Joint Federal Project (JFP) at Folsom Dam, Upstream and Downstream (for Cumulative Conformity Purposes)

Air Quality Technical Report

Sacramento, CA

Draft

May 2012

U.S. Army Corps of Engineers, Sacramento District

U.S. Army Corps of Engineers
Sacramento District

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Acronyms

1990 CAAA	1990 Clean Air Act Amendments
AB	assembly bill
AQMD	air quality management district
APCD	air pollution control district
ATCM	airborne toxic control measures
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCAA	California Clean Air Act
CEQ	White House Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
Corps	United States Army Corps of Engineers
DPM	diesel particulate matter
E.O.	executive order
GHG	greenhouse gas emissions
GWP	global warming potential
HAP	hazardous air pollutant
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
hp	horsepower
JFP	Joint Federal Project
LACMTA	Los Angeles County Metropolitan Transportation Authority
lbs/day	pounds per day
$\mu g/m^3$	micrograms per cubic meter
MIAD	Mormon Island Auxiliary Dam
mph	miles per hour
MPO	Metropolitan Planning Organization
MY	model year
N/A	not applicable
N_2O	nitrous oxide

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NF_3	nitrogen trifluoride
NOA	naturally occurring asbestos
NOx	nitrogen oxides
NO_2	nitrogen dioxide
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
Pb	lead
PFC	perfluorocarbon
PM	particulate matter
PM10	particulate matter smaller than or equal to 10 microns in diameter
PM2.5	particulate matter smaller than or equal to 2.5 microns in diameter
PMF	probable maximum flood
ppm	parts per million
ROG	reactive organic gases
SCS	sustainable communities strategies
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	sulfur dioxide
SVAB	Sacramento Valley Air Basin
TAC	toxic air contaminant
tons/yr	tons per year
ULSD	ultra-low sulfur diesel
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency

Tables

Executive Summary

The final phase of the Folsom Modification project, known as the Joint Federal Project (JFP) at Folsom Dam Upstream, is the completion of the approach channel and spur dike. There are two alternatives that are being considered for this project: (1) approach channel excavation with cutoff wall (known henceforth as Alternative 2), and (2) approach channel excavation with cofferdam (known henceforth as Alternative 3).

URS Corporation/ Brown and Caldwell Joint Venture has been contracted by the Sacramento District, U.S. Army Corps of Engineers (Corps), to perform an air quality impact analysis for the Approach Channel portion of the JFP. This technical report explains relevant air regulations and quantifies air emissions that would be expected during the construction of the Project alternatives. The analysis:

- Describes the affected environment and identifies sensitive receptors,
- Lists the air quality attainment status for criteria pollutants,
- Describes the methodology and calculations used to estimate air emissions,
- Explains the construction schedule, excavation equipment, and level of effort associated with each alternative,
- Estimates project specific and cumulative air quality impacts, and
- Identifies mitigation measures to reduce the severity of air impacts.

This report analyzes federal and state criteria pollutants, Toxic Air Contaminants (TACs), and greenhouse gases (GHGs). Criteria pollutants and TACs are identified by the federal Clean Air Act (CAA) and California Clean Air Act (CCAA). The TACs relevant to this project are diesel particulate matter (DPM) and naturally occurring asbestos (NOA).

The JFP at Folsom Dam Upstream project would temporarily increase both criteria pollutants and TACs from construction. Sources of pollutants include heavy equipment, on-site pickup trucks, on-site and off-site haul trucks, off-site worker vehicle trips, and earth disturbance activities (stockpiling, cut and fill, blasting) that create fugitive dust.

Although there are residences located within 1,000 feet of the Dike 7 and the Mormon Island Auxiliary Dam (MIAD) staging areas, they would not be exposed to substantial DPM emissions because of the limited construction activities in the vicinity. Although no NOA has been found on-site, fugitive dust mitigation measures will be implemented to reduce NOA impacts.

With proposed mitigation, NO_x emissions would be below the *de minimis* thresholds in all years for Alternative 2, and NOx emissions would be below the *de minimis* thresholds in all years for Alternative 3. The estimated mitigated emission inventories are presented below in Table ES-1.

Table ES-1. JFP Folsom Dam Upstream: Mitigated Annual Criteria Pollutant Emission Summary

Activity	Pollutant (tons per year [tons/yr])					
	ROG	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**
Alternative 2						
2013 Total	1	7	4	29	5	<1
2014 Total	<1	4	3	17	2	<1
2015 Total	<1	5	4	7	1	<1
2016 Total	1	14	11	19	2	<1
2017 Total	1	15	12	28	3	<1
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**
Alternative 3						
2013 Total	1	9	5	34	5	<1
2014 Total	<1	4	3	12	2	<1
2015 Total	1	5	4	4	1	<1
2016 Total	<1	4	3	20	3	<1
2017 Total	2	20	16	29	4	<1
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**N/A**	**N/A**

Notes:
1. For NEPA purposes, emission calculations are estimated using the OFFROAD2011 and EMFAC2007 models (based on USEPA guidance).
2. Emissions rates might not add up due to rounding.

Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
SO_2 sulfur dioxide
ROG reactive organic gases

The JFP at Folsom Dam, Upstream project construction period (2013-2017) would overlap for multiple construction months with the JFP at Folsom Dam, Downstream project (2010-2017). The USEPA had directed the Corps to complete a quantitative cumulative analysis for the JFP Folsom Dam Upstream and Downstream projects, and compare these emissions to the General Conformity *de minimis* thresholds. The combined Downstream and Upstream project NO_x emissions would exceed the *de minimis* thresholds in 2016 and 2017 for Alternative 2, and the NO_x emissions would exceed the *de minimis* thresholds in 2017 only for Alternative 3. The estimated mitigated emission inventories for the JFP Upstream and Downstream project during overlapping years are presented below in Table ES-2. Values which exceed *de minimis* thresholds are highlighted.

Table ES-2. JFP Folsom Dam Upstream and Downstream: Mitigated Annual Criteria Pollutant Emission Summary

	Pollutant (tons/yr)						
Activity	**ROG**	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**	**CO_2**
Alternative 2							
2013 Total	2	22	12	31	6	<1	10,388
2014 Total	2	24	15	24	4	<1	27,145
2015 Total	2	20	14	13	3	<1	26,427
2016 Total	2	28	19	24	4	<1	26,808
2017 Total	2	25	18	29	4	<1	7,388
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**
Alternative 3							
2013 Total	2	24	14	37	7	<1	8,611
2014 Total	2	24	15	19	4	<1	27,994
2015 Total	2	20	14	11	3	<1	27,141
2016 Total	2	17	12	24	4	<1	25,023
2017 Total	3	29	21	29	4	<1	9,275
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**

Notes:
1. For NEPA purposes, emission calculations are estimated using OFFROAD2011 and EMFAC2007 models.
2. Emissions rates might not add up due to rounding.

Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

Nitrogen oxide (NO_x) emissions that exceed 85 pounds per day (lbs/day) after incorporation of mitigation measures would be subject to a mitigation fee by the Sacramento Metropolitan Air Quality Management District (SMAQMD). SMAQMD uses that fee to fund NO_x reductions from existing sources of NO_x. The maximum NO_x emissions for Alternative 2 (92 lbs/day in 2016 and 98 lbs/day in 2017) and Alternative 3

(121 lbs/day) could exceed the 85 lbs/day threshold. Therefore NO_x mitigation fees could apply to the project. However, it is difficult to determine the worst-case daily NO_x emissions due to potential changes in equipment type, timing, and use. Project contractors and the Corps will need to maintain accurate equipment use records to determine the level of mitigation fees that must be paid to SMAQMD to mitigate the project.

1.0 SETTINGS/ AFFECTED ENVIRONMENT

1.1 Background

The final phase of the Folsom Modification project, known as the Joint Federal Project (JFP) at Folsom Dam Upstream, is the completion of the approach channel and spur dike. There are two action alternatives that are being considered for this project in addition to the No Action Project Alternative (Alternative A): (1) approach channel excavation with cutoff wall (known henceforth as Alternative 2), and (2) approach channel excavation with cofferdam (known henceforth as Alternative 3).

The project is subject to the U.S. Environmental Protection Agency (USEPA) General Conformity regulations because of the involvement of a federal agency - the Corps. General Conformity regulations implement Section 176(c) of the Clean Air Act which prohibits federal agencies from taking actions that may cause or contribute to violations of the National Ambient Air Quality Standards (NAAQS). The project is also subject to the Sacramento Metropolitan Air Quality Management District (SMAQMD) CEQA thresholds and mitigation requirements.

1.2 Purpose and Scope

The URS Corporation/ Brown and Caldwell Joint Venture has been contracted by the Sacramento District, Corps, to perform an air quality impact analysis for the approach channel portion of the JFP at Folsom Dam. The scope of work includes producing a technical report detailing relevant air regulations, and quantifying air quality environmental impacts during the construction of the alternatives. This analysis:

- Describes the affected environment and identifies sensitive receptors,
- Lists the air quality attainment status for criteria pollutants,
- Describes the methodology and calculations used to estimate air emissions,
- Explains the construction schedule, excavation equipment, and level of effort associated with each alternative ,
- Estimates project specific and cumulative air quality impacts, and
- Identifies mitigation measures to reduce the severity of air impacts.

1.3 Project Description

The following sub-sections describe the project alternatives, along with relevant details of some construction techniques.

1.3.1 Alternative 2: Approach Channel Excavation with Cutoff Wall

Key components of Alternative 2 are the cutoff wall, approach channel, spur dike, transload facility, concrete batch plant and staging areas. The following sub-sections describe each of these components in greater detail.

Cutoff Wall

The proposed cutoff wall would be located adjacent to Folsom Lake southeast of the Left Wing Dam and east of the Auxiliary Spillway chute excavation. The cutoff wall would provide seepage control to the spillway excavation between the rock plug and the Control Structure. The cutoff wall would consist of a reinforced concrete secant pile wall installed across the width of the future approach channel. The total length of the wall would be approximately 1,000 feet. The wall would be socketed into the underlying highly weathered granitic rock.

Approach Channel

The approach channel for the auxiliary spillway extends approximately 1,100 feet upstream of the concrete control structure. The approach channel converges as it approaches the control structure. The approach channel excavation includes excavation of rock material within the envelope of the approach channel, shaping and scaling of the channel surfaces, excavation of any rock trap recesses in the floor of the channel, placement of the approach slab, armoring of any side slopes susceptible to erosion. Excavation would occur both in-the-dry and in-the-wet.

Excavation of the rock plug would begin between the control structure and the cutoff wall to install the concrete slab and approach channel walls. The remaining rock plug excavation would be timed to follow the dropping lake level; top-down excavation of the rock plug would be performed following the lake level down to elevation 425.34 feet or less. As lake levels rise, excavation of the rock plug would be performed in-the-wet. To achieve the flood risk reduction benefits of the spillway earlier in the project life, a notch would be cut through the reduced rock plug down to elevation 350. The notch would be wide enough to pass a 200-year flood event. The in-the-wet excavation would continue to widen the channel in phases, until a width that passes the probable maximum flood (PMF) is reached.

Spur Dike

A spur dike is an embankment designed to direct water into an opening; in this case the opening would be the approach channel. The proposed elliptical-shaped spur dike would be located directly to the northwest of the approach channel. The core of the spur dike would be constructed of a decomposed quartz diorite core, commonly known as decomposed granite. This would be followed by a compacted random rock fill followed by a stone riprap cap. Material for the spur dike construction would come from the excavation of the approach channel excavation, or Mormon Island Auxiliary Dam (MIAD).

Transload Facility

A trans-load facility would be needed for mobilization/demobilization of marine equipment (e.g., sectional barges and heavy cranes), dredge spoil off-loading from barges to trucks, marine equipment fuel and explosives transfer to support barges, equipment maintenance, and marine crew deployment. The proposed trans-load facility would be comprised of a ramp, crane and crane pad, and a fuel transfer station. The trans-load facility would be located adjacent to Dike 7. The trans-load facility is temporary and would be removed after the completion of the approach channel project in 2017. Ramp material would be removed with excavators and hauled for disposal at MIAD.

Concrete Batch Plant and Staging Areas

The construction of the approach channel and cutoff wall would require large quantities of temperature controlled concrete. This would necessitate the use of a contractor-provided, on-site concrete batch plant and deliveries of large quantities of concrete aggregate, concrete sand, and cement. The batch plant would be powered by electricity from overhead Sacramento Municipal Utility District lines. One batch plant will be used for the duration of the project.

1.3.2 Alternative 3: Approach Channel Excavation with Cofferdam

Key components of Alternative 3 are the cofferdam, approach channel, spur dike, transload facility, concrete batch plant and staging areas. The following sub-sections describe each of these components in greater detail.

Cofferdam

The cofferdam consists of a series of 84-foot diameter circular sheet pile cells constructed using 85-foot-long flat sheet piles. The location of the cofferdam is based on a trade-off between cofferdam size and the amount of in-the-wet excavation. To prepare the foundation for the cofferdam, soft materials would be dredged until the decomposed granite is reached. Once the foundation is set, the cofferdam would be constructed. The construction of the cells requires sheet piles to be installed using a template. The template consists of two to three horizontally mounted ring wales provide support for the vertical flat sheets. The sheet piles are installed using a vibratory hammer, working progressively around the ring. Once erected, the cells would be filled with well-graded crushed rock. The same plan dimension is maintained throughout the cofferdam, allowing for one sheet pile installation template to be utilized for construction of all of the circular cells. A layer of riprap would be placed along the upstream toe of the cells for scour protection. The cells are founded directly on the decomposed granite.

After the cofferdam is installed, the downstream area would be dewatered. Timing would be coordinated with the completion of the control structure. When the control structure is operational the rock plug would be excavated and the approach channel slab and walls would be installed. Once the approach channel is excavated to final grade the cofferdam would be removed.

Approach Channel

Under Alternative 3, the excavation of the approach channel and the installation of the concrete slab and walls would be constructed as described in Section 1.3.1 for Alternative 2.

Spur Dike

Under Alternative 3, a spur dike would be constructed as described in Section 1.3.1 for Alternative 2.

Transload Facility

Under Alternative 3, a trans-load facility would be constructed as described in Section 1.3.1 for Alternative 2.

Concrete Batch Plant and Staging Areas

Under Alternative 3, a batch plant would be constructed and operated as described in Section 1.3.1 for Alternative 2.

1.4 Regulatory Settings

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).

The enforcement of federal and state air statutes and regulations is complex and the various agencies have different, but interrelated responsibilities. The USEPA is responsible for establishing the NAAQS, setting minimum New Source Review permitting and Operating Permit requirements for stationary sources; establishing New Source Performance Standards, National Emission Standards for Hazardous Pollutants and the Acid Deposition Control program; and administering regional air quality initiatives. The California Air Resources Board's (CARB's) role includes development, implementation, and enforcement of California's motor vehicle pollution control program, administration of the state's air pollution research program, adoption and updating, as necessary, of California Ambient Air Quality Standards (CAAQS), review of local air pollution control district (APCD) activities, and coordination of the development of the State Implementation Plan (SIP) for achievement of the NAAQS. Local APCDs are responsible for implementing federal and state regulations at the local level, permitting stationary sources of air pollution, and developing the local elements of the SIP. Emissions from indirect sources, such as automobile traffic associated with development projects, are addressed through the APCD's air quality plans, which are each air quality district's contribution to the SIP.

1.4.1 Federal Regulations

The following sections summarize the key federal regulations related to air quality and greenhouse gases (GHGs).

Clean Air Act

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 (PM10), fine particulate matter (PM2.5), and lead (Pb). The NAAQS for these pollutants are listed in Table 1-1 and represent the levels of air quality deemed necessary by USEPA to protect the public health and welfare with an adequate margin of safety.

General Conformity Rule and de minimis levels

Pursuant to CAA Section 176(c) requirements, USEPA promulgated the General Conformity Rule, which applies to most federal actions, including the Folsom JFP project.

The General Conformity Rule is used to determine if federal actions meet the requirements of the CAA and the applicable SIP by ensuring that pollutant emissions related to the action do not:

- Cause or contribute to new violations of a NAAQS.
- Increase the frequency or severity of any existing violation of a NAAQS.
- Delay timely attainment of a NAAQS or interim emission reduction.

A conformity determination under the General Conformity Rule is required if the federal agency determines: the action will occur in a nonattainment or maintenance area; that one or more specific exemptions do not apply to the action; the action is not included in the federal agency's "presumed to conform" list; the emissions from the proposed action are not within the approved emissions budget for an applicable facility; and the total direct and indirect emissions of a pollutant (or its precursors), are at or above the *de minimis* levels established in the General Conformity regulations.

Table 1-1. State and Federal Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	15 µg/m^3		
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[8]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m3)		53 ppb (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[9]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[9]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[9]	—	
Lead[10,11]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[11]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles[12]	8 Hour	See footnote 12	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page ...

For more information please call ARB-PIO at (916) 322-2990 California Air Resources Board (2/7/12)

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standards of 53 ppb and 100 ppb are identical to 0.053 ppm and 0.100 ppm, respectively.

9. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

   Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

10. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

11. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

12. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (2/7/12)**

Source: CARB 2010a

An action will be determined to conform to the applicable SIP if the action meets the requirements of 40 Code of Federal Regulations (CFR) 93.158(c). In addition, federal activities may not cause or contribute to new violations of air quality standards, exacerbate existing violations, or interfere with timely attainment or required interim emissions reductions toward attainment.

Federal GHG Regulations

Laws and regulations, as well as plans and policies, address global climate change issues. This section summarizes key federal regulations relevant to the project.

In *Massachusetts v. U.S. Environmental Protection Agency, et al*., 549 U.S. 497 (2007), the United States Supreme Court ruled that GHG fits within the CAA's definition of a pollutant, and that the USEPA has the authority to regulate GHG.

On October 5, 2009, President Obama signed Executive Order (E.O.) 13514; *Federal Leadership in Environmental, Energy, and Economic Performance,* E.O. 13514 requires Federal agencies to set a 2020 greenhouse gas emissions reduction target within 90 days; increase energy efficiency; reduce fleet petroleum consumption; conserve water; reduce waste; support sustainable communities; and leverage federal purchasing power to promote environmentally-responsible products and technologies.

On December 7, 2009, the Final Endangerment and Cause or Contribute Findings for Greenhouse Gases (endangerment finding), under Section 202(a) of the CAA went into effect. The endangerment finding states that current and projected concentrations of the six key well-mixed GHGs in the atmosphere [carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFEs)]) threaten the public health and welfare of current and future generations. Furthermore, it states that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare (EPA 2012a).

Under the endangerment finding, USEPA is developing vehicle emission standards under the CAA. USEPA and the Department of Transportation's National Highway Traffic Safety Administration have issued a joint proposal to establish a national program that includes standards that will reduce GHG emissions and improve fuel economy for light-duty vehicles in model years (MYs) 2012 through 2016. This proposal marks the first GHG standards proposed by the USEPA under the CAA as a result of the endangerment and cause or contribute findings (EPA, 2012b).

On February 18, 2010, the White House Council on Environmental Quality (CEQ) released draft guidance regarding the consideration of GHG in National Environmental Policy Act (NEPA) documents for federal actions. The draft guidelines include a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO_{2e}) emissions from a proposed action to trigger a quantitative analysis. CEQ has not established when GHG emissions are “significant” for NEPA purposes; rather, it poses the question to the public (CEQ 2010).

1.4.2 State Regulations

Key state regulations related to air quality and GHGs are summarized below.

California Clean Air Act

The CCAA establishes an air quality management process that generally parallels the federal process. The CCAA, however, focuses on attainment of the CAAQS that, for certain pollutants and averaging periods, are more stringent than the comparable NAAQS. The CAAQS are included in Table 1-1.

The CCAA requires that air quality management districts (AQMDs) and APCDs prepare a clean air plan if the district violates the CAAQS for CO, SO_2, NO_2, or O_3. The plan must include strategies for attaining the CAAQS for each non-attainment pollutant. These plans are required to be updated triennially. The region’s SIPs, which apply to the NAAQS, are described below in Section 1.6.4.

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 APCDs 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 and 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 Sacramento Valley Air Basin (SVAB). 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.

California GHG Regulations

California is a substantial contributor of global GHGs as it is the second largest contributor in the U.S. and the sixteenth largest in the world (CEC, 2006). From 1990 to 2003, California’s gross state product grew 83 percent while GHG emissions grew 12 percent. While California has a high amount of GHG emissions, it has low emissions per capita. The major source of GHG in California is transportation, contributing 41 percent of the State’s total GHG emissions (CEC, 2006). Electricity generation is the second largest generator, contributing 22 percent of the State’s GHG emissions. Emissions from fuel use in the commercial and residential sectors in California decreased 9.7 percent over the 1990 to 2004 period (CEC, 2006).

California has taken proactive steps, briefly described in the following sections, to address the issues associated with GHG emissions and climate change. A summary of the major California GHG regulations are presented below.

Table 1-2. Summary of Relevant California GHG Regulations

Bill, Year	Description
Assembly Bill (AB) 4420, 1988,	Directed California Energy Commission, in consultation with the CARB and other agencies, to "study and report…on how global warming trends may affect California's energy supply and demand, economy, environment, agriculture, and water supplies.
AB 1493, 2002	Requires CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions. These stricter emissions standards apply to automobiles and light trucks beginning with the 2009 MY. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, the waiver request has now been granted.
Executive Order (E.O.) S-3-05, 2005	The goal of E.O. S-3-05 is to reduce California's GHG emissions to (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below the 1990 levels by 2050.
AB 32, 2006 California Global Warming Solutions Act of 2006	Sets overall GHG emissions reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." 1. Requires statewide GHG emissions be reduced to 1990 levels by 2020 (The 1990 CO_{2e} level is 427 million metric tonnes of CO_{2e} (CARB, 2012a)). 2. Directs CARB to develop and implement regulations to reduce statewide emissions from stationary sources. 3. Specifies that regulations adopted in response to AB 1493 be used to address GHG emissions from vehicles 4. Requires CARB adopt a quantified cap on GHG emissions representing 1990 emissions levels 5. Includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.
E.O. S-01-07, 2007	Requires the carbon intensity of California's transportation fuels is to be reduced by at least 10% by 2020.
Senate Bill 375, 2008	Requires CARB to develop regional reduction targets for GHG emissions, and prompts the creation of regional plans to reduce emissions from passenger vehicle use throughout the state.
Source: CARB 2012a, CARB 2012b, CARB 2012c, Office of the Governor 2007	

California Environmental Quality Act GHG Amendments

California Environmental Quality Act (CEQA) and the CEQA Guidelines require that state and local agencies identify the significant environmental impacts of their actions, including potential significant air quality and climate change impacts, and to avoid or mitigate those impacts, when feasible. The CEQA amendments of December 30, 2009, specifically require lead agencies to address GHG emissions in determining the significance of environmental effects caused by a project, and to consider feasible means to mitigate the significant effects of GHG emission (California Natural Resources Agency 2012).

Provisions of the CEQA amendments relevant to the Project include the following (Office of Planning and Research 2009):

- A lead agency may consider the following when assessing the significance of impacts from GHG emissions:
  (1) The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
  (2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project;
  (3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. …
- When an agency makes a statement of overriding considerations, the agency may consider adverse environmental effects in the context of regionwide or statewide environmental benefits.
- Lead agencies shall consider feasible means of mitigating greenhouse gas emissions that may include, but not be limited to:
  (1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;
  (2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures;
  (3) Offsite measures, including offsets;
  (4) Measures that sequester GHGs;
  (5) In the case of the adoption of a plan, such as a general plan, long-range development plan, or GHG reduction plan, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

Asbestos Control Measures

CARB has adopted two airborne toxic control measures (ATCM) for controlling naturally occurring asbestos (NOA): the Asbestos ATCM for Surfacing Applications and the Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations. CARB and local air districts have been delegated authority by the USEPA to enforce the Federal National Emission Standards for Hazardous Air Pollutants regulations for asbestos.

1.4.3 Local Regulations

Relevant local air quality and GHG regulations are detailed below.

Sacramento Metropolitan Air Quality Management District

SMAQMD is responsible for implementing federal and state regulations at the local level, permitting stationary sources of air pollution, and developing the local elements of the SIP. Emissions from indirect sources, such as automobile traffic associated with development projects, are addressed through the APCD's air quality plans, which are each air quality district's contribution to the SIP. 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. The SMAQMD's CEQA significance thresholds, which would be applicable to the project, are described below.

SMAQMD GHG Requirements

The SMAQMD has not developed screening levels for GHG emissions from projects in Sacramento County.

To assess whether the incremental quantity of GHG emissions generated by a project is cumulatively considerable, a context for comparison must first be established. SMAQMD recommends that thresholds of significance for GHG emissions should be related to AB 32's GHG reduction goals (Table 1-2, SMAQMD, 2011).

1.5 Pollutants and Health Effects

Three categories of air quality pollutants of relevance to this Project are discussed in this section. Criteria pollutants have established national standards; toxic air contaminants (TACs) are defined by the state of California but do not have ambient air quality standards because often no safe levels have been determined; and GHGs are defined as gases that trap heat within the atmosphere.

1.5.1 Criteria Pollutants

Pollutants that have established national standards are referred to as *criteria pollutants*. For these pollutants, federal and state ambient air quality standards have been established to protect public health and welfare. Criteria pollutants include CO, NO_2, O_3, PM10, PM2.5, and SO_2. Ozone is a secondary pollutant that is not emitted directly to the atmosphere. Instead, it forms by the reaction of two ozone precursors – reactive organic gases and nitrogen oxides – in the presence of sunlight and high temperatures. The sources of these pollutants, their effects on human health and the nation's welfare, and annual emission to the atmosphere vary considerably.

The following table (Table 1-3) provides a general description (including potential health effects) of the criteria pollutants that could be emitted from the Project.

Table 1-3. Criteria Pollutants Health Effects

Pollutant	Characteristics	Health Effects
CO	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, death.
NO_2	Reddish-brown gas formed during combustion.	Increased risk of acute and chronic respiratory disease.
O_3	A highly reactive photochemical pollutant crated by the action of sunshine on ozone precursors (reactive organic gases (ROGs) and oxides of nitrogen.)	Eye irritation Respiratory function impairment
PM10 and PM2.5	Small particles that measure 10 microns or less are termed PM10 (fine particles less than 2.5 microns are PM2.5). 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.
SO_2	Colorless gas with a pungent odor.	Increased risk of acute and chronic respiratory disease.

1.5.2 Toxic Air Contaminants (TACs)

A TAC is defined by California law as an air pollutant that “may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health.” USEPA uses the term *hazardous air pollutant* (HAP) in a similar sense. Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA), whereby Congress mandated that USEPA regulate 188 air toxics, also known as HAPs. TACs can be emitted from stationary and mobile sources.

Ten TACs have been identified through ambient air quality data as posing the greatest health risk in California. Direct exposure to these pollutants has been shown to cause cancer, birth defects, damage to brain and nervous system and respiratory disorders.

TACs do not have ambient air quality standards because often no safe levels of TACs have been determined. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure. The requirements of the Air Toxic “Hot Spots” Information and Assessment Act apply to facilities that use, produce, or emit toxic chemicals. Facilities that are subject to the toxic emission inventory requirements of the Act must prepare and submit toxic emission inventory plans and reports, and periodically update those reports.

The TACs of concern for this project are diesel particulate matter (DPM) and NOA.

Diesel Particulate Matter

DPM is emitted from both mobile and stationary sources. In California, on-road, diesel-fueled engines contribute approximately 24 percent of the statewide total, with an additional 71 percent attributed to other mobile sources such as construction and mining equipment, agricultural equipment, and transport refrigeration units. Stationary sources contribute about 5 percent of total DPM.

In California, diesel exhaust particles have been identified as a carcinogen (California OEHHA and the American Lung Association, 2005). Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde, and nickel) have the potential to contribute to mutations in cells that can lead to cancer. Long-term exposure to diesel exhaust particles poses the highest cancer risk of any toxic air contaminant evaluated by the California Office of Environmental Health Hazard Assessment (OEHHA). CARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat, and lungs, and it can cause coughs, headaches, lightheadedness, and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks, and premature deaths among those suffering from respiratory problems. Because children's lungs and respiratory systems are still developing, they are more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children.

Naturally Occurring Asbestos

NOA was identified as a TAC in 1986 by CARB. NOA is located in many parts of California and is commonly associated with ultramafic rocks, according to the California Department of Geology's special publication titled "Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California." The project area has been identified as within an area where the local geology supports the formation of NOA.

Asbestos is a term used for several types of naturally fibrous minerals that are a human health hazard when airborne. The most common type of asbestos is chrysolite, but other types such as termolite and actinolite are also found in California. Serpentinite may contain chrysotile asbestos. Ultramafic Rock, a rock closely related to serpentinite, may also contain asbestos minerals. All types of asbestos are hazardous and may cause lung disease and cancer.

For individuals living in areas of NOA, there are many potential pathways for airborne exposure. Exposures to soil dust containing asbestos can occur under a variety of scenarios, including children playing in the dirt; dust raised from unpaved roads and driveways covered with crushed serpentine; grading and earth disturbance associated with construction activity; quarrying; gardening; and other human activities (SMAQMD, 2011).

1.5.3 Greenhouse Gases

Gases that trap heat in the atmosphere, which are often referred to as GHGs, are necessary to life, because they keep the planet's surface warmer than it otherwise would be. This is referred to as the Greenhouse Effect. As concentrations of greenhouse gases increase, however, the Earth's temperature increases. According to National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA) data, the Earth's average surface temperature has increased by 1.2ºF to 1.4ºF in the last 100 years (NOAA, 2007; NASA, 2007). Eleven of the last 12 years rank among the 12 warmest years on record (since 1850), with the warmest 2 years being 1998 and 2005. Most of the warming in recent decades is very likely the result of human activities. Other aspects of the climate are also changing, such as rainfall patterns, snow and ice cover, and sea level.

Some GHGs, such as CO_2, occur naturally and are emitted to the atmosphere through both natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. Each GHG traps a different amount of heat. In order to compare emissions of different GHGs, a weighting factor called a Global Warming Potential (GWP) is used, in which a single metric ton (1,000 kilograms) of CO_2 is taken as the standard. Emissions are expressed in terms of

CO_{2e}. Therefore, the GWP of CO_2 is 1; the GWP of CH_4 is 21; and the GWP of N_2O is 310. These three GHGs would be applicable to the project and potentially emitted during project construction activities, as detailed in Section 3.1.6 below. The principal GHGs that enter the atmosphere because of human activities are described below.

CO_2. Carbon dioxide enters the atmosphere via the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

CH_4. Methane is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices and from the decay of organic waste in municipal solid waste landfills.

N_2O. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

Fluorinated Gases. HFCs, PFCs, and SF_6 are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs], hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as High GWP gases.

The proposed project alternatives would be expected to emit CO_2, CH_4, and N_2O but are not expected to result in the emission of fluorinated gases.

1.6 Existing Conditions

1.6.1 Meteorology and Climate

The project area is located at the southern end of the Sacramento Valley, which has a Mediterranean climate, characterized by hot dry summers and mild rainy winters. During the year the temperature may range from 20 to 115 degrees Fahrenheit with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is about 20 inches with snowfall being very rare. The prevailing winds are moderate in strength and vary from moist breezes from the south to dry land flows from the north.

The mountains surrounding the Sacramento Valley create a barrier to airflow, which can trap air pollutants in the valley when meteorological conditions are right and a temperature inversion exists. The highest frequency of air stagnation occurs in the autumn and early winter when large high-pressure cells lie over the valley. The lack of surface wind during these periods and the reduced vertical flow caused by less surface heating reduces the influx of outside air and allows air pollutants to become concentrated in the air. The surface concentrations of pollutants are highest when these conditions are combined with smoke from agricultural burning or when temperature inversions trap cool air, fog and pollutants near the ground.

The ozone season (May through October) in the Sacramento Valley is characterized by stagnant morning air or light winds with the Delta sea breeze arriving in the afternoon out of the southwest. Usually the evening breeze transports the airborne pollutants to the north out of the Sacramento Valley. During about half of the days from July to September, however, a phenomenon called the “Schultz Eddy” prevents this from occurring. Instead of allowing for the prevailing wind patterns to move north carrying the pollutants out of the valley, the Schultz Eddy causes the wind pattern and pollutants to circle back southward. This phenomenon’s effect exacerbates the pollution levels in the area and increases the likelihood of violating the federal and state air quality standards (SMAQMD 2011).

1.6.2 Existing Air Quality

This existing air quality section includes a discussion of the existing emissions inventory for Sacramento County and California, criteria pollutant data collected at a local monitoring station, and sensitive receptors. Existing air quality values described in the emissions inventory and monitoring data sections provide a background against which project values are measured. Only criteria air pollutants and GHGs are shown, as no numeric standards exist for TACs.

Emissions Inventory

Table 1-4 shows Sacramento County’s 2010 emissions inventory. There are two main categories of emission sources in any area: stationary and mobile. On-road motor vehicles are the major source of reactive organic gases (ROGs), CO, and nitrogen oxides (NO_x) emissions in Sacramento County. Other (off-road) mobile vehicles and equipment contribute substantially to ROG, CO, and NO_x emissions. Motor vehicles and other mobile sources are the largest contributors to the County’s SO_2 emissions. Fugitive dust, primarily from construction sites, paved and unpaved roadways, and farming operations, is the major source of PM10 and PM2.5. Residential fuel combustion also substantially contributes to PM2.5 emissions. Criteria pollutant sources are summarized in Table 1-4.

Table 1-4. Sacramento County 2010 Emissions Inventories

Source Type	Category	Average Emission in Tons Per Day (tons/day)[1]					
		ROG	CO	NO_x	SO_2	PM10	PM2.5
Stationary	Fuel Combustion	0.3	3.8	3.6	0.1	0.4	0.4
Stationary	Waste Disposal	0.3	0.0	0.0	0.0	0.0	0.0
Stationary	Cleaning and Surface Coatings	4.1	-	-	-	-	-
Stationary	Petroleum Production and Marketing	2.5	0.0	0.0	-	-	-
Stationary	Industrial Processes	0.9	0.3	0.2	0.1	1.1	0.5
Area-wide	Solvent Evaporation	13.5	-	-	-	0.0	0.0
Area-wide	Miscellaneous Processes	4.1	40.8	3.1	0.1	40.1	10.3
Mobile	On-Road Motor Vehicles	20.1	181.8	39.1	0.2	2.0	1.4
Mobile	Other Mobile Sources	12.1	85.5	23.5	0.2	1.4	1.3
	Total	58.0	312.2	69.6	0.6	45.1	13.9

Source: CARB 2009
1. Totals may differ slightly than the sum of the individual pollutant sources due to rounding.

Table 1-5 shows Sacramento County's 2008 GHG emissions, and Table 1-6 shows California's GHG emissions. Transportation was the largest GHG emission source for both Sacramento County and California. Residential, commercial and industrial sources were the two other largest GHG sources in Sacramento County. Additional major statewide GHG emission sources were electric power and industries.

Table 1-5. Sacramento County 2005 GHG Emissions Inventory

Source Category	Annual Estimate of CO_2 equivalent (CO_{2e}) (million metric tons/yr)
Residential	2.44
Commercial and Industrial	2.23
Industrial Specific	0.041
On-Road Transportation	6.73
Off-Road Vehicle Use	0.58
Waste	0.74
Wastewater Treatment	0.13
Water-Related	0.064
Agriculture	0.20
High Global Warming Potential (GWP)	0.57
Sacramento International Airport	0.20
Total Emissions	**13.9**
Source: County of Sacramento, 2009.	

Table 1-6. California 2008 GHG Emissions Inventory

Source Category	Annual Estimate of CO_2 equivalent (CO_{2e}) (million metric tons/yr)
Transportation	174.99
Electric Power	116.35
Commercial and Residential	43.13
Industrial	92.66
Recycling and Waste	6.71
High GWP	15.65
Agriculture	28.06
Forestry	0.19
Total Gross Emissions	**477.74**
Source: CARB 2010b	

Monitoring Data – Criteria Pollutants

Air quality data from the Del Paso monitoring station near the area of analysis is summarized in Table 1-7. The Del Paso monitoring station is located approximately 11 miles from the project site. It was selected to best represent the regional conditions of the area of analysis because all relevant criteria pollutants (CO, O_3, NO_2, PM10, PM2.5, and SO_2) are sampled there.

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. During 2008-2010, both the 1-hour and 8-hour maximum CO concentrations were less than 4 parts per million (ppm). 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 a maintenance area for the CO NAAQS in March 1998 (USEPA, 2012c).

The 1-hour O_3 CAAQS had been exceeded up to 17 times each year at the individual monitoring station shown on Table 1-7. The recorded 8-hour O_3 concentrations exceeded the NAAQS up to 18 times in 2008 and exceeded the CAAQS up to 32 times in 2009. 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 2010.

Monitored NO_2 and SO_2 concentrations varied minimally year-to-year during the three year monitoring period and did not exceed the applicable CAAQS and/or NAAQS (Table 1-7).

The 24-hour and annual PM10 and annual PM2.5 CAAQS were exceeded during the monitoring period. Additionally, during this monitoring period, the NAAQS PM10 was not exceeded and the NAAQS PM2.5 was exceeded, as shown in Table 1-7.

Table 1-7. Summary of Pollutant Monitoring Data in Sacramento Del Paso Manor Monitoring Station

Criteria Air Pollutant	Yearly Monitoring Data		
	2008	**2009**	**2010**
CO Highest 1-Hour concentration (ppm)[(1)] Days above CAAQS Days above NAAQS	 3 0 0	 3 0 0	 2 0 0
CO Highest 8-Hour concentration (ppm) Days above CAAQS Days above NAAQS	 2.5 0 0	 3 0 0	 2 0 0

Criteria Air Pollutant	Yearly Monitoring Data		
	2008	2009	2010
O_3 – 1 Hour Highest concentration (ppm)[(2)] Days above CAAQS Days above NAAQS	 0.113 17 0	 0.122 14 0	 0.105 6 0
O_3 – 8 Hour Highest concentration (ppm) Days above CAAQS Days above NAAQS	 0.097 23 18	 0.102 32 15	 0.102 7 5
NO_2 – 1 Hour Highest concentration (ppm) Days above CAAQS Days above NAAQS	 0.058 0 0	 0.049 0 0	 0.052 0 0
PM10 Highest 24-hour concentration (µg/m^3) Arithmetic mean (µg/m^3) Days above CAAQS Days above NAAQS	 72.0 23.2 12.1 0	 48.0 18.7 0 0	 44.0 16.3 0 0
PM2.5 Highest 24-hour concentration (µg/m^3) Arithmetic mean (µg/m^3) Days above NAAQS	 93.1 18.9 24.1	 71.7 15.4 8.9	 41.6 8.7 0
SO_2 Highest 24-hour concentration (ppm) Days above CAAQS	 0.002 0	 0.002 0	 0.001 0

Source: CARB 2012d, USEPA 2012d

Notes:

1. Carbon monoxide concentration is based on average of two recorded maximum values.
2. Highest concentration and arithmetic mean for all pollutants, except carbon monoxide, displayed from the State and Federal Monitoring Data.

Acronyms

µg/m^3 microgram per cubic meter
CO carbon monoxide
NO_2 nitrogen dioxide
O_3 ozone
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ppm parts per million
SO_2 sulfur dioxide

Sensitive Receptors

Some locations are considered more sensitive to adverse effects from air pollution than others. These locations are termed sensitive receptors. For CEQA purposes, a sensitive receptor is generically defined as a location where human populations, especially children, seniors, and sick persons are found, and there is reasonable expectation of continuous human exposure according to the averaging period for the ambient air quality standard (e.g., 24-hour, 8-hour, and 1-hour). These typically include residences, hospitals, and schools. Locations of sensitive receptors may or may not correspond with the location of the maximum offsite concentration. The air quality analysis evaluates impacts at the worst-case location, typically adjacent to the source of emissions, regardless of the presence of a sensitive receptor.

1.6.3 Attainment Status

Sacramento County, in which the Folsom Dam is located, is designated as a “severe” non-attainment for the O_3 NAAQS and as nonattainment for the PM10 and PM2.5 NAAQS. The county is a designated maintenance area for the CO NAAQS. Since the project is located in a nonattainment area for ozone, the project’s emissions of ozone precursors (ROG and NO_x) must be compared to the federal conformity thresholds to determine whether the project is subject to conformity. Similarly, since Sacramento County is nonattainment for PM10 and PM2.5, and maintenance for CO, the project’s emissions of these pollutants must also be compared to the federal conformity thresholds.

Table 1-8. Federal and State Attainment Status

Pollutant	State Status	Federal Status
O3	Non-Attainment, serious for 1 hour and 8 hour average	Non-attainment, severe (1-hour and 1997 8-hour standards) (1)
PM10	Non-attainment, 24 hour standard and Annual mean	Non-attainment (2), moderate
PM2.5	Non-attainment, annual standard	Non-attainment
CO	Attainment	Maintenance Area (3)
NO2	Attainment	Attainment
SO2	Attainment	Attainment

Sources: SMAQMD 2012a, CARB 2012e; USEPA 2012e.

Notes:

1. The USEPA is in the process of implementing and finalizing new attainment area designations based on the 2008 O_3 NAAQS. The USEPA’s initial Sacramento County area designation, as of December 2011, is nonattainment for this standard.
2. Air quality meets Federal PM10 Standards. The USEPA is in the process of reviewing the CARB’s request, on behalf of SMAQMD, to formally designate the area as in attainment.
3. As of September 27, 2010, all carbon monoxide areas have been redesignated to maintenance areas.

Acronyms

CO	carbon monoxide
NO_2	nitrogen dioxide
O_3	ozone
PM10	particulate matter smaller than or equal to 10 microns in diameter
PM2.5	particulate matter smaller than or equal to 2.5 microns in diameter/
SO_2	sulfur dioxide

1.6.4 State Implementation Plans

Counties or regions that are designated as federal non-attainment areas for one or more criteria air pollutants must prepare a plan 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 demonstrate how the area will maintain the standard. These regional plans, prepared by local air districts, go into the SIP, which is compiled by the CARB and eventually approved by USEPA. These regional plans are themselves sometimes referred to as SIPs. SIPs are not single documents; rather, they are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations and federal controls. SIPs are not required for NO_2 and SO_2 in Sacramento County because the county is in attainment for these pollutants. The Sacramento County maintenance plans and/or SIPs for the other criteria pollutants are described below.

Ozone: In order to implement the 2008 O_3 NAAQS of 0.075 ppm, the USEPA intends to provide initial ozone non-attainment area designations, review any updated recommendations from the States, and provide final area attainment designations by mid-2012 (SMAQMD 2012b). Typically, attainment plans must be submitted no later than 3 years after the effective date of USEPA nonattainment designations. It is likely the SMAQMD would be required to submit an attainment plan within this timeline. The extent of the existing non-attainment area for the previous 8-hour O_3 NAAQS includes all of Sacramento and Yolo Counties, and parts of El Dorado, Placer, Solano, and Sutter Counties.

Carbon monoxide: 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.

PM10: The Sacramento County area is currently designated as non-attainment for the PM10 NAAQS, although the area has not measured any violations of the PM10 NAAQS in more than ten years. To formally change the PM10 area designation to attainment, on December 7, 2010, the CARB submitted the *PM10 Implementation/Maintenance Plan and Re-Designation Request for Sacramento County* to the USEPA. The USEPA is still in the process of reviewing the plan and attainment redesignation request. (SMAQMD 2012a).

PM2.5: On October 8, 2009, the USEPA signed the final PM2.5 nonattainment designations for the Sacramento area. The designations became effective on December 14, 2009. The SMAQMD is in the process of preparing a PM2.5 attainment plan and compiling emissions and monitoring data from the CARB. The SMAQMD intends to publicly release the plan for public review and submit the plan for agency approval by the deadline of December 2012. (Anderson, 2012, SMAQMD 2011c).

2.0 ANALYSIS METHODOLOGY

2.1 Significance Criteria

This section discusses how significance criteria are determined for both CEQA and NEPA, which would both be applicable to the project, and then presents the criteria for both federal and state levels. Significance criteria take into account each of the thresholds or measurements discussed below.

2.1.1 General Conformity *De Minimis* Thresholds

The General Conformity *de minimis* levels are based on the non-attainment classification of the air basin. The project is located in the SVAB, which is an ozone nonattainment area, classified as severe. The SVAB is also designated as nonattainment for PM10 and PM2.5, and a maintenance area for CO. The General Conformity *de minimis* levels for this project are shown below (Table 2-1). These thresholds were applied to the project's estimated emissions and used to determine NEPA impact significance as detailed in the NEPA significance criteria section below.

Table 2-1. General Conformity *De Minimis* Thresholds

Pollutant	Federal Attainment Status	Threshold Values (tons/yr)[1]
Ozone precursor (NO_x)	Nonattainment: Severe	25
Ozone precursor (ROGs)	Nonattainment: Severe	25
CO	Maintenance	100
SO_2	Attainment	N/A
PM2.5	Nonattainment	100
PM10	Nonattainment: Moderate	100
Pb	No designation	N/A

Source: USEPA 2011a

Notes:

1. Thresholds from 40 CFR Parts 51 and 93.

Acronyms:

CO carbon monoxide
N/A not applicable
NO_x nitrogen oxides
Pb lead
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

2.1.2 Sacramento Metropolitan Air Quality Management District Thresholds

SMAQMD has published CEQA significance thresholds for projects that would release criteria pollutants, TACs, and/or objectionable odors. SMAQMD has also published general guidance, but no thresholds, for GHGs. Applicable significance criteria are presented in the following sections. Because project impacts are limited to construction, not operations, only SMAQMD's construction related thresholds are presented.

Mass Emission Thresholds

Table 2-2 shows SMAQMD's construction specific NO_x significance threshold. If the project construction emissions exceed the CEQA NO_x threshold, the project applicant must pay mitigation fees of $16,640 per ton of NO_x to offset any excess emissions.

Table 2-2. Sacramento Metropolitan AQMD Daily Mass Emissions Thresholds for NO_x from Construction Emissions

Project Type	NO_x (lbs/day)
Short-term Effects (Construction)	85
Source: SMAQMD, 2011	

Ambient Concentration Thresholds

For construction projects disturbing more than 15 acres per day, dispersion modeling is required by SMAQMD to determine whether the project's emissions would exceed the PM10 CAAQS. For projects disturbing 15 or fewer acres per day, dispersion modeling is not required. Instead, the project must implement all Basic Construction Emission Control Practices. If all such measures are incorporated, project impacts are considered less than significant.

GHG Thresholds

GHG emissions have the potential to adversely affect the environment because they contribute, on a cumulative basis, to global climate change. Although the SMAQMD has not established thresholds of significance for GHG emissions, the SMAQMD does provide methodologies for GHG emission analysis and mitigation in their CEQA guidelines (SMAQMD 2011). The SMAQMD recommends that project applicants consider thresholds of significance for GHG emissions that are related to AB 32's GHG reduction goals as described in Table 1-2 above.

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 has the potential to create objectionable odors affecting a substantial number of people. In addition, the SMAQMD Rule 402 prohibits any person or source from emitting air contaminants that cause detriment, nuisance, or annoyance to a considerable number of persons or the public (SMAQMD 2011). The project is analyzed based on the SMAQMD recommendations that significance determinations be made on a case-by-case basis and consider parameters such as recommended odor screening distances, or odor complaint history.

Toxic Air Contaminants

Diesel Particulate Matter

The SMAQMD has not established a quantitative threshold of significance for construction-related TAC emissions. Therefore, the SMAQMD recommends that project applicants address this issue on a case-by-case basis, taking into consideration the specific construction-related characteristics of each project and the project's proximity to off-site receptors (SMAQMD ,2011). Consequently, this analysis evaluates DPM based on the quantity of emissions and the distance to nearby receptors.

Naturally Occurring Asbestos

Significance criteria for NOA are determined by whether or not a project involves earth moving activities within "areas moderately likely to contain NOA as documented within the report *The Relative Likelihood for the Presence of Naturally Occurring Asbestos in Eastern Sacramento County, California.*(California Geological Survey, 2006).

If a project would be located in an area at least moderately likely to contain NOA, then the impact shall be considered potentially significant (SMAQMD ,2011).

2.1.3 NEPA Significance Determinations

The criteria discussed below were applied in the EIR/EIS Air Quality chapter to determine NEPA significance conclusions but are not applied in this technical report:

- No effect: there are no measurable pollutant emissions;
- Negligible: If the project pollutant emissions are below the corresponding general conformity thresholds, and are expected to cause pollutant emissions that do not exceed other applicable emissions, air quality, or health risk thresholds (i.e., SMAQMD thresholds);
- Moderate air quality effects: pollutant emissions below corresponding general conformity thresholds, but having the potential to exceed other applicable emissions, air quality, or health risk thresholds; and
- Substantial effects: pollutant emissions that are greater than the corresponding general conformity threshold, or having the potential to exceed other applicable emissions, air quality, or health risk thresholds.

2.1.4 CEQA Significance Determinations

The criteria discussed below were applied in the EIR/EIS Air Quality chapter to determine CEQA significance conclusions but are not applied in this technical report:

- No effect: there are no measurable pollutant emissions;
- Less than significant: If the project pollutant emissions are below the appropriate SMAQMD CEQA significance thresholds;
- Less than significant with mitigation: pollutant emissions below appropriate SMAQMD CEQA significance thresholds, after mitigation; and
- Significant and unavoidable effects: pollutant emissions are greater than the appropriate SMAQMD CEQA significance thresholds even with implementation of mitigation.

2.2 Methodology and Assumptions

The methods for evaluating impacts are intended to satisfy the federal and state requirements, including NEPA, CEQA, and general conformity. In general, the construction emissions were estimated from several emission models and spreadsheet calculations, depending on the source type and data availability. Models used include the CARB Emission Factor (EMFAC2007/ EMFAC2011)[1] models (onroad vehicle emission factor model), and the CARB OFFROAD2011 model. Daily and total project emissions were estimated from appropriate emission factors from the models or USEPA AP-42 guidance, the type of equipment being operated, the level of equipment activity, and the associated construction schedules.

2.2.1 Criteria Pollutant and GHG Emission Calculations

The following section describes the methodology used to estimate criteria pollutant and GHG emissions from each construction activity associated with upstream activities. Cumulative emissions associated with upstream plus downstream activities are described in Section 5.0. A variety of Corps-provided documents or personal communications were used to calculate the upstream project emissions as summarized in Table 2-3. Sources of emission factors used in the calculations are detailed in the following sections.

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[1] The EMFAC2011 model has been adopted by SMAQMD for CEQA purposes, but this model has yet to be accepted by the USEPA for the General Conformity determinations. Based on a conversation with Karen Huss and Dawn Richmond of USEPA Region 9, we estimated emissions using the EMFAC2007 model versions for NEPA purposes (Huss, 2011, personal communication) and the EMFAC2011 model updates for CEQA purposes (Huss, 2011, personal communication).

Table 2-3. Summary of Data Sources and Uses

Source	Information Used
Corps, 2011a.	• Construction equipment lists for Alternatives B and C. • Schedule used to assume equal on-site haul truck activity in various years (Alternative 2: 2013, 2014, and 2016; Alternative 3: 2013, 2016, and 2017)
Corps, 2011b.	• Number of workers by construction activity and total days worked for both alternatives (2013-2017).
Corps, 2011c.	• Annual tonnage of rock processed at rock crushing facility
Corps, 2011d and Corps, 2011e.	• Concrete batch plant assumptions regarding schedule and the aggregate and concrete placement quantities.
Corps, 2011f.	• Quantities of materials (aggregate or dredged) required for spur dike, transload facility, ramp construction for off-site haul truck calculations. • Haul truck distances to MIAD and Jamestown, CA • Ratio of aggregate quantity needed for production of specific concrete quantity • Truck trips in 2017 to remove ramp for transload facility
Wisniewski, J., 2012.	• Blasting material truck trips (February 2014 to August 2017) • Blasting input parameters
Sandburg, N., 2012a.	• Updated concrete quantities moved from and produced at concrete batch plant during construction years 2014 -2016 • Distance to concrete batch plant • Updated schedule for concrete batch plant activities
Corps, 2009a.	• Fastest wind speed at site
Corps, 2009b.	• Amount of excavated material
Corps, 2010.	• Haul truck distances to aggregate material origin and for miscellaneous purposes. • For the JFP at Folsom Dam, Downstream Project: Haul truck assumptions and emission factors, assumptions for worker commute travel, aggregate material storage piles assumptions for concrete batch plants, assumptions for stockpile wind erosion emissions, and assumptions for heavy diesel truck travel.
Note: All data sources apply to the JFP at Folsom Dam, Upstream Project unless otherwise noted.	

The upstream emissions analysis includes the following activities:

- On-site construction off-road equipment, such as excavators, backhoes, bulldozers and scrapers, will be used for site preparation, construction and removal of the transload facility, excavation of the approach channel, construction of the spur dike, and installation of the concrete cutoff wall or installation and removal of the cofferdam
- Marine equipment will be used for placement and removal of the cofferdam, in-the-wet excavation and blasting, dredging, placement of silt curtains, and other on-water support services.
- On-site pickup and haul trucks will be used for general construction support and for hauling materials from excavated areas to staging or disposal areas, to the spurdike from excavation or staging areas, from the transload facility to disposal areas, or for cofferdam fill material to disposal areas.
- Off-site haul trucks. Aggregate will be trucked from off-site for construction of the transload facility and for concrete production. In addition, blasting materials will be stored off site and trucked in only on the day when they will be used onsite. In addition, haul trucks will be used to transport material from the concrete batch plant to the construction area.
- Off-site worker vehicles will be used for daily worker commutes.
- Fugitive dust sources will include in-the-dry blasting for the approach channel, stockpile handling, wind erosion of stockpiles, paved roads, unpaved roads, in-the-dry excavation for approach channel, operation of the rock crusher, and operation of the concrete batch plant. Stockpiles would be used for materials or fill associated with excavation of the approach channel, and the aggregate for the concrete batch plant. An unpaved road would be created onsite to support all construction activities. Use of paved roads would support off-site haul truck activities and construction worker commutes. The rock crusher would be used for the concrete batch operations. The concrete batch plant would support concrete production for construction activities.

On-site construction off-road equipment

Off-road construction equipment exhaust emissions were estimated using the OFFROAD2011 model for construction years 2013-2017. The emission factors were based on equipment horsepower rating. The exhaust emissions were calculated from the emission factor, the number of pieces of equipment, the engine duty, and the operating schedule. Activity data for construction equipment was provided by the project's engineers (Corps, 2011a).

On-site construction marine equipment

Marine exhaust emissions were estimated using the emission factors from the California Air Resources Board's Harbor Craft model (CARB, 2012f). The Harbor Craft model's emission factors are listed as a function of year and horsepower range.

The exhaust emissions were calculated from the emission factor, load factor the number of pieces of equipment, the engine duty, and the operating schedule. Activity data for construction equipment was provided by the project's engineers (Corps, 2011a).

On-site pickup trucks

On-site pickup truck exhaust emissions were estimated using the EMFAC2007/EMFAC2011 models for light duty trucks in Sacramento County. The emission factors were based on a speed of 10 miles per hour (mph).

On-site pickup truck information was provided by the project engineers (Corps, ,2011a), and is summarized in Table 2-4 below.

Table 2-4. On-site pickup truck trips

Activity	No. of Trucks	2013 (Miles)	2014 (Miles)	2015 (Miles)	2016 (Miles)	2017 (Miles)
Alternative 2						
Mobilization for Approach Walls (Roads , Crane Pads) (3 months) (Mid 2015)						
Pickup's standard F-150 (gas)	5	-	-	15,000	-	-
Pickup's Ford 150 4X4 (gas)	2	-	-	6,000	-	-
Mech trucks	2	-	-	8,400	-	-
Fuel trucks	2	-	-	8,400	-	-
Pipe Fitters Truck	1	-	-	840	-	-
Electric - Line Man Truck	1	-	-	1,120	-	-
Flatbed trucks	2	-	-	7,200	-	-
Intake Approach Walls & Slab (13 months) (September 2015-March 2017)						
Pickup's Ford 150 4X4 (gas)	1	-	-	3,975	3,975	3,975
Site Restoration/Teardown (1 Month) (July-August 2014)						
Pickup Trucks	6	-	43,200	-	-	-
Shop Trucks	2	-	19,200	-	-	-
Site Restoration Work (4 Months) (2017)						
Pickup's standard F-150 (gas)	1	-	-	-	-	4,800
Site Restoration Work (4 Months) (2017)						
Flatbed trucks	1	-	-	-	-	1,080
Totals		**0**	**62,400**	**50,935**	**3,975**	**9,855**
Alternative 3						
Intake Approach Walls & Slab (13 months) (September 2015-March 2017)						
Pickup's Ford 150 4X4 (gas)	1	-	-	11,925	-	-
Intake Approach Walls & Slab (13 months) (September 2015-March 2017)						
Pickup's Ford 150 4X4 (gas)	1	-	-	3,975	3,975	3,975
Site Restoration/Teardown (1 Month) (July - August 2014)						
Pickup Trucks	6	-	43,200	-	-	-
Shop Trucks	2	-	19,200	-	-	-

Activity	No. of Trucks	2013 (Miles)	2014 (Miles)	2015 (Miles)	2016 (Miles)	2017 (Miles)
Remove Downstream rock Cofferdam (2 Months) (2017)						
Pickup's Ford 150 4X4 (gas)	1	-	-	-	-	1,800
Site Restoration Work (4 Months) (2017)						
Pickup's standard F-150 (gas)	1	-	-	-	-	4,800
Flatbed trucks	1	-	-	-	-	1,080
Totals		**0**	**62,400**	**15,900**	**3,975**	**11,655**

<u>On-site haul trucks</u>

On-site haul truck exhaust emissions were estimated using the EMFAC2007/EMFAC2011 models for heavy-heavy duty diesel trucks using in Sacramento County. The emission factors were based on a speed of 10 mph. Excavated material will be transported from the approach channel to the disposal areas (at the MIAD or Dike 7), which is a one-way trip distance of 2 miles.

On-site haul truck information was estimated assuming a truck capacity of 20 cubic yards (cy) and the annual volume of soil materials excavated (URS 2012). The information is summarized in Table 2-5 below.

Table 2-5. On-site haul truck trips

Activity	No. of trucks	2013 (Miles)	2014 (Miles)	2015 (Miles)	2016 (Miles)	2017 (Miles)
Alternative 2						
Approach Channel Excavation	26,880	35,840	35,840	-	35,840	-
Transload Facility Dredging	900	3,600	-	-	-	-
Spur Dike Construction	19,750	-	-	-	26,333	52,667
Totals		**39,440**	**35,840**	**0**	**62,173**	**52,667**
Alternative 3						
Approach Channel Excavation	26,880	35,840	-	-	35,840	35,840
Transload Facility Dredging	900	3,600	-	-	-	-
Cofferdam Fill Material	14,960	14,960	14,960	-	-	29,920
Spur Dike Construction	19,750	-	-	-	26,333	52,667
Totals		**54,400**	**14,960**	**0**	**62,173**	**118,427**

<u>Off-site haul trucks</u>

Off-site haul truck exhaust emissions were estimated using the EMFAC2007/EMFAC 2011 models for heavy-heavy duty diesel trucks in Sacramento County. The emission factors were based on a speed of 35 mph. Off-site materials would be transported from three locations. Aggregate material would be transported from aggregate facilities, which are a one-way trip distance of 18 miles. Explosive material would be transported from a storage facility in Jamestown, CA, which is a one-way trip distance of 80 miles. Concrete would be transported from the concrete batch plant at the Folsom Prison staging area, which is a one-way trip distance of 0.5 miles.

Off-site haul truck information was estimated assuming a haul truck capacity of 20 cy or 30 tons, a concrete mixer truck capacity of 10 cy and the material volume transported (URS, 2012). The information is summarized in Table 2-6 below.

Table 2-6. Off-site haul truck trips

Activity	No. of trucks	2013 (Miles)	2014 (Miles)	2015 (Miles)	2016 (Miles)	2017 (Miles)
Alternative 2						
Aggregate Material for Concrete Mixing	350	2,288	3,432	3,432	3,432	-
Aggregate Material for Transload Facility	27,000	-	-	-	-	486,000
Concrete from Folsom Prison Staging Area	2,420	440	660	660	660	-
Explosive Material from Jamestown, CA	600	486,000	24,558	26,791	26,791	17,860
Totals		**488,726**	**28,650**	**30,833**	**30,833**	**503,860**
Alternative 3						
Aggregate Material for Concrete Mixing	188	-	2,125	2,318	2,318	-
Aggregate Material for Transload Facility	27,000	486,000	-	-	-	486,000
Concrete from Folsom Prison Staging Area	1,300	-	409	446	446	-
Explosive Material from Jamestown, CA	600	-	24,558	26,791	26,791	17,860
Totals		**486,000**	**27,091**	**29,554**	**29,554**	**503,860**

Off-site worker vehicle

Worker commute exhaust emissions were estimated using the EMFAC2007/EMFAC2011 models for light duty automobiles and light duty trucks in Sacramento County. The emission factors were based on a speed of 65 mph. URBEMIS estimated that the average commute distance traveled within Sacramento County is 15 miles for a one-way trip. Workers were assumed to take 3.02 one-way trips to incorporate lunch trips as well as the trip to and from home. These commute distances and trip rates were based on the value and data from URBEMIS for General Light Industry.

The number of worker vehicles was provided by the project engineers (Corps, 2011b). The information is summarized in Table 2-7 below.

Table 2-7. Worker Commute Trips

Activity	No. of Workers	2013 (Miles)	2014 (Miles)	2015 (Miles)	2016 (Miles)	2017 (Miles)
Alternative 2						
Transload Facility Workers	27	-	42,401	113,069	113,069	113,069
Approach Channel Workers	39	-	70,668	169,603	141,336	169,603
Total			**113,069**	**282,672**	**254,405**	**282,672**
Alternative 3						
Transload Facility Workers	41	84,802	70,668	113,069	113,069	169,603
Approach Channel Workers	43	-	98,935	169,603	169,603	169,603
Totals		**84,802**	**169,603**	**282,672**	**282,672**	**339,206**

2.2.2 Fugitive Dust Emission Calculations

The following section provides the methodology used to estimate fugitive dust emissions from unpaved and paved roads, and various construction activities.

Unpaved road entrained road dust

Unpaved road entrained fugitive dust emissions were estimated using AP-42 emission factors (USEPA, 2006a) and the vehicle miles traveled. The emission factor was calculated based on the silt content of the road, the weight of the vehicle, and the number of days per year where precipitation was over 0.01 inches. The silt content of the unpaved roads was obtained from the Folsom Dam Safety EIS calculations (U.S. Bureau of Reclamation [USBR] ,2007). The on-site pickup trucks were assumed to be light duty trucks with an average weight of 2 tons. The on-site haul trucks were assumed to be heavy-heavy duty diesel trucks with an average weight of 23.25 tons. The number of days where precipitation was over 0.01 inches ("wet" days) was obtained from AP-42 Figure 13.2.1-2 (USEPA, 2011a) and was found to be 90 days for the project area.

The total vehicles miles traveled (VMT) for the on-site pickup trucks were calculated using the mileage values from Table 2-4 (see methodology for on-site haul truck exhaust emissions). The total VMT for the on-site haul trucks were calculated using the mileage values from Table 2-5 (see methodology for on-site haul truck exhaust emissions).

Paved road entrained road dust

Paved road entrained fugitive dust emissions were estimated using the AP-42 emission factor (USEPA, 2011a) and the VMT. The emission factor was calculated based on the silt content of the road, the weight of the vehicle, and the number of days where precipitation was over 0.01 inches.

The vehicles were assumed to travel on five different types of paved roads: freeway, arterial (major street/highway), collector road, local road surface and rural road surface. The silt content of these roads and the percentage of vehicle travel on these roads were estimated from the Midwest Research Institute Study (Muleski, 1996)

The off-site haul trucks were assumed to be heavy-heavy duty diesel trucks with an average weight of 23.25 tons. The worker fleet was assumed to be 50% light duty automobiles and 50% light duty trucks, with an average weight of 1.75 tons. The number of days per year where precipitation was over 0.01 inches (“wet” days) was obtained from AP-42 Figure 13.2.1-2 (USEPA, 2011a) and was found to be 90 days for the project area.

The total VMT for the off-site haul trucks were calculated using the mileage values from Table 2-6 (see methodology for off-site haul truck exhaust emissions). The total vehicle miles traveled for worker commute were calculated using the mileage values from Table 2-7 (see methodology for worker commute exhaust emissions).

Cut and fill

Cut and fill emissions were estimated using the low detail emission factors from the URBEMIS2007 model for excavation fugitive dust. The URBEMIS2007 emission factor allows the calculation of fugitive dust emissions based on the maximum material daily volume disturbed. The total material volume disturbed was assumed to be 304,500 cubic yards (cy) for Alternative 2 and 355,600 cy for Alternative 3 (URS, 2009). Material for Alternatives B and C will be excavated over 1 year.

Stockpile handling

Stockpile handling emissions for early excavated material storage piles were estimated using AP-42 emission factors (USEPA, 2006b) and the amount of material handled. The emission factor was based on the mean wind speed and material moisture content. The mean wind speed and material moisture content values were obtained from the SMAQMD Guide to Air Quality Assessment in Sacramento County (SMAQMD 2004). The density and the volume of the storage pile were used to estimate the amount of material being handled. The volume of material stockpiled and handled is presented in Table 2-8.

Table 2-8. Stockpile Volume

Activity	2013 (cy)	2014 (cy)	2015 (cy)	2016 (cy)	2017 (cy)
Aggregate Volume	5,243	5,243	1,095	3,284	821

Excavation Volume	304,500	-	-	133,700	-
Total	**309,743**	**5,243**	**1,095**	**136,984**	**821**
Aggregate Volume	-	-	1,095	3,284	821
Excavation Volume	355,600	-	-	92,100	-
Total	**355,600**	**0**	**1,095**	**95,384**	**821**

Stockpile wind erosion

Stockpile wind erosion emissions were estimated using the AP-42 emission factor (USEPA, 2006c) and the surface area exposed to wind. The emission factor was based on the fastest mile wind speed (miles/hour) and the number of disturbances to the storage pile. The fastest mile wind speed (miles/hour) and the average wind direction were obtained a 1985 wind rose at Sacramento Executive Airport weather station (Corps, 2009a; USBR, 2007). The station is approximately 22 miles southwest of the Folsom project site, and it is representative of wind speeds and directions at the project site. The wind speed threshold velocity (the minimum wind speed required to initiate particle motion) was assumed to be the threshold velocity for coal overburden from AP-42 Table 13.2.5-2 (UESPA, 2006c).

Material will be added to the stockpile every day during construction activities. Therefore the number of disturbances to the storage pile was assumed to be 312, which is the maximum number of days for stockpiling. Each stockpile is assumed to have an average depth of 10 meters. The total stockpile surface area in square meters (m^2) exposed to wind erosion is calculated from the stockpile volumes in Table 2-8, and is presented in Table 2-9.

Table 2-9. Wind Erosion Stockpile Surface Area

Activity	2013 (m^2)	2014 (m^2)	2015 (m^2)	2016 (m^2)	2017 (m^2)
Aggregate Volume	401	401	84	251	63
Excavation Volume	23,281	-	-	10,222	-
Total	**23,682**	**401**	**84**	**10,473**	**63**
Aggregate Volume	-	-	84	251	63
Excavation Volume	27,188	-	-	7,042	-
Totals	**27,188**	**0**	**84**	**7,293**	**63**

Blasting

Blasting emissions were estimated using the methodology in the Blue Rock Quarry Draft Environmental Impact Report (Sonoma Countym 2005) based on a blasting emission factor and number of blasts per year. The calculation of the blasting emission factors depended on the blast area, blast depth and moisture content.

The blast information was provided by project engineers at the Corps. The blast area was estimated to be 1,550 m^2, the blast depth was estimated to be 20 feet, and the material moisture content was estimated to 2% for both alternatives (Wisniewski, 2012).

The Corps estimated that the total number of blasts for Alternative 2 was 200 blasts, while the total number of blasts for Alternative 3 was 280 blasts.

Rock crushing facility

Rock crushing emissions were estimated using the AP-42 emission factors (USEPA, 2004) and the annual production of the one rock crushing facility. Information about the annual production of the rock crushing facility was provided by the project engineers (Corpsm 2011c). It was estimated that 70,000 tons of rock would be processed at the facility annually for both alternatives.

Concrete batch plant

Concrete batch plant emissions were estimated using the AP-42 emission factors (USEPA, 2006c) and the amount of concrete processed at the one batch plant. The amount of concrete processed at the plant was provided by the Corps (Corpsm 2011d; Wisniewskim 2012). The amount of concrete required for Alternative 2 was estimated to be 24,200 cy. The amount of concrete required for Alternative 3 was estimated to be 13,000 cy.

2.2.3 Greenhouse Emission Calculations

The three most common GHG pollutants are CO_2, CH_4, and N_2O. Emissions for individual GHG pollutants were estimated, and then converted to CO_2e using the GWP listed in Section 1.5.3.

On-site construction off-road equipment

The CO_2 and CH_4 emissions were estimated using the OFFROAD2011 model for construction years 2013-2017; similar to the method used to estimate exhaust criteria pollutant emissions. Emission factors for N_2O were not available in the model. These emissions are expected to be negligible and therefore were not estimated.

On-site construction marine equipment

The CO_2 emissions were estimated using the emission factors from the California Air Resources Board's Harbor Craft model (CARB, 2012f).

On-site pickup trucks

The CO_2, CH_4 and N_2O emissions were estimated using the EMFAC2007 model for light duty trucks in Sacramento County; similar to the method used to estimate exhaust criteria pollutant emissions. The CO_2 emissions were estimated using the EMFAC2011 model for light duty trucks in Sacramento County. This model does not provide emission factors for CH_4 and N_2O, so The Climate Registry (TCR) emissions factors were used for emission calculations (TCR 2012).

On-site haul trucks

The CO_2, CH_4 and N_2O emissions were estimated using the EMFAC2007 model for heavy-heavy duty trucks in Sacramento County; similar to the method used to estimate exhaust criteria pollutant emissions. The CO_2 emissions were estimated using the EMFAC2011 model for heavy-heavy duty trucks in Sacramento County. This model does not provide emission factors for CH_4 and N_2O, so TCR emissions factors were used for emission calculations (TCR 2012).

Off-site haul trucks

The CO_2, CH_4 and N_2O emissions were estimated using the EMFAC2007 model for heavy-heavy duty trucks in Sacramento County; similar to the method used to estimate exhaust criteria pollutant emissions. The CO_2 emissions were estimated using the EMFAC2011 model for heavy-heavy duty trucks in Sacramento County. This model does not provide emission factors for CH_4 and N_2O, so TCR emissions factors were used for emission calculations (TCR 2012).

Off-site worker vehicle

The CO_2, CH_4 and N_2O emissions were estimated using the EMFAC2007 model for light duty automobiles and light duty trucks in in Sacramento County; similar to the method used to estimate exhaust criteria pollutant emissions. The CO_2 emissions were estimated using the EMFAC2011 model for light duty automobiles and light duty trucks in in Sacramento County. This model does not provide emission factors for CH_4 and N_2O, so TCR emissions factors were used for emission calculations (TCRm 2012).

Indirect greenhouse gas

According to the SMAQMD CEQA guidance, indirect GHG emissions should be estimated from utility providers associated with the project's electricity demands (SMAMQD 2011). Electrification of the rock crushing facility and concrete batch plant is a mitigation measure (discussed in 4.0). However the methodology to estimate indirect GHG emissions is presented below.

Electricity for rock crushing facility

The rock crushing plant will be electric (Sandburg, 2012b), which would result in indirect GHG emissions. According to the life cycle analysis for a rock crusher (Landfield and Karra, 2000), the power consumption of the rock crusher, normalized to the functional unit of 1,000 short tons of crushed rock, was 650 kilowatt-hour (kWh). Based on these metric, the electricity usage emission factor was estimated to be 0.65 kWh per ton of crushed rock. The Sacramento Municipal Utility District (SMUD) CO_2 emission factor was found to be 0.268 tons of CO_2 per megawatt-hour (MWh) (SMUD 2010).

Rock crushing facility GHG emissions were estimated using the electricity usage and CO_2 emission factors; the amount of rock processed annually was estimated to be 70,000 tons for both alternatives.

Electricity for concrete batch plant

The manufacture of concrete requires large amounts of energy; the electrification of this process results in substantial indirect GHG emissions. Studies have shown that CO_2 emissions generated by typical normal strength concrete mixes were found to range between 0.29 and 0.32 metric tons of CO_2 equivalent per cubic meter of concrete (Flowers and Sanjayan, 2007). In order to be conservative, this study assumed 0.32 metric tons (320 kilograms) of CO_2 would be created per cubic meter of concrete produced.

Concrete batch plant operations GHG emissions were estimated using the emissions from these studies (Flowers and Sanjayan, 2007) and the amount of concrete processed. The amount of concrete required for Alternative 2 was estimated to be 24,200 cy. The amount of concrete required for Alternative 3 was estimated to be 13,000 cy.

2.2.4 Air Dispersion Modeling

During typical construction projects the majority of particulate matter emissions (i.e., PM10 and PM2.5) are generated in the form of fugitive dust during ground disturbance activities. PM emissions are also generated in the form of equipment exhaust and reentrained road dust from vehicle travel on paved and unpaved surfaces.

The SMAQMD recommends that PM10 emissions be addressed as a localized pollutant. Thus, the SMAQMD considers PM10 emissions to be a significant impact at the project level if they would exceed the SMAQMD's concentration-based threshold of significance at an off-site receptor location. Because PM2.5 is a subset of PM10, the SMAQMD assumes that construction projects that do not generate concentrations of PM10 that exceed the District's concentration-based threshold of significance would also be considered less-than-significant for PM2.5 impacts (SMAQMD 2011).

The SMAQMD recommends that lead agencies model the PM10 emission concentrations generated by construction activity for all projects except those that implement all Basic Construction Emission Control Practices, and where the maximum daily disturbed area would not exceed 15 acres (based on 25% of the total project area if the exact maximum daily disturbed area is not known at the time of the analysis).The total JFP Phase 4 Folsom Dam project area is approximately 56 acres; therefore the maximum daily disturbed area is 14 acres. Since the maximum daily disturbed area is less than the SMAQMD threshold, and the project will implement all Basic Construction Emission Control Practices (see Section 4.0), no modeling would be required.

3.0 IMPACTS ANALYSIS

Using the methodologies described in Section 2.2, the impacts of the proposed project were evaluated and are discussed in the following sections.

3.1 Construction Impacts

3.1.1 Exhaust Emissions

Emissions of criteria pollutants would occur during construction activities at the proposed site. These construction activities include off-road equipment, marine equipment, on-site pickup trucks, on-site haul trucks, off-site haul rucks, and off-site worker vehicles.

In cases where emission factors were only provided for PM10, a ratio is used to estimate emissions for PM2.5. Table 3-1 summarizes the unmitigated construction exhaust emissions by activity for Alternatives 2 and 3 in years 2013-2017 for NEPA purposes. Table 3-2 summarizes the unmitigated construction exhaust emissions by activity for Alternative 2 and Alternative 3 in years 2013-2017 for CEQA purposes.

Table 3-1. Unmitigated Total Construction Exhaust Emission Summary for NEPA

Activity	Pollutant (tons)					
	ROG	NO_x	CO	PM10	PM2.5 [1]	SO_2
Alternative 2						
On-site construction off-road	4	68	37	3	3	<1
On-site construction marine	4	36	15	1	1	<1
On-site pickup trucks	<1	<1	<1	<1	<1	<1
On-site haul trucks	1	3	1	<1	<1	<1
Off-site haul trucks	1	9	3	<1	<1	<1
Off-site worker vehicles	<1	<1	2	<1	<1	<1
TOTAL	**10**	**116**	**58**	**4**	**4**	**<1**
Alternative 3						
On-site construction off-road	4	53	29	2	2	<1
On-site construction marine	3	24	10	1	1	<1
On-site pickup trucks	<1	<1	<1	<1	<1	<1
On-site haul trucks	1	4	2	<1	<1	<1
Off-site haul trucks	1	9	3	<1	<1	<1

Activity	Pollutant (tons)					
	ROG	NO_x	CO	PM10	PM2.5 [1]	SO_2
Off-site worker vehicles	<1	<1	2	<1	<1	<1
TOTAL	**9**	**90**	**46**	**3**	**3**	**<1**

Notes:

1. The OFFROAD2011 model does not provide emission factors for PM2.5 from on-site construction off-road road equipment. Therefore emissions for PM2.5 were based on the CEIDARS 0.92 PM10/PM2.5 conversion ratio (SCAQMD 2006).
2. EMFAC2007 was used to estimate on-road emission factors for NEPA purposes.
3. Emission rates might not add up due to rounding

Acronyms:

CO carbon monoxide
NO_x nitrogen oxide
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

Table 3-2. Unmitigated Total Construction Exhaust Emission Summary for CEQA

Activity	Pollutant (lbs/yr)					
	ROG	NO_x	CO	PM10	PM2.5	SO_2
Alternative 2						
2013 Total	2,662	43,112	18,587	196,609	41,067	39
2014 Total	1,766	19,538	10,327	189,769	35,790	16
2015 Total	2,047	23,557	13,656	80,441	24,959	14
2016 Total	5,872	68,643	33,438	211,945	39,501	21
2017 Total	6,486	83,009	38,423	204,606	24,741	9
Total (lbs)	18,833	237,859	114,431	883,370	166,058	99
Daily Emissions (lbs/day)	12	152	73	566	106	<1
Alternative 3						
2013 Total	3,414	50,698	21,113	235,951	40,974	46
2014 Total	1,237	13,760	7,623	124,802	24,510	16
2015 Total	1,773	18,667	10,797	41,193	16,307	20

Activity	Pollutant (lbs/yr)					
	ROG	NO_x	CO	PM10	PM2.5	SO_2
2016 Total	1,229	13,765	7,666	202,583	32,272	12
2017 Total	8,000	98,793	46,223	206,790	25,741	108
Total (lbs)	15,653	195,683	93,422	811,319	139,804	202
Daily Emissions (lbs/day)	10	125	60	520	90	<1
Note: Total emissions (lbs) were divided by the total number of days in the construction period (1,560) to estimate the daily emissions (lbs/day).						

3.1.2 Fugitive Dust Emissions

Fugitive dust emissions would occur during construction activities at the proposed site. These construction activities include unpaved and paved entrained road dust, cut and fill, stockpiling, blasting of rock, rock crushing, and concrete batch plant operations.

In cases where emission factors were only provided for PM10, a ratio is used to estimate emissions for PM2.5. Table 3-3 summarizes the unmitigated construction exhaust emissions for both Alternative 2 and Alternative 3 in years 2013-2017 for NEPA and CEQA purposes.

Table 3-3. Unmitigated Construction Fugitive Dust Emission Summary for NEPA and CEQA

	Pollutant (tons)	
Activity	PM10	PM2.5[1]
Alternative 2		
Unpaved road entrained road dust	331	33
Paved road entrained road dust	23	3
Cut and fill	18	4
Stockpile handling	<1	<1
Stockpile wind erosion	2	<1
Blasting	8	2
Rock crushing	3	1
Concrete batch plant	53	35
TOTAL	**437**	**79**
Alternative 3		

	Pollutant (tons)	
Activity	**PM10**	**PM2.5[1]**
Unpaved road entrained road dust	307	31
Paved road entrained road dust	23	3
Cut and fill	21	4
Stockpile handling	<1	<1
Stockpile wind erosion	2	<1
Blasting	11	3
Rock crushing	3	1
Concrete batch plant	35	24
TOTAL	**402**	**67**

Notes:
1. The methodology for cut and fill, blasting, rock crushing and the concrete batch plant does not provide emission factors for PM2.5. Therefore emissions for PM2.5 were based on the CIEDARS PM10/PM2.5 conversion ratio (SCAQMD 2006). The PM10/PM2.5 conversion ratio for cut and fill is 0.208, for blasting is 0.3, for rock crushing is 0.3, and for the concrete batch plant is 0.674.
2. Emission rates might not add up due to rounding.

Acronyms:
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter

3.1.3 Comparison to General Conformity *de minimis* thresholds

Table 3-4 summarizes total annual emissions for ROG, NO_x, CO, SO_2, PM10, and PM2.5 from all the activities described above.

In Table 3-4, Alternative 2 and 3 emissions are compared to both the General Conformity *de minimis* thresholds for determination of significance of impacts. Based on Table 3-4, Alternative 2 unmitigated NO_x emissions would exceed the *de minimis* thresholds in 2016-2017, and unmitigated PM10 emissions would exceed the *de minimis* thresholds in 2016-2017. In all years of the construction period, ROG, CO, and PM2.5 emissions would not exceed the *de minimis* thresholds. Based on Table 3-4, Alternative 3 unmitigated NO_x emissions would exceed the *de minimis* thresholds in 2017, and unmitigated PM10 emissions would exceed the *de minimis* thresholds in 2013 and 2016-2017. Mitigation measures and mitigated emissions compared to the *de minimis* levels are discussed in Section 4.0 below.

Table 3-4. JFP Folsom Dam Upstream: Unmitigated Criteria Pollutant Emission Summary for NEPA

	Pollutant (tons/yr)					
	ROG	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**
Alternative 2						
2013 Total	2	21	10	98	21	<1
2014 Total	1	9	5	95	18	<1
2015 Total	1	12	7	40	12	<1
2016 Total	3	34	17	106	20	<1
2017 Total	3	40	20	102	12	<1
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**
Alternative 3						
2013 Total	2	24	11	118	21	<1
2014 Total	1	7	4	62	12	<1
2015 Total	1	9	5	21	8	<1
2016 Total	1	6	4	101	16	<1
2017 Total	4	48	24	104	13	<1
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**

Notes:

1. For NEPA purposes, emission calculations are estimated using OFFROAD2011 and EMFAC2007 models.
2. Emissions rates might not add up due to rounding.

Acronyms:

CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

3.1.4 Sacramento Metropolitan Air Quality Management NO_x Threshold

According to the SMAQMD CEQA guidance, construction-generated NO_x emissions shall be evaluated for significance under CEQA on a daily mass emission basis of 85 pounds per day because NO_x is an ozone precursor, which is a pollutant of regional concern (SMAQMD 2011, SMAQMD 2012b). The unmitigated average daily NO_x emissions from the JFP Folsom Dam Upstream would be 152 pounds per day for Alternative 2, and 125 pounds per for Alternative 3. Both alternatives exceed the

SMAQMD NO_x CEQA threshold. Mitigation measures and mitigated emissions compared to the SMAQMD NO_x threshold are discussed in Section 4.0 below.

3.1.5 Sacramento Metropolitan Air Quality Management PM10 Threshold

As described above, because the project's maximum daily disturbed area is less than 15 acres, there is no applicable SMAQMD threshold for PM10 emissions and the PM10 CAAQS would not be applicable to the project. However, the project would be required to comply with SMAQMD's Basic Construction Emission Control Practices. Mitigation measures are discussed in Section 4.0 below.

Greenhouse Gas Emissions

GHG emissions would be emitted from the project due to fuel combustion, as well as indirect emissions from the electricity used to operate the rock crusher and concrete batch plant. GHG emissions generated from construction of the project would be short-term. However, because the time that CO_2 remains in the atmosphere cannot be definitively quantified due to the wide range of time scales in which carbon reservoirs exchange CO_2 with the atmosphere, there is no single value for the half-life of CO_2 in the atmosphere (IPCC 1997). Therefore, the duration that CO_2 emissions from a short-term project would remain in the atmosphere is unknown.

The SMAQMD currently does not have any significance thresholds for GHG emissions, though they recommend that GHG emissions consider the AB 32's GHG reduction goals. Table 3-5 summarizes Alternative 2 and 3 total annual emissions for GHGs from all the activities described above. Mitigation measures are discussed in Section 4.0 below.

Table 3-5. Unmitigated GHG Emission Summary for CEQA and NEPA

Year	CO_2e (metric tons/year)
Alternative 2	
2013 Total	5,507
2014 Total	4,006
2015 Total	4,261
2016 Total	6,350
2017 Total	5,118
Alternative 3	
2013 Total	3,078
2014 Total	2,760
2015 Total	2,905
2016 Total	2,755
2017 Total	6,082

3.2 Offensive Odors

The JFP Folsom Dam Upstream project is not expected to have any short- or long-term impacts associated with offensive odors. The SMAQMD recommends that significance determinations be made on a case-by-case basis and consider parameters such as the Recommended Odor Screening Distances, or odor complaint history. SMAQMD's odor screening distances have been developed for stationary odor sources. SMAQMD has not developed any specific odor screening distances for construction activities. However, because ultra-low sulfur diesel fuel is now required in California, the potential for diesel-related odor effects from construction equipment and trucks is minimal. These odors would be temporary in nature and would not cause an odor nuisance.

3.3 Toxic Air Contaminants

3.3.1 Diesel Particulate Matter

DPM would be emitted from on-site off-road heavy construction equipment, on-site pickup trucks, on-site haul trucks and off-site haul trucks. DPM is considered a carcinogen and the project would expose nearby receptors to these emissions during the construction period.

SMAQMD has not established a quantitative threshold of significance for construction-related TAC emissions, but direct project applicants to consider project proximity to off-site receptors. Sensitive receptors such as the residences along Mountain View road, the residences along Lorena Lane/ Cristina Court are located within 1,000 feet of the Dike 7 staging area. In addition, there is a single residence along East Natoma Road located within 1,000 feet of the MIAD staging area. Therefore these sensitive receptors could be potentially exposed to the DPM cancer risk from the project.

However, health risks associated with exposure to carcinogenic substances are typically measured over 70 years of exposure. Since the proposed project is a short-term construction project lasting only five years, the potential human exposure to DPM from this alternative would be short-term. In addition, all off-site receptors are located near the staging areas, where the only construction activities would involve the on-site pickup trucks and on-site haul trucks. In the worst-case scenario, they will be exposed to daily DPM mass emissions (using PM10 emissions as a substitute for DPM emissions) of 2 pounds per hour for Alternative 2, and 3 pounds per hour for Alternative 3. The predominant wind direction at Folsom Dam is southwest based on a 1985 wind rose for data collected at the Sacramento Executive Airport weather station (Corps, 2009a, USBR 2007). The residences along Mountain View road and Lorena Lane/ Cristina Court are located southeast of the Dike 7 staging area, so there will be minimal impact from DPM emissions. However, the residence along East Natoma Road is located southwest of the MIAD staging area, so the receptors could potentially be impacted by DPM emissions.

Proposed mitigation measures for MY 2010 haul trucks would reduce the daily DPM mass emissions to <1 pounds per hour for Alternative 2, and 1 pound per hour for

Alternative 3 (see 4.0). Therefore, these sensitive receptors would be exposed to a limited and less than significant DPM cancer risk from the project.

3.3.2 Naturally Occurring Asbestos

The Folsom Dam area has been identified as an area where the local geology supports the formation of NOA, within ultramafic rock specifically. According to the SMAQMD CEQA guidance, a site investigation should be performed to determine whether and where NOA is present in the soil and rock on the project site and areas that would be disturbed by the project (SMAQMD 2011). A previous investigation of the project area's geology, including soil testing efforts, indicated that the project area overlies granitic rock except for the MIAD area, which overlies metamorphic rock (ultramafic rocks) (USBR 2009). The granitic material would not be expected to contain any NOA materials (LeFevre, 2012). Although no NOA has been discovered in the MIAD area (Corps, 2010; LeFevre, 2012.), ultramafic rock near this area could include NOA and pose a risk to construction workers or sensitive receptors. However, the JFP Folsom Upstream Project's implementation of mitigation measures to reduce PM10 emissions and comply with CARB's Section 93105, Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining (Asbestos ATCM) (CARB 2001), as discussed in Section 4.0 below, would reduce the potential for workers or sensitive receptors to be exposed to airborne NOA. These impacts would be expected to be less than significant with mitigation.

4.0 MITIGATION MEASURES

Unmitigated NO_x and PM10 emissions from the construction of the JFP Folsom Dam, Upstream project would exceed applicable CEQA and NEPA significance criteria. Therefore, the Corps will implement the following mitigation measures to reduce the potential air quality effects of the project.

4.1 Mitigation Measure AQ-1: Basic Construction Emissions Control Practices

The SMAQMD requires construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions (SMAQMD 2011). These measures are required by the SMAQMD, and therefore would not be considered mitigation measures. The Corps would comply with the following control measures for the JFP Folsom Dam, Upstream project:[2]:

1) Water all exposed surfaces twice daily. Exposed surfaces include but are not limited to: soil piles, graded areas, unpaved parking areas, staging areas, and access roads.

2) Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would travel along freeways or major roadways should be covered.

3) Use wet power vacuum street sweepers to remove any visible trackout mud or dirt from adjacent public roads at least once a day. Use of dry power sweeping is prohibited.

4) Limit vehicle speeds on unpaved roads to 15 miles per hour (mph).

5) All roadways, driveways, sidewalks, or parking lots to be paved should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.

6) Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes [required by California Code of Regulations, Title 13, sections 2449(d)(3) and 2485]. Provide clear signage that posts this requirement for workers at the site entrances.

7) Maintain all construction equipment in proper working condition according to the manufacturer’s specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.

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[2] The project would not require dispersion modeling because of compliance with these control measure and limiting the maximum daily disturbed area to 14 acres, which is less than the SMAQMD 15-acre threshold.

4.2 Mitigation Measure AQ-2: Fugitive Dust Emission Mitigation Measures

Fugitive dust mitigation will require the use of adequate measures during each construction activity and will include frequent water applications or application of soil additives, control of vehicle access, and vehicle speed restrictions. Mitigated emissions are presented in Table 4-3.

4.2.1 Asbestos Measures

A geologist will monitor the project area for the presence of NOA during all construction activities. If found, the Corps will comply with the CARB's Section 93105, Asbestos ATCM for Construction, Grading, Quarrying, and Surface Mining Operations (CARB 2001). In addition, the Corps will implement the fugitive dust mitigation measures below, which are similar to those required under an Asbestos Dust Control Plan.

4.2.2 Unpaved roads

To mitigate fugitive dust emissions from on-site traffic on unpaved roads, the Corps would implement the following measures:

1. Limit vehicle speeds on unpaved roads to 10 miles per hour, and
2. Water at least every two hours of active construction activities or sufficiently often to keep the area adequately wetted.

Speed limit controls would contribute to 44% emission control efficiency (Western Governors Association, 2004), while watering controls would contribute to 55% emission control efficiency (SCAQMD 2007)

4.2.3 Cut and fill

To mitigate fugitive dust emission from cut and fill activities, the Corps would implement the following measures:

1. Pre-wet the ground to the depth of anticipated cuts, and
2. Suspend any excavation operations when wind speeds are high enough to result in dust emissions across the property line, despite the application of dust mitigation measures.

Watering activities would contribute to 55% emission control efficiency (SCAQMD 2007).

4.2.4 Stockpile handling and stockpile wind erosion

To mitigate stockpile handling and stockpile wind erosion fugitive dust emissions, the Corps would keep the active storage pile adequately wetted using wet suppression controls. Wet suppression controls would contribute to 90% emissions control efficiency (Fitz, 2000).

To mitigate fugitive dust emissions from storage piles that would remain inactive for more than seven days, the Corps would implement one or more of the following measures:

1. Wet suppression controls,
2. Apply chemical dust suppressants or chemical stabilizers,
3. Cover with tarp(s) or vegetative cover, and/or
4. Install wind barriers around three sides of the storage pile.

4.2.5 Blasting

To mitigate fugitive dust emissions from in-dry blasting operations, the Corps would apply water every 4 hours within 100 feet of the demolition area. Watering controls would contribute to 36% control efficiency (Western Governors Association, 2004).

4.2.6 Rock crushing facility

To mitigate fugitive dust emissions from the rock crushing facility, the Corps would implement wet suppression controls. Wet suppression controls would contribute to 94% control efficiency (USEPA, 2004)

4.2.7 Concrete batch plant

To mitigate fugitive dust emissions from the concrete batch plant operations, the Corps would implement one or more of the following measures:

1. Applying water sprays,
2. Setting up enclosures, hoods, curtains, shrouds, movable and telescoping chutes, and/or
3. Installing a central dust collection system.

These measures would contribute to 94% to 99.9% control efficiency (USEPA, 2006d).

4.2.8 Post-Construction

Upon completion of the project, post-construction stabilization of disturbed surfaces would be accomplished using one or more of the following measures:

1. Establishing a vegetative cover,
2. Placing at least 12 inches of non-asbestos-containing material,
3. Paving, and/or

4. Implementing any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions.

4.3 Mitigation Measure AQ-3: Exhaust Emission Mitigation Measures

Four categories of mitigation measures are recommended to reduce the total project NO_x and PM10 emissions as discussed in a report presented to the Corps (URS 2011). These mitigation measures were accepted by the Corps (Sandburg, 2012b) and are presented below. Mitigated emissions are presented in Table 4-1 and Table 4-2.

4.3.1 Cleaner Off-Road Equipment

The project will incorporate the Los Angeles County Metropolitan Transportation Authority (LACMTA) Green Construction Policy (LACMTA 2011) requirements for the on-site construction off-road equipment.

The Corps would use Tier 3 off-road equipment for the first two years of construction (2013-2014), and use interim Tier 4 off-road equipment beginning in 2015. This mitigation measure is expected to create a 59% reduction in NO_x emissions, a 62% reduction in ROG emissions, and a 71% reduction in PM10 emissions for Alternative 2. This mitigation measure is expected to create a 62% reduction in NO_x emissions, a 61% reduction in ROG emissions, and a 75% reduction in PM10 emissions for Alternative 3 (see Table 4-1 and Table 4-2).

Mitigated emissions for off-road equipment was estimated using the OFFROAD2011 model, and specifying the model years where Tier 3 or interim Tier 4 engine standards would be met. The model years in which engine standards would be met was obtained from the CARB (CARB 2012g).

4.3.2 Marine Engine Standards

The USEPA adopted Tier 3 and Tier 4 standards for newly-built marine engines in 2008. The Tier 3 standards reflect the application of technologies to reduce engine PM and NO_x emission rates. Tier 4 standards reflect application of high-efficiency catalytic after-treatment technology enabled by the availability of ultra-low sulfur diesel (ULSD). These Tier 4 standards would be phased in over time for marine engines beginning in 2014 (USEPA, 2008).

The Corps would use Tier 2 and 3 marine engines standards to reduce marine exhaust emissions. Due to uncertainty as to the availability of Tier 4 marine engines within the required project timeline, mitigation measures did not include use of Tier 4 marine engines. However, should they become available during the appropriate construction periods, use of these engines would further lower project emissions.

This mitigation measure would result in a 56% reduction in NO_x emissions, a 65% reduction in ROG emissions and a 65% reduction in PM10 emissions for Alternative 2. This mitigation measure would result in a 56% reduction in NO_x

emissions, a 66% reduction in ROG emissions and a 69% reduction in PM10 emissions for Alternative 3. (see Table 4-1 and Table 4-2).

Mitigated emissions for marine equipment were estimated using the CARB and USEPA marine engine standards and multiplying the standards by the load factors used to estimate the unmitigated emissions.

4.3.3 Haul truck controls

The USEPA adopted emissions standards for MY 2007 and later heavy-duty highway engine, such as haul trucks, in January 2001 (USEPA, 2001). These emission standards were expected to be phased in between 2007 and 2010, with few engines meeting the NO_x requirements until 2010.

Since haul truck NO_x emissions account for approximately 7% of the total construction NO_x emissions, the Corps would implement the use of MY 2010 or newer haul trucks beginning in 2013. This measure would ensure the maximum reduction in NO_x emissions, since these engines are required to meet the USEPA NO_x standards. This mitigation measure would reduce haul truck NO_x emissions by 92%, ROG emissions by 63%, and PM10 emissions by 91% for Alternative 2. This mitigation measure would reduce haul truck NO_x emissions by 99%, ROG emissions by 97%, and PM10 emissions by 99% for Alternative 3 (see Table 4-1 and Table 4-2).

Mitigated emissions for haul trucks were estimated using the EMFAC2007/EMFAC2011 model, employing the same methodology that was described in Section 2.2.1.

4.3.4 Use of Electrical Equipment

Construction equipment powered by electricity, rather than fuel, does not contribute to diesel exhaust emissions. Electrification would result in a small amount of indirect CO_2 emissions due to the operation of the electric grid. Various types of construction equipment may feasibly be run on electricity.

The Corps would electrify the concrete batch plant and the rock crushing facility. This mitigation measure would reduce NO_x emissions, ROG emissions and PM10 emissions from the concrete batch plant and the rock crushing plant by 100% (see Table 4-1 and Table 4-2). These measures would increase indirect GHG emissions, but this increase would be offset by the decrease in GHG emissions from fuel-based operations.

4.4 Mitigation Measure AQ-4: NO_x Mitigation Fee

The Corps will provide payment of the appropriate SMAQMD-required NO_x mitigation fee to offset the project's NO_x emissions when they exceed SMAQMD's threshold of 85 lbs/day.

4.5 Mitigation Measure AQ-5: GHG Emission Reduction Measures

The SMAQMD recommends the following mitigation measures for reducing GHG emissions from construction projects. The use of electric equipment is already listed above and will reduce direct GHG emissions from fuel-based equipment. The Corps will implement the following mitigation measures wherever possible.

1) Improve fuel efficiency from construction equipment:

    a. Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to no more than 3 minutes (5 minute limit is required by the state airborne toxics control measure [Title 13, sections 2449(d)(3) and 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.
    b. Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
    c. Train equipment operators in proper use of equipment.
    d. Use the proper size of equipment for the job.
    e. Use equipment with new technologies (repowered engines, electric drive trains).

2) Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).

3) Use an ARB approved low carbon fuel for construction equipment. (NOx emissions from the use of low carbon fuel must be reviewed and increases mitigated.)

4) Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.

5) Recycle or salvage non-hazardous construction and demolition debris (goal of at least 75% by weight).

6) Use locally sourced or recycled materials for construction materials (goal of at least 20% based on costs for building materials, and based on volume for roadway, parking lot, sidewalk and curb materials). Wood products utilized should be certified through a sustainable forestry program.

7) Produce concrete on-site if determined to be less emissive than transporting ready mix.

8) Use SmartWay certified trucks for deliveries and equipment transport.

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

4.6 Mitigated Construction Impacts

The estimated mitigated criteria pollutant emission summary is presented in Table 4-1. The estimated mitigated fugitive dust emissions are presented in Table 4-3 and are based on implementation of Mitigation Measures AQ-1, AQ-2, and AQ-3 above. Off-site employee vehicles criteria pollutant emissions could not feasibly be controlled by quantifiable mitigation measures.

Table 4-1. Mitigated Total Construction Exhaust Emission Summary for NEPA

	Pollutant (tons)					
Activity	**ROG**	**NO_x**	**CO**	**PM10**	**PM2.5 [1]**	**SO_2**
Alternative 2						
On-site construction off-road	2	28	16	1	1	<1
On-site construction marine	1	16	15	1	1	<1
On-site pickup trucks	<1	<1	<1	<1	<1	<1
On-site haul trucks	<1	1	<1	<1	<1	<1
Off-site haul trucks	<1	2	1	<1	<1	<1
Off-site worker vehicles	<1	<1	2	<1	<1	<1
TOTAL	**3**	**47**	**34**	**2**	**2**	**<1**
Alternative 3						
On-site construction off-road	1	20	13	1	1	<1
On-site construction marine	1	11	10	<1	<1	<1
On-site pickup trucks	<1	<1	<1	<1	<1	<1
On-site haul trucks	<1	1	1	<1	<1	<1
Off-site haul trucks	1	8	4	1	<1	<1
Off-site worker vehicles	<1	<1	2	<1	<1	<1
TOTAL	**3**	**40**	**30**	**2**	**1**	**<1**

Notes:

1. The OFFROAD2011 model does not provide emission factors for PM2.5 from on-site construction off-road road equipment. Therefore emissions for PM2.5 were based on the CEIDARS 0.92 PM10/PM2.5 conversion ratio (SCAQMD 2006).
2. EMFAC2007 was used to estimate on-road emission factors for NEPA purposes.
3. Emission rates might not add up due to rounding

Acronyms:

CO carbon monoxide
NO_x nitrogen oxide
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

Table 4-2. Mitigated Total Emission Summary for CEQA

Activity	Pollutant (lbs/yr)					
	ROG	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**
Alternative 2						
2013 Total	1,118	14,690	7,350	57,365	9,087	39
2014 Total	821	9,005	6,569	34,399	4,605	16
2015 Total	898	9,962	8,868	13,617	2,441	14
2016 Total	2,318	28,850	22,180	38,612	5,301	21
2017 Total	2,648	30,439	24,785	56,448	7,542	9
Total (lbs)	7,803	92,946	69,752	200,441	28,977	99
Daily Emissions (lbs/day)	5	60	45	128	19	<1
Alternative 3						
2013 Total	2,949	17,261	10,251	67,740	10,353	46
2014 Total	1,196	5,281	5,208	24,071	3,527	16
2015 Total	1,768	6,801	7,404	8,230	1,910	20
2016 Total	1,251	4,273	4,775	38,784	4,913	12
2017 Total	8,101	37,804	31,327	57,674	8,024	108
Total (lbs)	15,266	71,420	58,964	196,499	28,727	202

Activity	Pollutant (lbs/yr)					
	ROG	NO_x	CO	PM10	PM2.5	SO_2
Daily Emissions (lbs/day)	10	46	38	126	18	<1

Notes:

1. The OFFROAD2011 model does not provide emission factors for PM2.5 from on-site construction off-road road equipment. Therefore emissions for PM2.5 were based on the CEIDARS 0.92 PM10/PM2.5 conversion ratio (SCAQMD 2006).
2. EMFAC2011 was used to estimate on-road emission factors for CEQA purposes.
3. Emission rates might not add up due to rounding

Acronyms:

CO carbon monoxide
NO_x nitrogen oxide
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

Table 4-3. Mitigated Total Construction Fugitive Dust Emission Summary for CEQA and NEPA

	Pollutant (tons)	
Activity	**PM10**	**PM2.5[1]**
Alternative 2		
Unpaved road entrained road dust	63	6
Paved road entrained road dust	21	3
Cut and fill	8	2
Stockpile handling	<1	<1
Stockpile wind erosion	<1	<1
Blasting	5	<1
Rock crushing	<1	<1
Concrete batch plant	1	1
TOTAL	**99**	**12**
Alternative 3		
Unpaved road entrained road dust	58	6
Paved road entrained road dust	21	3
Cut and fill	9	2

Stockpile handling	<1	<1
Stockpile wind erosion	<1	<1
Blasting	7	2
Rock crushing	<1	<1
Concrete batch plant	1	<1
TOTAL	**97**	**14**

Notes:
1. The methodology for cut and fill, blasting, rock crushing and the concrete batch plant does not provide emission factors for PM2.5. Therefore emissions for PM2.5 were based on the CIEDARS PM10/PM2.5 conversion ratio (SCAQMD 2006). The PM10/PM2.5 conversion ratio for cut and fill is 0.208, for blasting is 0.3, for rock crushing is 0.3, and for the concrete batch plant is 0.674.
2. Emission rates might not add up due to rounding.

Acronyms:
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter

4.6.1 Comparison to General Conformity *de minimis* thresholds

Table 4-4 summarizes total annual Upstream Project emissions for ROG, NO_x, CO, SO_2, PM10, and PM2.5 from Mitigation Measures (AQ-1, AQ-2, and AQ-3) described above.

Mitigated emissions in Table 4-4 are compared to both the General Conformity *de minimis* thresholds for determination of significance of impacts. Based on Table 4-4, with proposed mitigation, NO_x emissions would be below the *de minimis* thresholds in all years for Alternative 2, and NOx emissions would be below the *de minimis* thresholds in all years for Alternative 3. All other mitigated criteria pollutant emissions would also be below the *de minimis* thresholds.

Table 4-4. JFP Folsom Dam Upstream: Mitigated Criteria Pollutant Emission Summary for NEPA

	Pollutant (tons/yr)					
Activity	**ROG**	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**
Alternative 2						
2013 Total	1	7	4	29	5	1
2014 Total	<1	4	3	17	2	<1
2015 Total	<1	5	4	7	1	<1
2016 Total	1	14	11	19	2	1
2017 Total	1	15	12	28	3	1
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**
Alternative 3						

2013 Total	1	9	5	34	5	1
2014 Total	<1	4	3	12	2	<1
2015 Total	1	5	4	4	1	1
2016 Total	<1	4	3	20	3	<1
2017 Total	2	20	16	29	4	2
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**

Notes:
1. For NEPA purposes, emission calculations are estimated using OFFROAD2011 and EMFAC2007 models.
2. Emissions rates might not add up due to rounding.

Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

4.6.2 Sacramento Metropolitan Air Quality Management NO_x Threshold

As discussed above, NO_x emissions that exceed 85 pounds per day after incorporation of mitigation measures would be subject to a mitigation implementation fee used to control other emission sources in the proposed action region. Implementation of mitigation measures in Section 4.2 above would reduce NO_x emissions from the project but maximum daily emissions could potentially exceed the SMAQMD threshold. The maximum NO_x emissions for Alternative 2 (92 lbs/day in 2016 and 98 lbs/day in 2017) and Alternative 3 (121 lbs/day) could exceed the 85 lbs/day threshold. Therefore NO_x mitigation fees could apply to the project. However, it is difficult to determine the worst-case daily NO_x emissions due to potential changes in equipment type, timing, and use. Project contractors and the Corps will need to maintain accurate equipment use records to determine the level of mitigation fees that must be paid to SMAQMD to mitigate the project.

4.6.3 Sacramento Metropolitan Air Quality Management PM10 Threshold

There is no applicable SMAQMD threshold for PM10 emissions for the project. However, the SMAQMD requires construction projects to implement basic construction emission control practices to control fugitive dust and diesel exhaust emissions (SMAQMD 2011). The project would implement Mitigation Measures AQ-1, AQ-2, and AQ-3 described above.

4.6.4 Greenhouse Gas Emissions

The SMAQMD currently does not have any significance thresholds for GHG emissions, though they recommend that GHG emissions consider the AB 32’s GHG reduction goals. The project would implement Mitigation Measure AQ-5 described above to reduce GHG emissions. This mitigation measure would increase the energy efficiency of the construction project, which is in line with the AB 32’s requirement that GHG emissions in 2020 be no greater than 1990 emissions.

5.0 CUMULATIVE IMPACTS

This section presents the cumulative analysis of implementing the JFP at Folsom Dam Upstream project in combination with other past, present, and reasonably foreseeable future projects that may result in environmental impacts

5.1 JFP Folsom Dam, Downstream and Upstream Projects

The JFP at Folsom Dam, Upstream project construction period (2013-2017) would overlap for multiple construction months with the JFP at Folsom Dam, Downstream project (2010-2017). The USEPA had directed the Corps to complete a quantitative cumulative analysis for the JFP Folsom Dam Upstream and Downstream projects, and compare these emissions to the General Conformity *de minimis* thresholds (Sandburg, 2012b).

5.1.1 Methodology

The unmitigated and mitigated emission estimates for construction activities at the JFP at Folsom Dam, Upstream project were estimated in Sections 3.0 and 4.0, respectively. Emission estimates for construction activities at the JFP at Folsom Dam, Downstream project are estimated as described below.

<u>Exhaust Criteria Pollutant Emission Calculations</u>

The on-site construction off-road equipment emission rates were estimated using the OFFROAD2011 model using equipment and activity data for construction equipment provided by the project's engineers (Corps, 2011a). The on-site construction marine equipment were estimated using the emission factors from the California Air Resources Board's Harbor Craft model (CARB, 2012f) and activity data for construction equipment was provided by the project's engineers (Corps, 2011a).

On-site pickup truck exhaust emissions were estimated using OFFROAD2011 and truck trip information from the Final Supplemental Environmental Assessment/Environmental Impact Report Folsom Dam Safety and Flood Damage Reduction Control Structure, Chute, and Stilling Basin Work [known henceforth as Final Supplemental EA/EIR] (Corps, 2010).[3]

On-site and off-site haul truck exhaust emissions were estimated using the EMFAC 2007/EMFAC 2011 models for heavy-heavy duty diesel trucks in Sacramento County. The truck speeds and trip information was obtained from the Final Supplemental EA/EIR (Corps, 2010).

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[3] Exhaust emissions for on-site pickup trucks for the JFP at Folsom Dam, Downstream project were estimated using EMFAC2007/EMFAC2011 because of the SMAQMD recommended GHG mitigation measure (Section 4.5). However, this mitigation measure was not in place for the Final Supplemental Environmental Assessment/Environmental Impact Report Folsom Dam Safety and Flood Damage Reduction Control Structure, Chute, and Stilling Basin Work; therefore the on-site pickup truck exhaust emissions for the JFP at Folsom Dam, Downstream project should be estimated with OFFROAD2011.

Off-site worker vehicle exhaust emissions were estimated using the EMFAC2007/EMFAC2011 models for light duty automobiles and light duty trucks in Sacramento County. The vehicle trip information was obtained from the Final Supplemental EA/EIR (Corps, 2010).

Fugitive Dust Emission Calculations

Unpaved road dust generated by on-site trucks was estimated using the AP-42 emission factors (USEPA, 2006a) and trip information from the Final Supplemental EA/EIR (Corps, 2010).

Paved road entrained road dust for off-site truck and worker vehicles was estimated using the AP-42 emission factor (USEPA, 2011a) and trip information from the Final Supplemental EA/EIR (Corps, 2010).

Cut and fill fugitive dust emissions were estimated using the URBEMIS2007 model emission factors and daily volume disturbed from the Final Supplemental EA/EIR (Corps, 2010).

Stockpile handling fugitive dust emissions were estimated using AP-42 emission factors (USEPA, 2006b) and the amount of material handled from the Final Supplemental EA/EIR (Corps, 2010). Stockpile wind erosion fugitive dust emissions were estimated using the AP-42 emission factor (USEPA, 2006c) and area exposed to wind from the Final Supplemental EA/EIR (Corps, 2010).

On-site blasting fugitive dust emissions were estimated using emission factors and blasting data from the Final Supplemental EA/EIR (Corps, 2010). There will no rock crushing facility, but there will be one concrete batch plant for the JFP at Folsom Dam, Downstream project. Concrete batch plant fugitive dust emissions were estimated using the AP-42 emission factors (USEPA, 2006c) and the amount of concrete processed from the Final Supplemental EA/EIR (Corps, 2010).

Greenhouse Emission Calculations

The on-site construction off-road equipment GHG emission rates were estimated using the OFFROAD2011 model and equipment and activity data for construction equipment was provided by the project's engineers (Corps, 2011a). The on-site construction marine equipment emissions were estimated using the emission factors from the USEPA guidance (USEPA, 2000). Activity data for construction equipment was provided by the project's engineers (Corps, 2011a).

On-site pickup truck GHG emissions were estimated using OFFROAD2011 and truck trip information from the Final Supplemental EA/EIR (Corps, 2010). On-site and off-site haul truck GHG emissions were estimated using the EMFAC 2007/EMFAC 2011 models for heavy-heavy duty diesel trucks using in Sacramento County. The truck speeds and trip information was obtained from the Final Supplemental EA/EIR (Corps, 2010).

Off-site worker vehicle GHG emissions were estimated using the EMFAC2007/EMFAC2011 models for light duty automobiles and light duty trucks in Sacramento County. The vehicle trip information was obtained from the Final Supplemental EA/EIR (Corps, 2010).

The electricity indirect GHG emissions from the concrete batch plant were estimated using the Flower and Sanjayan methodology (Flowers and Sanjayan, 2007) and the amount of concrete produced from the Final Supplemental EA/EIR (Corps, 2010).

Mitigation Measures

Mitigation measures for exhaust emissions at the JFP at Folsom Dam, Downstream project were based on SMAQMD guidance for on-site off-road construction and on-site haul trucks (> 50 horsepower), including owned, leased, and subcontractor vehicles. This mitigation measure would achieve a project wide fleet-average 20 percent reduction in NO_x exhaust emissions and 45 percent reduction in PM10/PM2.5 exhaust emissions (Corps, 2010).

Watering controls for cut and fill activities would reduce PM10/PM2.5 fugitive dust emissions by 55%, while watering controls for unpaved road entrained dust would reduce PM10/PM2.5 fugitive dust emissions by 44% (Corps, 2010).

Watering controls for the stockpile handling would reduce PM10/PM2.5 fugitive dust emissions by 90%, and watering controls for the concrete batch plant would reduce PM10/PM2.5 fugitive dust emissions by 90% due to watering controls. Watering controls for on-site blasting would reduce PM10/PM2.5 fugitive dust emissions by 36% (Corps, 2010).

5.1.2 Comparison to General Conformity *de minimis* thresholds

Table 5-1 summarizes total annual unmitigated emissions for ROG, NO_x, CO, SO_2, PM10, and PM2.5 for the JFP at Folsom Dam, Upstream and Downstream projects.

Emissions in Table 5-1 are compared to both the General Conformity *de minimis* thresholds for determination of significance of impacts. Based on Table 5-1, unmitigated NO_x and PM10 emissions would exceed their respective *de minimis* thresholds in all overlapping years (2013-2017) for Alternative 2. Based on Table 5-1, unmitigated NO_x and PM10 emissions would exceed their respective *de minimis* thresholds in all overlapping years (2013-2017) for Alternative 3, except for NOx in 2016. ROG, PM2.5, and CO unmitigated emissions would be below their respective *de minimis* thresholds in all overlapping years (2013-2017) for both alternatives.

Table 5-1. JFP Folsom Dam Upstream and Downstream: Unmitigated Criteria Pollutant Emission Summary for NEPA

	Pollutant (tons/yr)						
Activity	**ROG**	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**	**CO_2**
Alternative 2							
2013 Total	3	39	18	107	26	<1	10,434
2014 Total	3	33	17	189	77	<1	27,587
2015 Total	2	29	16	134	72	<1	26,869
2016 Total	4	49	25	192	74	<1	27,213
2017 Total	4	52	26	103	13	<1	7,388
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**
Alternative 3							
2013 Total	3	42	19	127	26	<1	7,762
2014 Total	3	30	15	157	73	<1	26,220
2015 Total	2	27	15	115	67	<1	25,373
2016 Total	2	22	13	188	70	<1	23,254
2017 Total	5	59	30	104	13	<1	8,462
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**

Notes:

1. For NEPA purposes, emission calculations are estimated using OFFROAD2011 and EMFAC2007 models.
2. Emissions rates might not add up due to rounding.

Acronyms:

CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

Table 5-2 summarizes total annual mitigated emissions for ROG, NO_x, CO, SO_2, PM10, and PM2.5 for the JFP at Folsom Dam, Upstream and Downstream projects. Mitigation for the JFP at Folsom Dam, Upstream project is presented in Section 4.0, while mitigation for the JFP at Folsom Dam, Downstream project is presented in Section 5.1.1.

Mitigated emissions in Table 5-2 are compared to the General Conformity *de minimis* thresholds for determination of significance of impacts. Based on Table 5-2, mitigated NO_x would exceed the *de minimis* thresholds in 2016-2017 for Alternative 2. Based on Table 5-2, mitigated NO_x emissions would exceed the *de minimis* thresholds in only the last overlapping year (2017) for Alternative 3. Mitigated ROG, CO, PM2.5, and PM10 emissions would be below their respective *de minimis* thresholds in all overlapping years (2013-2017) for both alternatives.

Table 5-2. JFP Folsom Dam Upstream and Downstream: Mitigated Criteria Pollutant Emission Summary for NEPA

	Pollutant (tons/yr)						
Activity	**ROG**	**NO_x**	**CO**	**PM10**	**PM2.5**	**SO_2**	**CO_2**
Alternative 2							
2013 Total	2	22	12	31	6	<1	10,388
2014 Total	2	24	15	24	4	<1	27,145
2015 Total	2	20	14	13	3	<1	26,427
2016 Total	2	28	19	24	4	<1	26,808
2017 Total	2	25	18	29	4	<1	7,388
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**
Alternative 3							
2013 Total	2	24	14	37	7	<1	8,611
2014 Total	2	24	15	19	4	<1	27,994
2015 Total	2	20	14	11	3	<1	27,141
2016 Total	2	17	12	24	4	<1	25,023
2017 Total	3	29	21	29	4	<1	9,275
General Conformity *de minimis* Levels	**25**	**25**	**100**	**100**	**100**	**N/A**	**N/A**

Notes:
For NEPA purposes, emission calculations are estimated using OFFROAD2011 and EMFAC2007 models.
Emissions rates might not add up due to rounding.

Acronyms:
CO carbon monoxide
NO_x nitrogen oxide
N/A not applicable
PM10 particulate matter smaller than or equal to 10 microns in diameter
PM2.5 particulate matter smaller than or equal to 2.5 microns in diameter
ROG reactive organic gases
SO_2 sulfur dioxide

5.2 Other Cumulative Projects

The JFP at Folsom Upstream project could potentially overlap with other ongoing Corps, Reclamation, and City of Folsom projects that are in and around the vicinity of the Folsom Facility, in addition to the JFP at Folsom Dam, Downstream project described above. The cumulative impacts from these concurrent construction activities will be analyzed qualitatively as described below.

5.2.1 Criteria Pollutants

It is expected that the primary impacts from these concurrent projects would be due to construction activities. Construction of these projects would increase emissions of criteria pollutants, including ROG, NOx, CO, SO_2, PM10, and PM2.5 emissions, from onsite construction activities, including transport of materials.

The JFP at Folsom Dam, Upstream project would be above the NO_x *de minimis* threshold, even with mitigation. However, with mitigation, it would be less than the CEQA significance thresholds levels. Therefore, if these construction projects are implemented concurrently, the combined cumulative effects could be above CEQA thresholds for air quality emissions and would exceed the *de minimis* thresholds.

If this were the case, without consideration of scheduling and sequence of activities, concurrent construction projects within and adjacent to Folsom Reservoir could have adverse cumulative air quality impacts, although these impacts would be temporary. To address these potential cumulative effects, the Corps would coordinate the scheduling and sequence of construction activities with Reclamation, City of Folsom and SMAQMD. For example, should construction activities such as excavation significantly overlap such that SMAQMD thresholds would be exceeded, the agencies could stagger the work in order to comply with the thresholds, reducing the potential for cumulative effects. This coordination could reduce any potential air quality effects to less than significant.

5.2.2 Greenhouse Gases

It is unlikely that any single project by itself could have a significant impact on the environment with respect to GHGs. However, the cumulative effect of human activities has been clearly linked to quantifiable changes in the composition of the atmosphere, which, in turn, have been shown to be the main cause of global climate change (IPCC 2007).

Therefore, the analysis of the environmental effects of GHG emissions is inherently a cumulative impact issue. While the emissions of one single project will not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative effect with respect to global climate change. With respect to global warming, CO_2 is tracked as a contributor to GHG emissions.

It is expected that the primary impacts from these concurrent projects would be due to construction activities. On an individual basis, these projects would mitigate emissions below significance threshold levels. If these projects are implemented concurrently, the combined cumulative effects could be above reporting requirements for GHG emissions. If this was the case, without consideration for scheduling and sequence of activities, concurrent construction projects within and adjacent to Folsom Dam could have adverse cumulative effects on climate change. To address these potential cumulative effects, the Corps should coordinate the scheduling and sequence of construction activities with Reclamation, the City of Folsom, and SMAQMD. For example, should construction emissions that contribute to climate change (GHG) significantly overlap such that CO_2 emissions increase significantly, the agencies would stagger the work in order to comply with the thresholds, reducing the potential for cumulative effects. This coordination would likely reduce any potential effects to less than significant.

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SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

Larry Greene
AIR POLLUTION CONTROL OFFICER

May 18, 2012

Nancy H. Sandburg
Biological Sciences Environmental Manager
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814

Re: General Conformity Determination - Folsom Dam Joint Federal Project

Dear Ms. Sandburg,

On August 3, 2011, Sacramento Metropolitan Air Quality Management District (District) staff met with representatives from the U.S. Army Corps of Engineers (USACE), the Department of Water Resources, and the California Air Resources Board (CARB) to discuss general conformity determination of the Folsom Dam Joint Federal Project. USACE determined that the Folsom Dam Project would exceed the de minimis threshold for emissions of oxides of nitrogen (NOx), and must make a conformity determination.

The existing General Conformity budgets in the applicable SIP (1994 Sacramento Area Regional Ozone Attainment Plan) for the Sacramento Federal Nonattainment Area (SFNA) do not provide a basis for making a positive conformity determination because the current emissions estimates are higher and the project will cause emissions beyond the time period covered by the 1-hour ozone SIP. However, the criterion under 40 CFR 93.158(a)(5) provides that a State can commit to revising the SIP in such a way as to accommodate a Federal action, and the SIP commitment itself provides the basis for a positive conformity determination.

A conformity analysis evaluation was prepared by the District in cooperation with the CARB and consultation with US EPA Region 9. District staff used the 2009 Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan ("2009 Attainment and RFP Plan" submitted by the State to EPA on April 17, 2009) and the 2011 Sacramento Attainment and RFP Plan (adopted by SMAQMD on November 10, 2011 but not yet submitted by the State to EPA) to show there are excess emission reductions (margin of safety) available to accommodate the Folsom Dam project.

In addition to accommodating the emissions increases, the 2009/2011 SFNA Ozone SIP also fulfills the 5 criteria identified in 40 CFR 93.158(a)(5)(i)(B) for SIP revisions that may be relied upon by Federal agencies to make a positive conformity determination. Each of the criteria is discussed below.

(1) A specific schedule for adoption and submittal of a revision to the SIP which would achieve the needed emission reductions prior to the time emissions from the Federal action would occur;

The 2009 Sacramento Regional 8-Hour Ozone Attainment and RFP Plan was submitted by the State to EPA on April 17, 2009 and the 2011 Sacramento Attainment and RFP Plan was adopted by SMAQMD on November 10, 2011 but not yet submitted by the State to EPA. In a conference call with CARB and EPA Region IX staff on March 12, 2012, Sylvia Oey of CARB acknowledged that CARB is working on providing a technical update to reductions from state strategy measures in the 2009 and 2011 Attainment and RFP plans. CARB has committed to submit the SIP revisions by the end of 2012.

(2) Identification of specific measures for incorporation into the SIP which would result in a level of emissions which, together with all other emissions in the nonattainment or maintenance area, would not exceed any emissions budget specified in the applicable SIP;

This criterion is met through the adoption and submittals of the 2009 Attainment and RFP Plan and the 2011 Plan revision. Additional specific measures are not needed because this project consumes a nominal amount of the excess emission reduction buffer, which provides a margin of safety for achieving attainment, as shown in the 2009 and 2011 Attainment and RFP plans. CARB will ensure that their technical revisions associated with state measures do not consume the excess emission reduction and cause the Folsom Dam Project to exceed the emissions budget. The NOx emissions from the project are less than 0.1% of the nonattainment inventory and will consume less than 2% of the excess reduction buffer. Even if the excess reduction buffer is decreased due to CARB's technical updates, the project will still only consume a nominal amount of the margin of safety. The accompanying analysis provides more detail information addressing this criterion.

(3) A demonstration that all existing applicable SIP requirements are being implemented in the area for the pollutants affected by the Federal action, and that local authority to implement additional requirements has been fully pursued;

Figures 7-1 and 7.2 of the 2011 Attainment and RFP Plan show the reductions that the District and CARB have achieved from adopting and implementing control measures in the previous ozone plans. Tables 7-1A and 7-4 list new reasonable available control measures that are included in the 2011 Attainment and RFP Plan. The existing control measures surpass the amount of emission reductions needed for the reasonable further progress (RFP) targets by a margin that meets the contingency measure requirements. The additional measures in Tables 7-1A and 7-4 are not included in the RFP demonstration and provide an additional safety margin.

CARB is also acting on its current SIP commitments, as demonstrated in the Status Report on the State Strategy for California's 2007 State Implementation Plan (SIP) and Proposed Revision to the SIP Reflecting Implementation of the 2007 State Strategy, submitted to U.S. EPA on August 12, 2009. The status report identified rules adopted by CARB that will provide the needed reductions in nitrogen oxides (NOx) that the state committed to in order to attain the ozone standard in the Sacramento Federal Nonattainment Area in 2018.

(4) A determination that the responsible Federal agencies have required all reasonable mitigation measures associated with their action; and

Since Folsom Dam Modification project will be required to comply with all state and local regulations and will employ additional emission mitigation measures including electrification and use of cleaner construction equipment, trucks and marine vessels to meet California Environmental Quality Act (CEQA) mitigation requirements, it meets the criteria for implementation of all reasonable mitigation measures.

(5) Written documentation including all air quality analyses supporting the conformity determination;

This general conformity evaluation serves to meet the requirement to provide air quality analyses to support conformity determination.

Therefore, the District has concluded the total direct and indirect mitigated emissions from Folsom Dam Joint Federal Project would be accommodated by the SFNA's 2009 Attainment and Reasonable Further Progress Plan and 2011 Plan revision. In addition, 2009/2011 SFNA SIP satisfies the individual criteria in 40 CFR 93.158(a)(5)(i)(B) for SIP revisions that may be relied upon for conformity determinations

If you have any question regarding this document please contact me at (916) 874-4802, or Mr. Charles Anderson, Program Coordinator, Planning and Emission Inventory at (916) 874-4831.

Sincerely,

Larry Greene
Executive Director/Air Pollution Control Officer
Sacramento Metropolitan Air Quality Management District

Attachments: Conformity Determination Evaluation, May 15, 2012

cc

Dawn Richmond, USEPA, Region 9
Jeff Wehling, USEPA, Region 9
John Ungvarsky, USEPA, Region 9
Sylvia Oey, CARB
Scott King, CARB
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SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

Sacramento, CA 95814

CONFORMITY DETERMINATION EVALUATION

DATE:	May 15, 2012
ENGINEER:	Hao Quinn

PROJECT NAME: JOINT FEDERAL PROJECT AT FOLSOM DAM

LOCATION: FOLSOM DAM, SACRAMENTO COUNTY

PROPOSAL: FOLSOM DAM MODIFICATION: CONSTRUCTION OF AN AUXILIARY SPILLWAY

INTRODUCTION:

The U.S. Army Corps of Engineers (USACE) is the lead agency responsible for the joint federal project (JFP), Folsom Dam Modification, for construction an auxiliary spillway consisting of a control structure, spillway chute, stilling basin, approaching channel, and spur dike. The construction project is for providing dam safety and flood damage reduction at Folsom Dam located downstream from confluence of North and South Forks of the American River near the city of Folsom, California.

All federal projects are subject to the U.S. EPA General Conformity regulations[1]. The purpose of the General Conformity Rule is to ensure that federal activities (1) do not cause or contribute to new violation of National Ambient Air Quality Standards (NAAQS), (2) do not cause additional or worsen existing violations of or contribute to new violations the NAAQS, and (3) delay in attainment of the NAAQSs. The General Conformity de minimis thresholds for the Sacramento Federal Nonattainment Area (SFNA) are: 25 tpy for NOx and 25 tpy for VOC (ozone – severe nonattainment), 100 tpy for PM_{10} (PM_{10} – moderate nonattainment), 100 tpy for $PM_{2.5}$ ($PM_{2.5}$ – nonattainment) and 100 tpy for CO (CO – maintenance)[2].

The Folsom Dam construction project is expected to exceed the General Conformity de minimis threshold for NOx over the life of the project when mitigated. Therefore, the USACE must demonstrate conformity by (1) showing the project will meet all ozone State Implementation Plan (SIP) control requirements[3], and (2) meeting one of following options[4]:

1. Demonstrate that the total direct and indirect emissions are specifically identified and

[1] 40 CFR § 6.303, § 51.853 and § 93.153
[2] 40 CFR § 93.153(b), EPA Website on Status of SIP Requirements, http://www.epa.gov/airquality/urbanair/sipstatus/reports/ca_areabypoll.html
[3] Sacramento Area Regional Ozone Attainment Plan, SMAQMD, November 15, 1994; and Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan, SMAQMD, November 10, 2011
[4] 40 CFR § 93.158(a)

accounted for in the applicable SIP.

2. Demonstrate that the total direct and indirect emissions would not exceed the emissions budgets specified in the applicable SIP.
3. Obtain a written commitment from the State to revise the SIP to include the emissions from the action.
4. Fully offset the total direct and indirect emissions by reducing emissions of the same pollutant or precursor in the same non-attainment or maintenance area.

The option applicable to this project is to obtain a written commitment from the State Governor or the Governor's designee for SIP actions, as described in 40 CFR §93.158(a)(5)(i)(B), to revise the SIP to achieve the needed emission reductions prior to the time emissions from the Federal action would occur, such that total direct and indirect emissions from the action do not exceed the 2011 SIP emissions budgets. This evaluation and verification are conducted on the mitigated project emissions provided by USACE.

PROJECT DESCRIPTION[6]:

USACE is building a control spillway at Folsom Dam on the American River systems. Phase 3 (JFP at Folsom Dam, Downstream) of the project includes construction of a control structure, spillway chute and stilling basin, and has a construction period of 2010 to 2016. Phase 3 overlaps with the final phase, Phase 4 (JFP at Folsom Dam, Upstream), which is expected to take place, from 2013 to 2017. Phase 4 project will include construction of an approach channel, spur dike, and either a temporary cut-off wall (Alternative 2) or a cofferdam (Alternative 3) for approach channel excavation. Construction activities include excavation, blasting, rock processing and concrete batching and the following sources of direct and indirect emissions are expected:

- On-site construction off-road equipment
- On-site marine engine
- On-site and off-site haul truck engine
- Off-site worker vehicle
- On-site and off-site haul truck entrained paved and unpaved road dust
- Off-site worker vehicle trip entrained road dust for trip to and from the site
- On-site excavation
- On-site material storage piles
- On-site in-the-dry blasting
- Rock crushing and concrete batching

[6] Source: Chapter 1 of Air Quality Technical Report, "Joint Federal project (JFP) at Folsom Dam, Upstream", prepared by URS for USACE, May 2012.

Table 1 contains project timeline and operation schedule. It is followed by an aerial photo[7] of the project site.

Table 1. Folsom Dam Modification Project Timeline and Operation Schedule[8]

Activity	Year	Days	Hrs/day
Phase 3 (JFP at Folsom Dam, Downstream)			
Upper Spillway Chute Excavation, trimming, Foundation Clean-up (16 Months) (September 2011-June 2015)	2011-2015	315	10
Upper Spillway Chute Concrete work (16 Months) (September 2011-July 2014)	2011-2014	315	10
Control Structure Concrete Placement and Batch Plant (2013-2014)	2013-2014	240	10
Stepped Spillway Chute Excavation, trimming, Foundation Clean-up (10 Months) (September 2013-February 201	2013-2017	200	10
Spillway Stilling Basin Excavation, trimming, Foundation Clean-up (2 Months) (February 2014-April 2014)	2014	36	10
Downstream Chute Concrete Placement and Batch Plant (2013-2017)	2013-2017	900	8
Spillway Stilling Basin Concrete Work (17 Months) (February 2015-July 2016)	2015-2016	328	10
Stepped Spillway Chute Concrete work (16 Months) (September 2015-March 2017)	2015-2017	315	10
Remove Downstream rock Cofferdam (2 Months) (2017)	2017	36	10
Site Restoration Work (4 Months) (2017)	2017	27	10
Alternative 2 of Phase 4 (JFP at Folsom Dam, Upstream) - Approach Channel Excavation With Cutoff Wall			
Construct Transload Facility (April-June 2013)	2013	405	10
Site Prep/Haul Rd Prep (12 Months) (June 2013-August 2014)	2013-2014	136	10
Common Excavation to waste (3 Months) (September 2013-December 2013)	2013	69	10
Concrete Secant Pile Wall (2013-2016)	2013-2016	917	10
Cutoff Wall Concrete Placement (2013-2016)	2013-2016	187	10
Rock Excavation DRY (2 Months) (2014)	2014	35	12
Site Restoration/Teardown (1 Month) (July-August 2014)	2014	240	10
Mobilization for Approach Walls (Roads , Crane Pads) (3 months) (Mid 2015)	2015	60	10
Intake Approach Walls & Slab (13 months) (September 2015-March 2017)	2015-2017	265	10
Set up Bubble Curtain/operate Bubble Curtain/Silt Curtain (6 Months) (November 2015-December 2015)	2015	125	10
Dredge Common to Rock (4 Months)(December 2015-March 2016)	2015-2016	74	20
Drill and Shoot/Dredge Rock WET (14 Months) (March 2016-January 2017)	2016-2017	276	20
Import Material from Quarry to D1/D2 MIAD (6 months) (September 2016-March 2017)	2016-2017	116	10.43
Haul Road Prep, Spur Dike Stripping (1 month) (September 2016)	2016	7	10.43
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill (6 Months) (January 201	2017	110	10.43
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap (2 Months) (2017)	2017	28	10.43
Foundation Clean Up (2 Months) (February 2017-April 2017)	2017	75	10
Remove Transload Facility (August-October 2017)	2017	405	10
Alternative 3 of Phase 4 (JFP at Folsom Dam, Upstream) - Approach Channel Excavation With Cofferdam			
Construct Transload Facility (April-June 2013)	2013	405	10
Mobilization for Cofferdam (Haul Road) (12 Months) (June 2013-June 2014)	2013-2014	238	10
Construction of Sheet Pile Cells EA (1 Month) (Late 2013-Mid 2014)	2013-2014	26	10
Fill Cells CY's (6 Months) (Late 2013-Mid 2014)	2013-2014	121	10
Common Excavation Below Cofferdam, CY (3 Months) (September 2013)	2013	10	
Common Dredge Work Below Cofferdam, CY (3 Months) (Late 2013)	2013	28	20
Set up Bubble Curtain/operate Bubble Curtain/Silt Curtain (1 Month) (August 2013)	2013	125	24
Dewater Behind Cofferdam (2014)	2014	4	24
Site Restoration/Teardown (1 Month) (July - August 2014)	2014	240	10
Intake Approach Walls & Slab (13 months) (September 2015-March 2017)	2015-2017	265	10
Common Excavation, CY (4 Months) (Late 2015-Mid 2017)	2015-2017	75	10
Rock Excavation DRY (4 Months)	2016	80	12
Haul Road Prep, Spur Dike Stripping (1 month) (September 2016)	2016	8	10.43
Import Material from Quarry to D1/D2 MIAD (6 months) (September 2016-March 2017)	2016-2017	116	10.43
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill (6 Months) (January 201	2017	110	10.43
Foundation Clean up SY (2 Months) (February -April 2017)	2017	21	10
Remove cell rubble fill CY (5 Months) (2017)	2017	94	10
Remove sheets, EA (1 Month) (2017)	2017	20	10
Dredge Common to Rock (2 Months)	2017	38	20
Drill and Shoot/Dredge Rock WET (7 Months) (2017)	2017	134	20
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap (2 Months) (2017)	2017	28	10.43
Remove Transload Facility (August-October 2017)	2017	405	10

[7] Source: Cover page of Air Quality Technical Report, "Joint Federal project (JFP) at Folsom Dam, Upstream", prepared by URS for USACE, May 2012.

[8] Source: Emission calculation spreadsheet, Folsom Dam Modifications Calculations AQ Comparison Summary 5_3_12.xlsx.

EMISSION MITIGATION MEASURES[9]:

USACE will utilize mitigation measures to reduce the total project NO_x and $PM_{10}/PM_{2.5}$ emissions. They are:

1. Off-road construction equipment complying with the Los Angeles County Metropolitan Transportation Authority (LACMTA) Green Construction Policy. Use Tier 3 off-road equipment for first two years of construction (2013-2014) and Tier 4 off-road equipment beginning 2015.
2. Marine engines complying with U.S. EPA Tier 2 and Tier 3 engine standards. Use Tier 2 marine engines for the first two years of construction (2013-2014) and Tier 3 marine engines beginning 2015.
3. Use of model year 2010 or newer haul trucks beginning in 2013.
4. Electrification of concrete batch plant and rock crushing plant.
5. Fugitive dust controls which include watering controls on blasting operations, unpaved roads, excavation, wet suppression on stockpiles, and speed control.

[9] Source: Chapter 4 of Air Quality Technical Report, "Joint Federal project (JFP) at Folsom Dam, Upstream", prepared by URS for USACE, May 2012.

PROJECT EMISSIONS:

U.S. Army Corps of Engineers, through URS Corporation/Brown and Caldwell Joint Venture, has estimated the following project emissions with mitigation measures[11].

Table 2. Folsom JFP Approach Channel Project (Upstream+Downstream) Summary: Emissions After Mitigation (tons/year)

Activity Year	VOC	NOx	CO	PM_{10}	$PM_{2.5}$	SO_2
Alternative 2 (Approach Channel Excavation With Cutoff Wall)						
2013	2	22	12	31	6	<1
2014	2	24	15	24	4	<1
2015	2	20	14	13	3	<1
2016	2	**28**	19	24	4	<1
2017	2	**25**	18	29	4	<1
General Conformity *De Minimis* Levels	25	25	100	100	100	100
Alternative 3 (Approach Channel Excavation With Cofferdam)						
2013	2	24	14	37	7	<1
2014	2	24	15	19	4	<1
2015	2	20	14	11	3	<1
2016	2	17	12	24	4	<1
2017	3	**29**	21	29	4	<1
General Conformity *De Minimis* Levels	25	25	100	100	100	100

Using the aforementioned mitigation measures, all pollutant emissions except NOx would be below the General Conformity annual de minimis threshold during all construction years. Mitigated NOx emissions would be above the de minimis thresholds in 2016 and 2017 for Alternative 2 and 2017 for Alternative 3. Therefore, a conformity determination is required for NOx emissions.

[11] Source: Table 5-2 of Air Quality Technical Report, "Joint Federal project (JFP) at Folsom Dam, Upstream", prepared by URS for USACE, May 2012.

CONFORMITY DETERMINATION:

Section 176(c) (42 U.S.C. 7506) of the Clean Air Act requires federal agencies to ensure that their actions conform to the applicable SIP for attaining and maintaining the national ambient air quality standards (NAAQS). Conformity with the applicable SIP must be determined for each federal action pollutant that exceeds the de minimis threshold[12]. The applicable SIP (or EPA approved SIP[13]) for SFNA is the 1994 Sacramento 1-Hour Ozone Attainment Demonstration SIP (94SIP). It was approved by EPA, effective February 7, 1997 (62 FR 1150). In July 1997, EPA promulgated an 8-hour standard for ozone[14] to provide greater protection of public health. The 1-hour ozone NAAQS was revoked in 2005 (70 FR 44470) and replaced with an 8-Hour Ozone NAAQS. Subsequently, the 2011 Sacramento Attainment and RFP Plan (2011 Attainment and RFP Plan) was adopted by SMAQMD on November 10, 2011 and is pending submittal by the State to EPA. ARB is committed to submit the SIP revisions by December 2012.

Steps for Determining Applicable Sections in 40 CFR § 93.158 for SFNA Ozone SIP Conformity Determination

1. **68FR32843** (June 2, 2003) states that once 1-hour ozone standard is revoked, the federal project must conform to the 8-hour standard.

> *"Once the 1-hour ozone standard is revoked in whole or in part, Federal agencies will be required to conduct conformity determinations for the 8-hour standard if the project/action is in an area designated nonattainment for that standard. The general conformity regulations specify requirements for actions/projects in areas without an approved SIP. Those requirements would apply to 8-hour ozone nonattainment areas until the SIP is approved by EPA."*

2. However, **73FR1415** (January 8, 2008) states that the 1-hour ozone SIP is considered the applicable SIP until a revised SIP is submitted and approved by EPA. Therefore, conformity determination must be made with respect to the 1-hour ozone SIP under 40 CFR § 93.158(a).

3. Since the project will cause emissions beyond the time period covered by the 1-hour SIP, **40 CFR § 93.162** (Emissions beyond the time period covered by the SIP) is applicable. It allows (a) conformity with the last emission budget in the applicable SIP (94SIP) or (b) submittal of a revised SIP which accommodates the emissions from the Federal action. However, a SIP revision has already been submitted. The 2011 Attainment and RFP Plan was prepared and is pending submittal by ARB to EPA. It demonstrates how the region will attain the federal 1997 8-hour ozone standard and meet reasonable further progress requirements in the Sacramento Nonattainment Area. We will apply **40 CFR § 93.158(a)(5)(i)(B)** to determine whether the project causes emissions to be above the emissions budget in the 2011 Attainment and RFP Plan.

[12] 40 CFR § 93.158(a)
[13] 40 CFR § 93.152
[14] "National Ambient Air Quality Standards for Ozone"(62FR38855, July 18, 1997)

<u>40 CFR § 93.158(a)(5)(i)(B)</u>

(B) The total of direct and indirect emissions from the action (or portion thereof) 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 nonattainment (or maintenance) area, would exceed an emissions budget specified in the applicable SIP and the State Governor or the Governor's designee for SIP actions makes a written commitment to EPA which includes the following:

For the Federal agency to make a positive conformity determination under 40 CFR § 93.158(a)(5)(i)(B), the air district will need to submit a letter to EPA (with a cc to the United States Corps of Engineers) addressing the following 5 elements outlined in this section. Each of the elements is discussed below:

(1) A specific schedule for adoption and submittal of a revision to the SIP which would achieve the needed emission reductions prior to the time emissions from the Federal action would occur;

The 2009 Sacramento Regional 8-Hour Ozone Attainment and RFP Plan was submitted by the State to EPA on April 17, 2009 and the 2011 Sacramento Attainment and RFP Plan was adopted by SMAQMD on November 10, 2011 but not yet submitted by the State to EPA. In a conference call with CARB and EPA Region IX staff on March 12, 2012, Sylvia Oey of CARB acknowledged that CARB is working on providing a technical update to reductions from state strategy measures in the 2009 and 2011 Attainment and RFP plans. CARB has committed to submit the SIP revisions by the end of 2012.

(2) Identification of specific measures for incorporation into the SIP which would result in a level of emissions which, together with all other emissions in the nonattainment or maintenance area, would not exceed any emissions budget specified in the applicable SIP;

This criterion is met through the adoption and submittals of the 2009 Attainment and RFP Plan and the 2011 Plan revision. Additional specific measures are not needed because this project consumes a nominal amount of the excess emission reduction buffer, which provides a margin of safety for achieving attainment, as shown in the 2009 and 2011 Attainment and RFP plans. CARB will ensure that their technical revisions associated with state measures do not consume the excess emission reduction and cause the Folsom Dam Project to exceed the emissions budget. The NOx emissions from the project are less than 0.1% of the nonattainment inventory and will consume less than 2% of the excess reduction buffer. Even if the excess reduction buffer is decreased due to CARB's technical updates, the project will still only consume a nominal amount of the margin of safety.

Chapter 7 of the 2011 Attainment and RFP Plan contains new and amended control measures and strategies for meeting the requirement to demonstrate reasonable further progress and attainment of the 1997 8-hour ozone NAAQS. The plan contains control measures with excess emission reductions beyond emission reduction target for attainment, such that the emissions from the Folsom Dam Modification project, together with all other emissions in the nonattainment or maintenance area, would not exceed the emissions budget.

Conformity With 2011 Attainment and RFP Plan Emissions Budget
The highest annual project NOx emission level after mitigation at 29 tons/year occurs in 2017 under Alternative 3. This is equal to an average day of 0.08 ton/day (29 tons/yr / 365 days/yr = 0.08 ton/day), and is less than 0.1% of total SFNA NOx emissions.

Table 8-1[15], Summary of Attainment Demonstration for 8-Hour Ozone NAAQS 2018 "Severe" Classification Scenario, of the 2011 Attainment and RFP Plan shows attainment by 2018 with an additional 3.8% NO_x emission reduction beyond the emission reduction target. This excess NOx emission reduction is 4 tpd NOx (104 tpy * 3.8% = 4 tpd). It provides a margin of safety for achieving attainment target (Emissions Budgets) of 91 tpd NOx (104 tpy *(100%-12.5%) = 91 tpd).

Since the amount of highest average daily project NOx at 0.08 tpd[16] (29 tons/yr / 365 day/yr = 0.08 ton/day) is about 2% of the 4 tpd NOx (0.08 tpd/4 tpd * 100% = 2%) reduction buffer, additional emissions from Folsom Dam Modification will not cause the region to exceed the 2011 SIP emissions budget.

In addition, the recent U.S. economic downturn, beginning in 2008, has not been accounted in the ozone SIP plan. The economic downturn has caused significant reductions in construction activities as noted in the loss of employment and housing starts. In Sacramento County, employment in the construction industry has decreased by 48% (a loss of 21,882 employees) from 2005 to 2010[17]. New single-family home permits issued in Sacramento County have decreased by 81% from 2006 to 2010[18]. Since the impacts of the economic downturn are not yet included in the SIP planning inventory, the forecasted attainment year inventory is overestimated.

California Air Resources Board (CARB) conducted a comprehensive review of the construction inventory as a result of a 2009 study by Rob Harley at UC Berkeley which determined that the off-road equipment inventory is overestimated by more than a factor of three based on a fuel-based method.[19] As a result, CARB has recently made significant updates to the off-road emission inventory to reflect the reduced activities due to recession, and more accurate lower population, hours of use, load factor and growth forecasts. The revised (or more realistic) emissions are substantially lower (about 1/3) than the off-road equipment inventory in the 2011 SIP. ARB anticipates submitting the revised inventory and attainment demonstration by December 2012 and will ensure that the conclusion presented here remains valid.

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[15] Table 8-1,"*Summary of Attainment Demonstration for 8-Hour Ozone NAAQS 2018 "Severe" Classification Scenario*", Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan, SMAQMD, November 10, 2011.
[16] The 49 tpy is highest annual emission after mitigation and it occurs in 2017, see emission data under Project Emissions.
[17] Bureau of Labor Statistics, accessed January 2012, http://www.bls.gov/cew/data.htm
[18] Construction Industry Research Board, 2006, 2010 (cited by California Building Industry Association), http://www.cbia.org/go/cbia/newsroom/housing-statistics/housing-starts/
[19] CARB webpage, http://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles; http://www.arb.ca.gov/regact/2010/offroadlsi10/offroadappd.pdf

(3) A demonstration that all existing applicable SIP requirements are being implemented in the area for the pollutants affected by the Federal action, and that local authority to implement additional requirements has been fully pursued;

Figures 7-1 and 7.2 of the 2011 Attainment and RFP Plan show the reductions that the District and CARB have achieved from adopting and implementing control measures in the previous ozone plans. Tables 7-1A and 7-4 (presented below) of the 2011 Attainment and RFP Plan list new reasonable available control measures that are included in the plan. The existing control measures surpass the amount of emission reductions needed for the reasonable further progress (RFP) targets by a margin that meets the contingency measure requirements. The additional measures in Tables 7-1A and 7-4 are not included in the RFP demonstration and provide an additional safety margin.

Table 7-1A
Adopted New State and Federal SIP Measures
Expected 2018 Emission Reductions
Sacramento Nonattainment Area

New SIP Measures Adopted by End of 2008	NOx (tpd)	VOC (tpd)
Passenger Vehicles	**--**	**1.1**
Modifications to Reformulated Gasoline	--	1.1
Heavy-Duty Trucks	**9.5**	**0.8**
Cleaner In-Use Heavy-Duty Trucks	9.5	0.8
Goods Movement Sources	**2.1**	**0.1**
Accelerated Intro. of Cleaner Line-Haul Locomotives	1.9	0.1
Clean Up Existing Harbor Craft	0.2	0.0
Off-Road Equipment	**1.9**	**0.4**
Cleaner In-Use Off-Road Equipment (over 25hp)	1.9	0.4
Other Off-Road Sources	**--**	**0.4**
Emission Standards for Recreational Boats and Vehicles	--	0.4
Areawide Sources	**--**	**0.3**
Consumer Products	--	0.3
Emission Reductions from Adopted New Measures	**13**	**3**

Locomotives measure relies on U.S. EPA rulemaking.
Includes motor vehicle inventory from SACOG FEB 2008 submittal.
Updated emission reductions from adopted measures provided by CARB (Lynn Terry e-mail 10-21-08).

Table 7-4
Summary of New Regional and Local Proposed Control Measures
Sacramento Nonattainment Area

Control Measure Name	2018 Emission Reductions (TPD)	
	VOC	NO_x
Regional Non-regulatory Measures		
Regional Mobile Incentive Program – On-road	<0.1	0.9
Regional Mobile Incentive Program – Off-road	<0.1	<0.1
Spare The Air Program	<0.1	<0.1
SACOG Transportation Control Measures	--	--
Urban Forest Development Program	0 - 0.2	--
Total Regional Non-regulatory Measures	**0.1**	**0.9**
Local Regulatory Measures		
Architectural Coating	1.5	--
Automotive Refinishing	0.2	--
Degreasing/Solvent Cleaning	1.4	--
Graphic Arts	na	--
Miscellaneous Metal Parts and Products	<0.1	--
Natural Gas Production and Processing	0.1	--
Boilers, Steam Generator, and Process Heaters	--	0.2
IC Engines	--	<0.1
Large Water Heaters and Small Boilers	--	0.9
Total Local Regulatory Measures	**3.2**	**1.2**
Total Reductions*	**3.4**	**2.2**

Notes: Numbers are truncated to one decimal place. na = not available
*Total reductions are summed from untruncated values. See summary table in Appendix C – Proposed Control Measures.

CARB is also acting on its current SIP commitments, as demonstrated in the Status Report on the State Strategy for California's 2007 State Implementation Plan (SIP) and Proposed Revision to the SIP Reflecting Implementation of the 2007 State Strategy, submitted to U.S. EPA on August 12, 2009. The status report identified rules adopted by CARB that will provide the needed reductions in nitrogen oxides (NOx) that the state committed to in order to attain the ozone standard in the Sacramento Federal Nonattainment Area in 2018.

(4) A determination that the responsible Federal agencies have required all reasonable mitigation measures associated with their action; and

Since Folsom Dam Modification project will be required to comply with all state and local regulations and will employ additional emission mitigation measures including electrification and use of cleaner construction equipment, trucks and marine vessels to meet California Environmental Quality Act (CEQA) mitigation requirements, it meets the criteria for implementation of all reasonable mitigation measures.

(5) Written documentation including all air quality analyses supporting the conformity determination;

This general conformity evaluation serves to meet the requirement to provide air quality analyses to support conformity determination.

CONCLUSION:

A positive conformity determination can be made for the mitigated emissions from the Folsom Dam Modification project. This finding is based on:

- Folsom Dam Modification project will be required to comply with all state and local regulations, thus it will meet all SIP control requirements. Folsom project will employ additional emission mitigation measures including electrification and use of cleaner construction equipment, trucks and marine vessels.

- The 2011 Attainment and RFP Plan provides 4 tpd NOx in margin of safety for achieving NOx emission attainment target; the emissions increase from Folsom Dam Modification project (maximum emissions of 0.08 tpd NOx) is a nominal portion (2%) of the margin of safety provided; therefore, this margin of safety ensures the project will not cause the nonattainment area to exceed the 2011 Attainment and RFP emissions budget.

- ARB has committed to submit SIP revisions by December 2012 and will ensure that ARB's technical revisions associated with state measures do not consume the excess emissions allocated to the Folsom Dam Project.

RECOMMENDATIONS:

This evaluation recommends that U.S. Army Corps of Engineers makes a positive general conformity determination for Folsom Dam Modification project with emission mitigation. The district will submit a commitment letter to EPA to show that, in addition to accommodating the emissions increase from the Folsom Dam Modification project, the 2011 Attainment and RFP Plan also satisfies the 5 elements identified in 40CFR93.158(a)(5)(i)(B) for SIP revisions.

REVIEWED BY: ________________ **DATE:** May 16, 2012

APPROVED BY: ________________ **DATE:** 5/21/12

Joint Federal Project (JFP) at Folsom Dam, Approach Channel Excavation

Folsom, California

Draft Water Quality and Bioaccumulation Technical Memorandum

February 2012

US Army Corps of Engineers Sacramento District

U.S. Army Corps of Engineers
Sacramento District

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Appendix X

Water Quality and Bioaccumulation Technical Memorandum

Table of Contents

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List of Abbreviations and Acronyms

Basin Plan	CVRWQCB Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
BMP	Best Management Practice
CASQA	California Stormwater Quality Association
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulation
CFS	Cubic feet per second
USACE	U.S. Army Corps of Engineers
CTR	California Toxics Rule
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
Construction General Permit	State General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2010-0014-DWQ
CWA	Clean Water Act
CY	Cubic yards
DO	Dissolved Oxygen
ERL	Effect Range-Low
ERM	Effect Range-Median
MCL	Maximum Contaminant Level
MIAD	Mormon Island Auxiliary Dam
MPN	Most Probable Number
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
PEC	Probable Effect Concentration
OAL	Office of Administrative Law
Reclamation	United States Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
SQG	Sediment Quality Guideline
SWAMP	Surface Water Ambient Monitoring Program
SDWA	Safe Drinking Water Act

List of Abbreviations and Acronyms (Con't)

SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TEC	Threshold Effect Concentration
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this technical memorandum is to provide supporting details for the analysis of potential effects on water quality and mercury bioaccumulation potential related to the Joint Federal Project (JFP) at Folsom Dam, Approach Channel Excavation. The water quality analysis section presents details on beneficial uses, sediment samples collected for characterization of existing conditions, water quality objectives for metals, and an analysis of the relationship between metals concentrations in sediments, total suspended sediment (TSS) concentrations, and dissolved metals in the water column. The mercury bioaccumulation potential section provides details on the conceptual model for mercury sources, transformations, and bioaccumulation processes relevant to the analysis of impacts.

2.0 WATER QUALITY

This section provides details on background sediment samples collected to characterize existing water quality and details on the analysis of factors affecting dissolved metals concentrations in water.

2.1 Beneficial Uses and Metals Water Quality Objectives

The Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins, Fourth Edition (Basin Plan), designates beneficial uses, establishes water quality objectives, contains implementation plans and policies for protecting water of the basin, and incorporates by reference plans and policies adopted by the Central Valley Regional Water Quality Control Board (CVRWQCB).

The Basin Plan lists the beneficial uses of Folsom Lake, which include:

- Municipal and domestic water supply (MUN);
- Irrigation (AGR);
- Industrial power (POW);
- Water contact (REC-1) and non-contact recreation (REC-2);
- Warm (WARM) and cold (COLD) freshwater habitat;
- Warm freshwater spawning habitat (SPWN); and
- Wildlife habitat (WILD), along with potential beneficial uses for industrial service supply (RWQCB 1998)

The existing beneficial uses that apply to the aquatic life criteria for this Project are WARM, COLD and WILD

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, in other words, the MUN beneficial use of Folsom Reservoir. 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 and are currently regulated by the USEPA as primary and secondary maximum contaminant levels (MCLs). Therefore, MCLs set the water quality standards for MUN uses.

Although MCLs are used for MUN, the aquatic life objectives put forth in the California Toxics Rule (CTR) are more stringent because, in general, aquatic life are more sensitive to metals exposure than people are through drinking water. At least one exception to this is hexavalent chromium, which has a Public Health Goal (PHG) of 0.02 µg/L for human exposure through drinking water, as compared to a chronic water quality objective of 11 µg/L for protection of freshwater organisms.

The aquatic life objectives are the average for two periods for exposure: a 4-day chronic exposure and a 1-hr acute exposure. The analysis presented in the memo focuses on the chronic exposure because this is a lower, more stringent value. These objectives are based on the dissolved metal concentrations. Dissolved metal concentration is the metal concentration present in a sample that has passed through a 0.45 µm filter. The dissolved metal form is most damaging to aquatic organisms, entering through the gills and membranes. Due to the formation of inorganic complexes, the hardness concentration in the sample affects the toxicity of many metals to aquatic organisms. Therefore, aquatic life objectives are expressed as hardness dependent equations for cadmium, total chromium, copper, lead, nickel and zinc.

The aquatic life objectives presented in the CTR (2000) are based on 100 mg/L of hardness. Background data provided for Folsom Lake indicate that the hardness concentration is approximately 30 mg/L; therefore, the aquatic life objectives were calculated assuming a hardness of 30 mg/L (Tables 2.1-1 and 2.1-2).

Table 2.1-1. Chronic Aquatic Life Criteria and Hardness Correction Factors

Trace Element	Chronic (4-day average) (100 mg/L Hardness)	Chronic (4-day average) (30 mg/L Hardness)	mc	bc	CF (chronic, freshwater)
Arsenic	150	150	NA	NA	NA
Cadmium	2.2	0.92	0.79	-2.7	0.96
Chromium (total)	180	66.	0.82	1.6	0.86
Copper	9.0	3.20	0.85	-1.7	0.96
Lead	2.5	0.66	1.3	-4.7	0.97
Nickel	52	19.	0.85	0.06	1.0
Zinc	120	43.	0.85	0.88	0.99

NA – Not applicable because arsenic toxicity is not affected by hardness concentration

Table 2.1-2. Acute Aquatic Life Criteria and Hardness Correction Factors

Trace Element	Acute (1-hr average) (100 mg/L Hardness)	Acute (1-hr average) (30 mg/L Hardness)	m_A	b_A	CF (acute, freshwater)
Arsenic	340	340	NA	NA	NA
Cadmium	4.3	1.2	1.1	-3.7	0.99
Chromium (total)	550	205	0.82	3.7	0.32
Copper	13	4.3	0.94	-1.7	0.96
Lead	65	17.	1.3	-1.5	0.97
Nickel	470	170	0.85	2.3	1.0
Zinc	120	44	0.85	0.89	0.99

NA – Not applicable because arsenic toxicity is not affected by hardness concentration For further explanation of the calculations, refer to the CTR (2000), page 31717.

2.2 Previous Sediment Sampling

In an effort to characterize the sediments within the project area, the USACE and Reclamation conducted several assessments to determine the quality of the sediments. These assessments are summarized below. Trace element (arsenic, cadmium, chromium, copper, lead, nickel and zinc) concentrations in sediments are used in Section 2.3 below to predict dissolved metals concentrations under different TSS concentrations. Mercury concentrations are used in Section 3 below to evaluate the potential for mercury bioaccumulation effects.

Joint Federal Project Auxiliary Spillway Folsom Lake Sediment Characterization (August 2006). Reclamation conducted an assessment (Reclamation, 2006) of the concentrations of mercury and metals present within the reservoir sediments that would become suspended as a result of the construction activities related to the Auxiliary Spillway. Of the 18 samples that were collected, only two reached the threshold of 0.2 mg/kg for mercury. The mean of all sites was 0.16 mg/kg for mercury. Table 2.2-1 below provides the mean concentrations of the reported results for mercury and other metals within the sediment samples. Locations of the sediment samples are indicated in Figure x.1 and x.2 below.

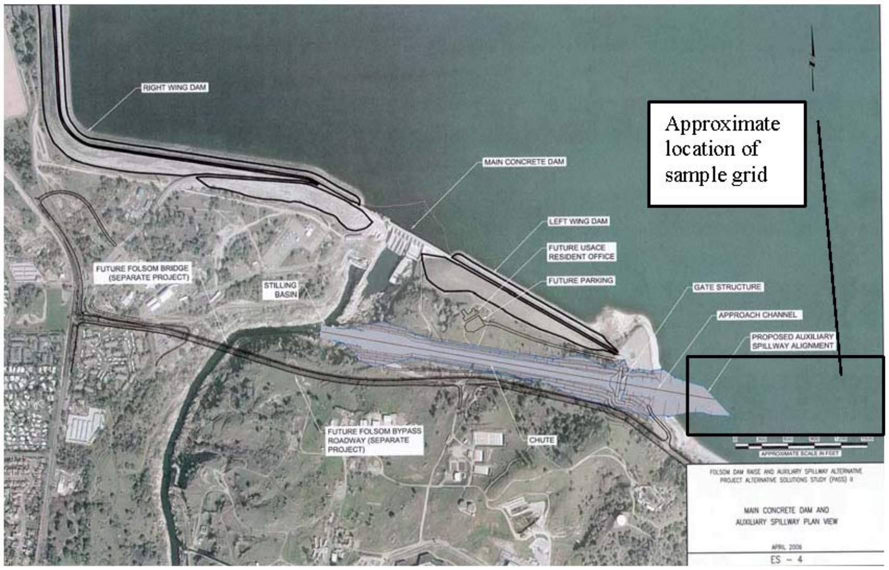

Figure x.1. Approximate location of sediment samples collected by Reclamation (2006).

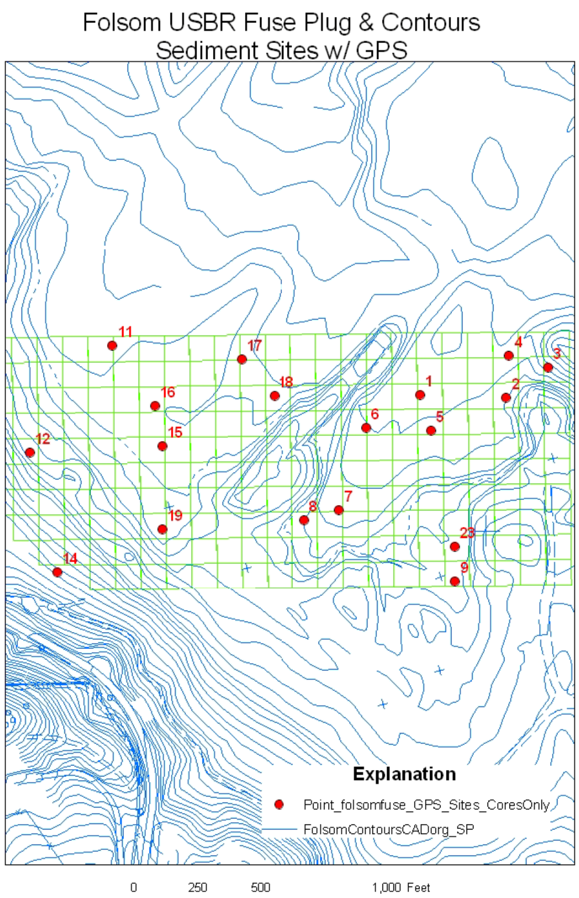

Figure x.2. Specific location of sediment samples collected by Reclamation (2006).

Sediment Characterization Study at Folsom Dam Auxiliary Spillway within the Area of the Seismic Refraction Study (March 2008). The USACE prepared a Sediment Characterization Report (USACE, 2008) along the alignment of the Folsom Dam Auxiliary Spillway. Eight soil samples were collected and analyzed for concentrations for metals. Table 2.2-1 below provides the reported mean concentrations of mercury and other metals within the sediment samples.

Draft Summary Report of Sediment Testing Pre-dredge Sediment and Water Quality Samples, Folsom Dam Auxiliary Spillway (October 2011). The USACE report (USACE, 2011) was prepared to document the pre-dredge sediment concentrations for the proposed Folsom Dam Auxiliary Spillway. Two composite samples were collected from the proposed approach channel location and one composite sample was collected from the proposed transload facility location. Chemical constituents for characterization include metals, total petroleum hydrocarbons, organochlorine pesticides, and polynuclear aromatic hydrocarbons. Table 2.2-1 below provides the reported mean concentrations of the reported results for mercury and other metals within the sediment samples.

Table 2.2-1. Folsom Dam Auxiliary Spillway Approach Channel Sediment Quality Samples

Element (Natural Background) *	Units	August 2006 (Reclamation 2006)		March 2008 (USACE 2008)		October 2011 (USACE 2011)	
		Range	Mean	Range	Mean	Range	Mean
Arsenic (4.8 ± 0.5)	mg/kg	4.1-12	7.44	1.67-5.74	2.84	0.711-2.13	1.43
Cadmium (.09 ± .01)	mg/kg	<0.4-<0.61	<0.50	<1.00-<1.00	<1.00	<0.400-<0.400	<0.400
Chromium (92 ± 17)	mg/kg	44-87	65.06	13.2-36.39	18.52	20.1-35	26.80
Copper (28 ± 4)	mg/kg	41-72	56.34	4.98-8.29	6.88	10.7-26.5	16.90
Lead (17 ±0.5)	mg/kg	12-26	19.65	3.43-8.3	5.02	2.63-6.97	4.47
Mercury (0.05 + 0.04)	mg/kg	0.12-0.2	0.16	<0.100-<0.100	<0.100	0.015-0.0528	0.03
Nickel (47 ± 11)	mg/kg	50-100	76.28	10.4-17	13.49	16.1-33.9	22.30
Zinc (67 ± 6)	mg/kg	60-99	80.06	15.3-30.3	23.20	21.7-45.4	30.83
Total Samples		18		8		3	

*Note: Natural background concentrations based on average ± 1 standard deviation of upper continental crustal abundance, as reported by Rudnick (2003).

2.3 Factors Affecting Dissolved Metals Concentrations

A partition coefficient (Kp) models the equilibrium of metals between the dissolved and particulate phase by relating the concentrations of dissolved metals, particulate (i.e., sediment) metals, and total suspended sediment concentrations. The maximum and minimum log Kp values found in the literature are presented with the mean sediment concentrations in Table 2.3-1. By applying a partition coefficient or a range of partition coefficients, in combination with known sediment and TSS data, the dissolved metal concentration can be determined. Modeling this calculation, with a range of partition coefficients and TSS concentrations, can forecast potential exceedances of the dissolved aquatic life objectives. Partition coefficients (Kps) are typically presented as log base 10 values, Table 2.3-1.

Table 2.3-1. Log Kp Values For Freshwater Sediments from Literature (Allison et.al. 2005)

Substance	Mean Sediment Concentration (µg/kg) (from Table 1.1-3)	Log K_p (Max)	Log K_p (Min)
Arsenic	74000	6.0	2.0
Cadmium	250	6.3	2.8
Chromium (total)	65000	6.0	3.9
Copper	56000	6.1	3.1
Lead	20000	6.5	3.4
Nickel	76000	5.7	3.5
Zinc	80000	6.9	3.5

Water-column partition coefficients are a ratio between the particulate metal concentration (or sorbed metal) and the dissolved metal concentration and are calculated as presented in the following equation (from Allison et al. 2005):

$$K_p = \frac{sorbed\ metal\ concentration\ \left(\frac{mg}{kg}\right)}{dissolved\ metal\ concentration\ \left(\frac{mg}{L}\right)} = \frac{(C_t - C_d)}{C_d \times TSS}$$

where:

C_d = dissolved concentration of the metal (µg/L)
TSS = total suspended sediment (mg/L)
C_t = total concentration of the metal (µg/L) and

$$C_t = \frac{C_s * TSS}{10^6}$$

where:

C_s = concentration of the metal in the sediment (µg/Kg)

10^6 = unit conversion factor = 10^6 mg in 1 Kg

By rearranging these terms and substituting TSS and Cs for Ct, Cd becomes:

$$C_d = \frac{C_s}{K_p + \frac{10^6}{TSS}}$$

A model was developed to solve this equation for the TSS concentration that would yield a C_d that exceeds the water quality objective for that metal. The K_p values applied to the model were the maximum and minimum values presented in Allison et al. (2005). The water quality objectives were corrected for typical hardness concentrations, 29 – 32 mg/L.

The modeled TSS results indicate that exceedances will likely occur for dissolved lead for TSS concentrations greater than 33 mg/L. Exceedances likely occur for dissolved copper for TSS concentrations greater than 54 mg/L. Exceedances likely occur for dissolved nickel for TSS concentrations greater than 507 mg/L. TSS concentrations less than 1000 mg/L will not cause exceedances the other dissolved metals.

By adjusting the log K_p values modeled, the sensitivity of the TSS threshold for causing dissolved metal exceedances is determined to directly correlate to the lower bound for the K_p. When the log K_p maximum for lead is set at 4.7 and minimum is 4.6, TSS caused zero (0) exceedances.

Based on the model results, some trace elements (arsenic, cadmium, and chromium) are not likely to exceed the aquatic life objectives at any TSS concentration; however, copper, lead, zinc, and nickel could exceed the objectives at moderate TSS (30 – 100 mg/L). These are the metals most commonly observed in exceedances.

The analysis signifies that the two circumstances driving the water quality exceedances are site specific K_p values, which can not be controlled, and turbidity, which can be controlled. Mitigation in this case is turbidity control (previously described), and monitoring for dissolved metals during operations. If exceedances are detected, a higher frequency monitoring program should be installed to evaluate the 4-day average. If this does not control the dissolved metals concentrations, then work should be slowed until the concentrations decrease.

There are several options for controlling TSS and mitigating the dissolved metal exceedances. These include:

- Silt curtains and other measures that control TSS outside working zone
- Use monitoring to address dissolved trace elements inside and outside working zone
- If dissolved objectives are exceeded outside working zone:
    - Increase monitoring frequency and monitor at night to evaluate the four-day average
    - Slow down work to bring down four-day average
    - Perform active treatment within working area using alum or some other coagulant

3.0 MERCURY BIOACCUMULATION

This section provides the details of the quantitative and qualitative analysis of the potential for environmental effects due to mercury bioaccumulation as a consequence of project activities. The qualitative analysis relies on a conceptual model of mercury sources, transformations, and bioaccumulation processes in Folsom Reservoir (Figure x.3). The quantitiative analysis compares mercury concentrations in sediments to effect levels of concern.

Mercury is the specific focus of this analysis because Folsom Reservoir, the American River, and the downstream waters of the Sacramento-San Joaquin River Delta have all been placed on the State of California's list of impaired waterbodies (the 303-d list) because of mercury concentrations in fish that exceed risk assessment thresholds.

Mercury is known to have been used and released in the upper watershed of the American River as a result of the historic use of mercury to extract gold in mining operations carried out in the Sierra Foothills (Central Valley Regional Water Quality Control Board, 2010). Atmospheric deposition is another substantial source of mercury to all surface waters, as a result of releases to the atmosphere from natural sources (i.e., volcanos) and human activities such as coal combustion (Fitzgerald, 1994).

This analysis begins with an overview of mercury environmental effects, with a specific focus on processes relevant to Folsom Reservoir. Following that overview, information on mercury concentrations in fish and sediments in Folsom Reservoir is summarized and put into context by comparison to expected background concentrations.

3.1 Mercury Environmental Effects

Mercury is a potent neurotoxin that occurs in several different chemical forms (Mason, 1995). The most common form is inorganic mercury (Hg^{2+}), which can form complexes in solution with anions such as chloride and sulfide. Mercury produced from mining is inorganic mercury present as mercury sulfide, the reddish ore also known as cinnabar. Cinnabar ore was crushed and roasted during mining operations to produce elemental mercury (Hg^0), the silvery liquid also known as quicksilver.

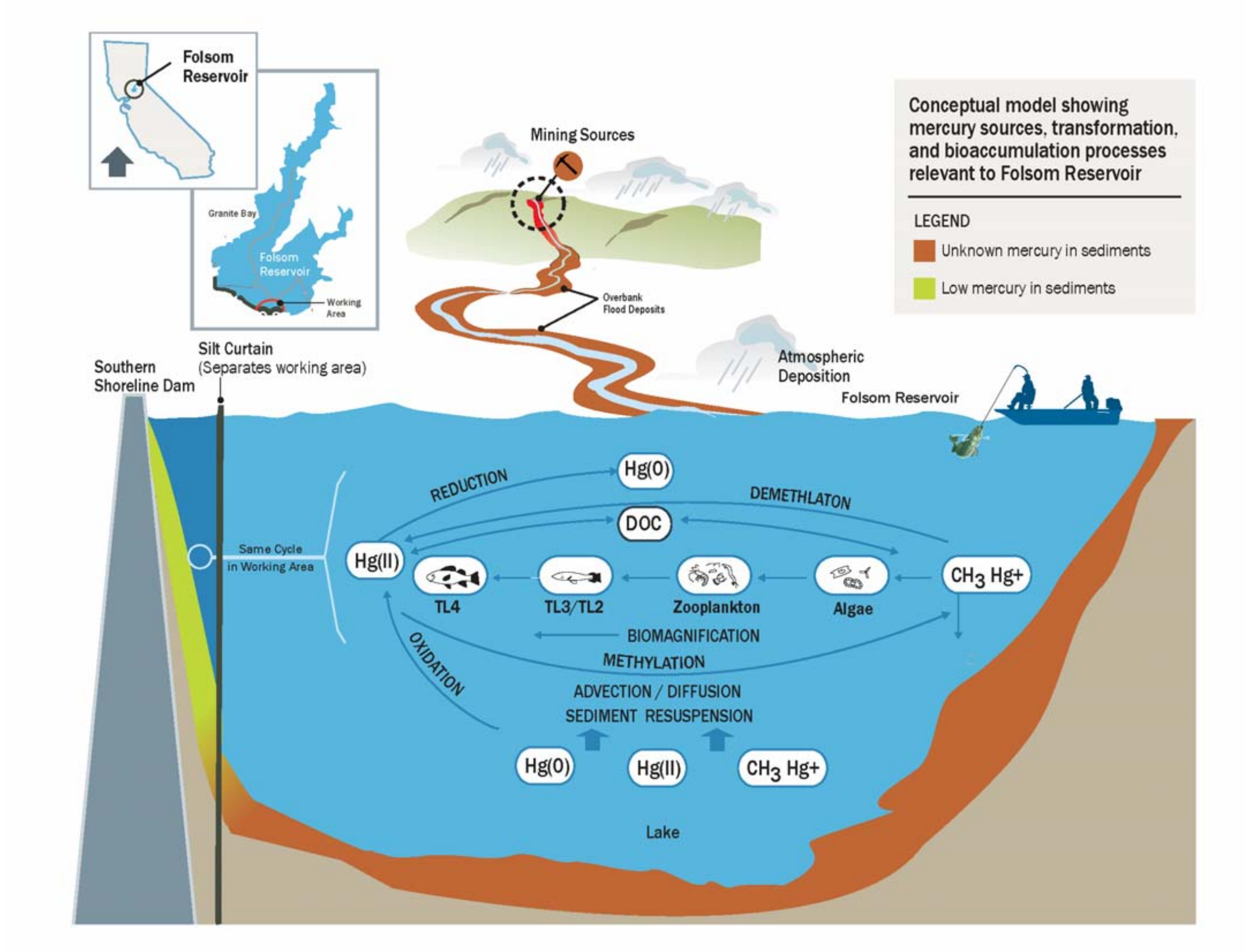

Figure X.3: Mercury Conceptual Model

In the California Coast ranges during the time period of 1840-1972, millions of pounds of cinnabar ore were mined to produce quicksilver. Much of that quicksilver produced in California was transported to the Sierra Foothills, where it was used to extract of gold from placer deposits mobilized by hydraulic mining. As a result of the historic mining use, many lakes and streams in California have mercury contaminated sediments present (Alpers et al. 2000).

The chemical form of greatest concern is known as methylmercury (methylmercury), which is inorganic mercury with a carbon attached by a covalent bond. Methylmercury has an extremely high affinity for sulfur atoms present in amino acids, and therefore binds to proteins. Small aquatic organisms (zooplankton and benthic invertbrates) that graze on algae that have assimilated methylmercury into protein will tend to retain the protein, and therefore accumulate mercury (bioaccumulation). Algae pick up methylmercury that is released from methylating bacteria by both direct excretion as well as indirectly, when the bacteria die off and decay.

Bacteria are constantly growing and splitting—like algae, they have bloom and decay cycles (as colonies, or whole populations, not individual organisms) which fluctuate daily and seasonally with temperature, light, food, oxygen availability, etc. The cycle of methylation and demethylation is constantly running. The goal is to avoid, or mitigate for, project activities that push the cycle towards greater net methylation.

Zooplankton graze on bacteria, algae, detritus, anything they can find according to their feeding strategy. Some graze by filtering and straining and, consequently, pick up more bacteria. Some zooplankton scoop up algae in a more targeted manner.

The cycle of methylation and demethylation is constantly running, both in the water column and down in the bottom sediments. In the bottom sediments, where dissolved oxygen is low, the methylation part of the cycle runs faster than the demethylation part; so a net increase of methylmercury concentrations occurs when dissolved oxygen concentrations decrease. Methylmercury produced by methylating bacteria would be released from bacteria cells both by direct excretion and also when they die off and decay. Algae exposed to methylmercury in the water column take it up by ether passive diffusion or active transport; it is not yet definitively known.

In general, the bottom sediments are where a lot of the net methylation occurs, because the bacteria are more numerous and low oxygen conditions are more prevalent than in overlying waters. So the first thing resuspension of bottom sediments does is to bring methylmercury attached to those sediments, and present in sediment porewater, up into the water column, where it is assimilated by algae more readily than if those sediments were just lying inert on the bottom.

The second thing resuspension might do is to take bottom sediments with *inorganic* mercury attached, and move that inorganic mercury into an environment where it can be more readily methylated. The process is thought to involve increasing the bioavailability of inorganic mercury to the bacteria that turn it into methylmercury. In undisturbed bottom sediments, inorganic mercury is tied up by sulfide, organic matter, and possibly other complexing agents, making it harder for the bacteria to take up the inorganic mercury and methylate it. Shaken up into the water column, some of those complexes break down, making the inorganic mercury that was originally in bottom sediments more available to methylating bacteria. This second process has not been completely documented, other than at the research level. Research has also shown that atmospherically deposited mercury is more bioavailable initially, but becomes less available with time (in a lake) or with watershed transport across a forest.

Under construction activities with the use of turbidity curtains, mixing bottom sediments and porewater with methylmercury into the overlying waters is more likely to occur than increased methylation rates due to increased bioavailability.

The bubble curtain involved in blasting would keep the Lake well oxygenated in the vicinity of the curtain. Although oxygenation is sometimes used as a mitigation tool during dredging to reduce methylmercury, this effect would ameliorate increased methylmercury bioaccumulation, but not entirely mitigate for this increase.

Although most sentinel organisms have a short life span (fish species such as wakasagi smelt live only one year, and they comprise the greatest fish numbers and volume), that does not reduce the potential for bioaccumulation resulting from the project to a low level. Despite the short duration of in-the-wet activities, and the small footprint of the working area, a small increase of methylmercury within the working area water column caused by resuspension would still have a small net effect on transfer of mercury to higher trophic levels. Predatory birds can catch wakasagi smelt, for example, from all over the lake, whereas only a small fraction of the entire smelt population in the lake would be exposed to the working area (with turbidity curtains in place). The short life span also means that any increased exposure to predatory birds is of short duration—no more than a year.

Bioaccumulation of mercury tends to increase at successively higher levels in the food web (biomagnification). Biomagnification of methylmercury is approximately 1 million fold from dissolved methylmercury in water to the flesh of a top level aquatic predator; in other words, an average concentration of 1 ng/L of methylmercury in water can lead to an average concentration of 1 mg/kg in the flesh of a large mouth bass.

Exposure of people and wildlife to methylmercury through consumption of fish is the focus of this environmental analysis. Exposure to elemental mercury through inhalation is more of an industrial / occupational concern, and not relevant to the project setting. Exposure to mercury through drinking water is also not relevant to this environmental analysis. The very small difference between the CTR criterion for mercury in potable water (0.050 ng/L) and non-potable water (0.051 ng/L) reflects the relatively low risk of exposure to inorganic mercury through the drinking water pathway as compared to consumption of organisms; conventional drinking water treatment to remove sediment is also highly effective at removing inorganic mercury, because of its tendency to adhere to particles.

Methylmercury is produced from inorganic mercury by the metabolic action of naturally occurring bacteria; in particular, sulfate reducing bacteria that thrive under low oxygen conditions are known to be significant sources of methylmercury.

3.1 Mercury in Folsom Reservoir Fish

Surveys conducte by the State Water Resources Control Board's (SWRCB) Surface Waters Ambient Monitoring Program (SWAMP) show that mercury concentrations in fish exceed the USEPAs recommended maximum level of 0.3 ppm for protection of hman health (Figure X.4). Mercury concentrations in higher trophic level fish (e.g., bass) and bottom feeders (e.g., catfish) tends to be higher compared to lower trophic level fish (e.g., bluegill) and regularly stocked fish (e.g., trout).

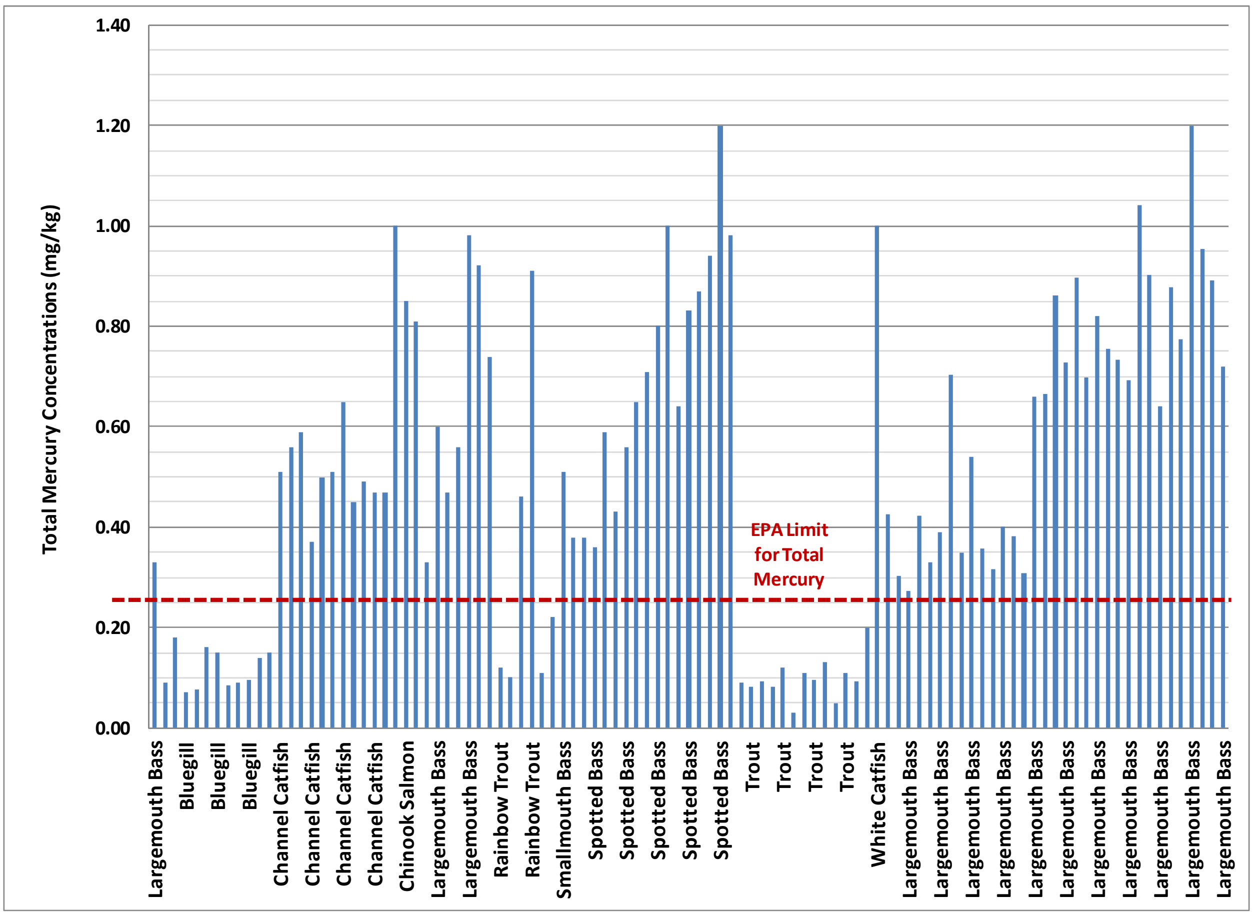

Figure X.4: Chart of Folsom Lake Fish Mercury Concentrations.

Source: CVRWQCB, Reclamation, and Davis et al. (2010

Mercury in large predatory fish such as large mouth bass tends to increase with increasing age. Length, used as a proxy for age, is correlated with mercury concentrations in large mouth bass (Figure x.5). When comparing mercury in fish from one reservoir to another, it helps to use the same fish species and use a standardized length for comparison. The SWAMP program uses a standardized length of 350 mm. Mercury concentrations in large mouth bass are comparable to bass in other lakes and reservoirs throughout the Central Valley (Figure x.6) and California (Figure x.7).

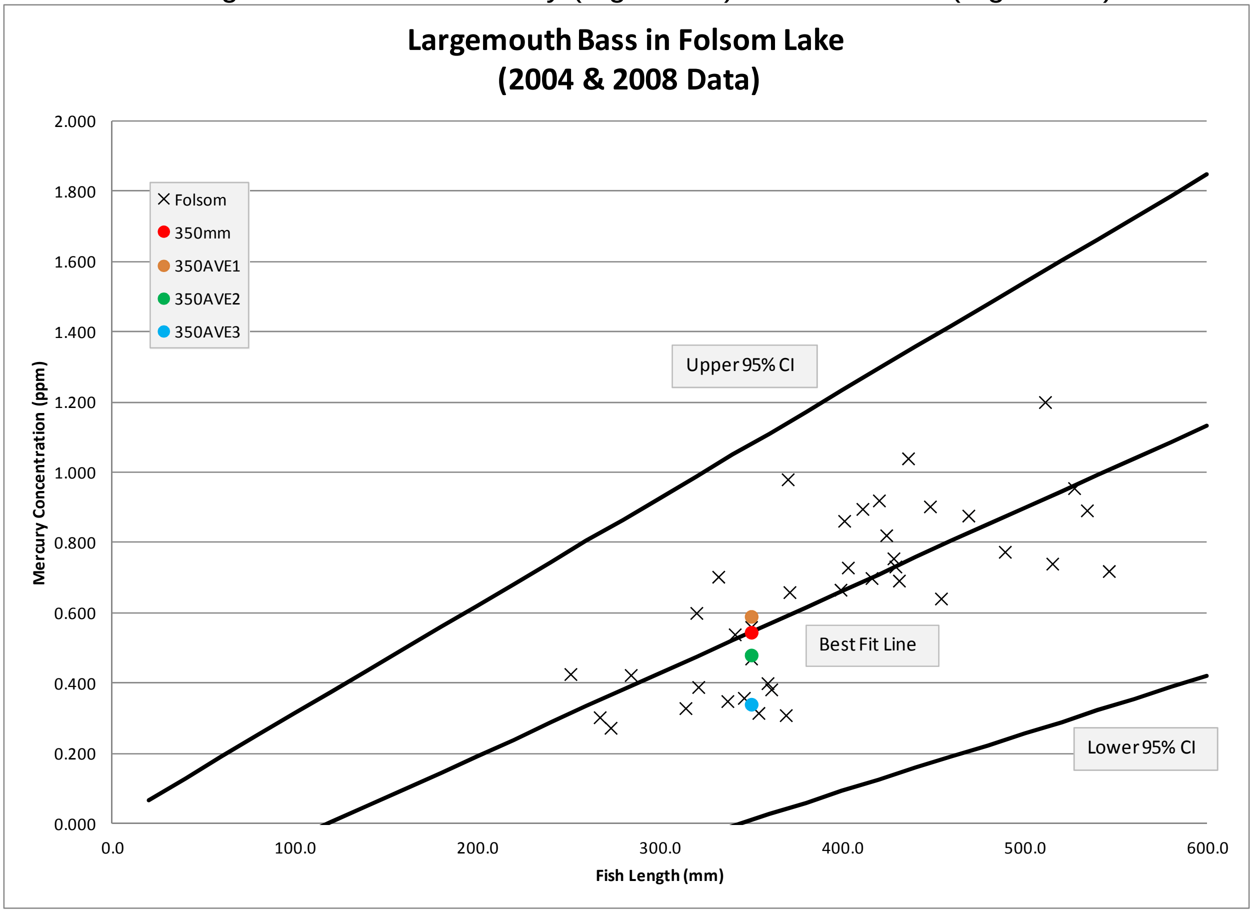

Figure X.5: Correlation of Mercury Concentrations in Large Mouth Bass With Length

Dots labeled 350 AVE1, 350 AVE2, and 350 AVE3 represent best estimates for mercury concentrations in fish from three different locations within Folsom Reservoir. Red dot labeled 350mm represents best estimate of mercury concentration in a 350 mm fish using entire data set of all three locations.

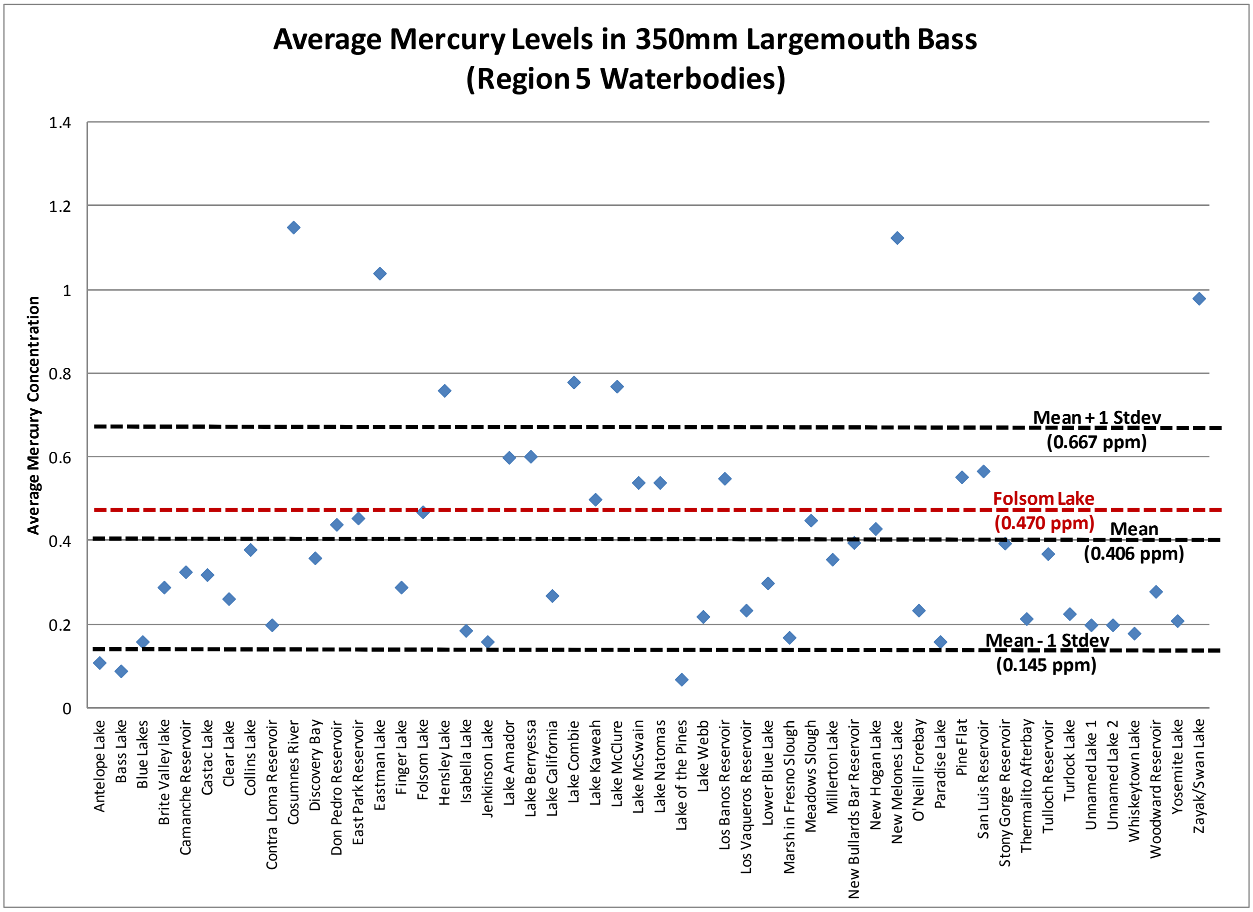

Figure x.6. Comparison of Mercury Concentrations in Folsom Reservoir Large Mouth Bass with Other Lakes in the Central Valley.

Averages represent best estimates of mercury concentrations in 350 mm Large Mouth Bass.

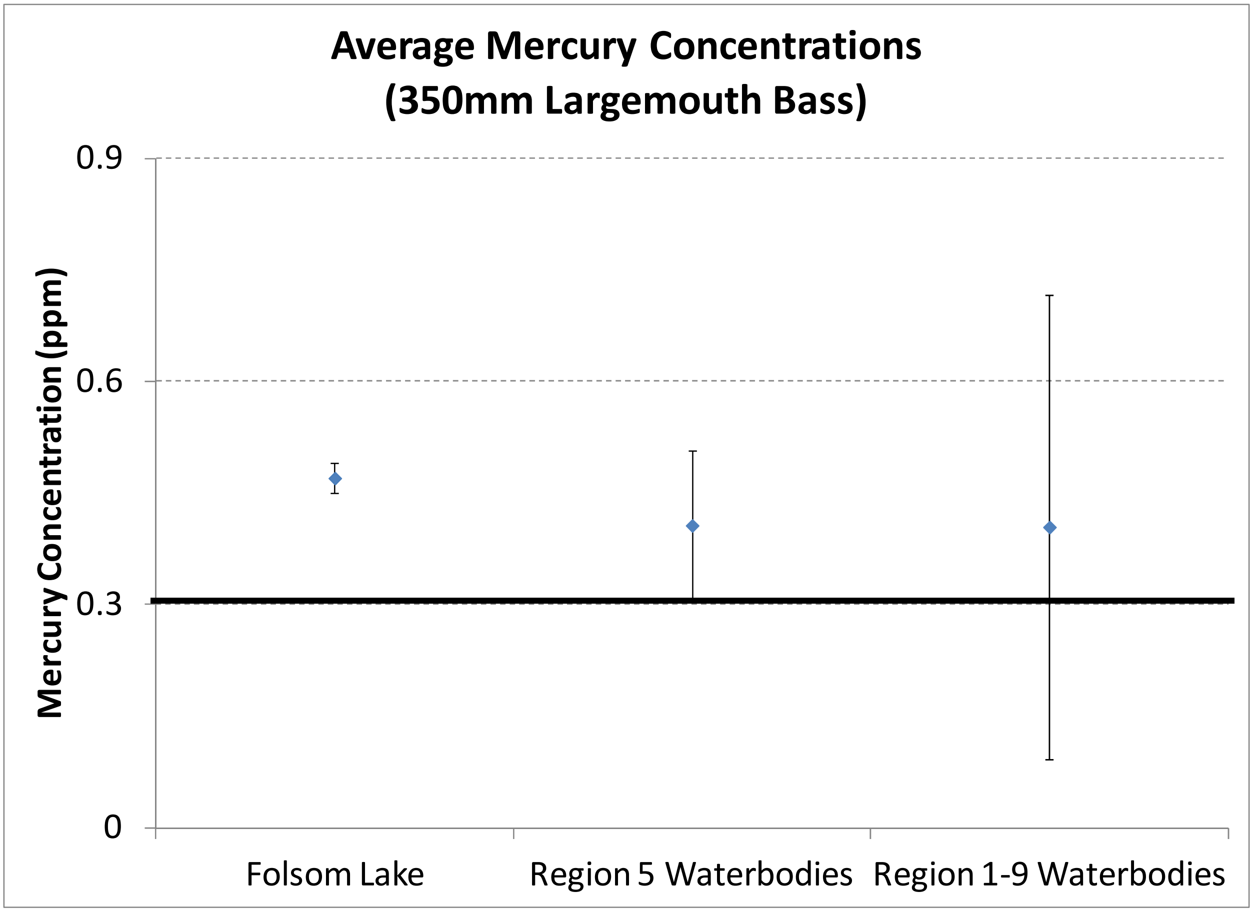

Figure x.7. Mercury concentrations in Large Mouth Bass (standardized to 350 mm length) in Folsom Lake compared to waterbodies in the Central Valley (Region 5) and throughout the State (Region 1-9)

Data shown indicate the mean +/- one standard deviation. Bold gridline indicates the EPA threshold of 0.3 ppm. Data from Davis et al (2010), based on the 2007 – 2008 survey of mercury in fish conducted by the Surface Waters Ambient Monitoring Program (SWAMP).

3.2 Mercury in Folsom Reservoir Sediments

This section compares mercury concentrations in Folsom Reservoir sediments to thresholds of concern.

The SWRCB published in November 2006, the "Revision of the Clean Water Act Section 303(d) List of the Water Quality Limited Segments, Volume 1". The purpose of this staff report was to present the SWRCB section 303(d) listing methodology. The SWRCB recommended sediment quality guidelines based on published peer-reviewed literature or developed by state or federal agencies. Acceptable guidelines included selected values (e.g., effects range-median, probable effects level, probable effects concentration), and other sediment quality guidelines. Only those sediment guidelines that are predictive of sediment toxicity were used (i.e., those guidelines that have been shown in published studies to be predictive of sediment toxicity in 50 percent or more of the samples analyzed).

Numerical sediment quality guidelines (SQGs) for freshwater ecosystems have been developed for a variety of federal, state, and local agencies using matching sediment chemistry and biological effects data. Sediment quality guidelines were developed by MacDonald, et al (2000) in the document entitled, “Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems”. This document was an effort to develop standardized limits using various published SQGs, consensus-based SQGs were developed for 28 chemicals of concern in freshwater sediments (i.e., metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and pesticides). For each contaminant of concern, two SQGs were developed from the published SQGs - a threshold effect concentration (TEC) and a probable effect concentration (PEC). TECs would indicate a reliable basis for predicting the absence of sediment toxicity. Similarly, PECs provide a reliable basis for predicting sediment toxicity.

All 29 sediment samples collected by Reclamation (2006) were below the mercury PEC objective of 1.06 mg/kg (Figure X.8). This would indicate that the mercury contaminant concentration levels are below the amount in which harmful effects on sediment-dwelling organisms would be expected to occur on a frequent basis. More over, of the total 29 samples collected, only 2 samples exceeded the mercury TEC objective of 0.18 mg/kg. This would indicate the likelihood that the majority of the sediment samples collected; the concentrations of mercury were below the level in which harmful effects on sediment dwelling organisms would not be expected.

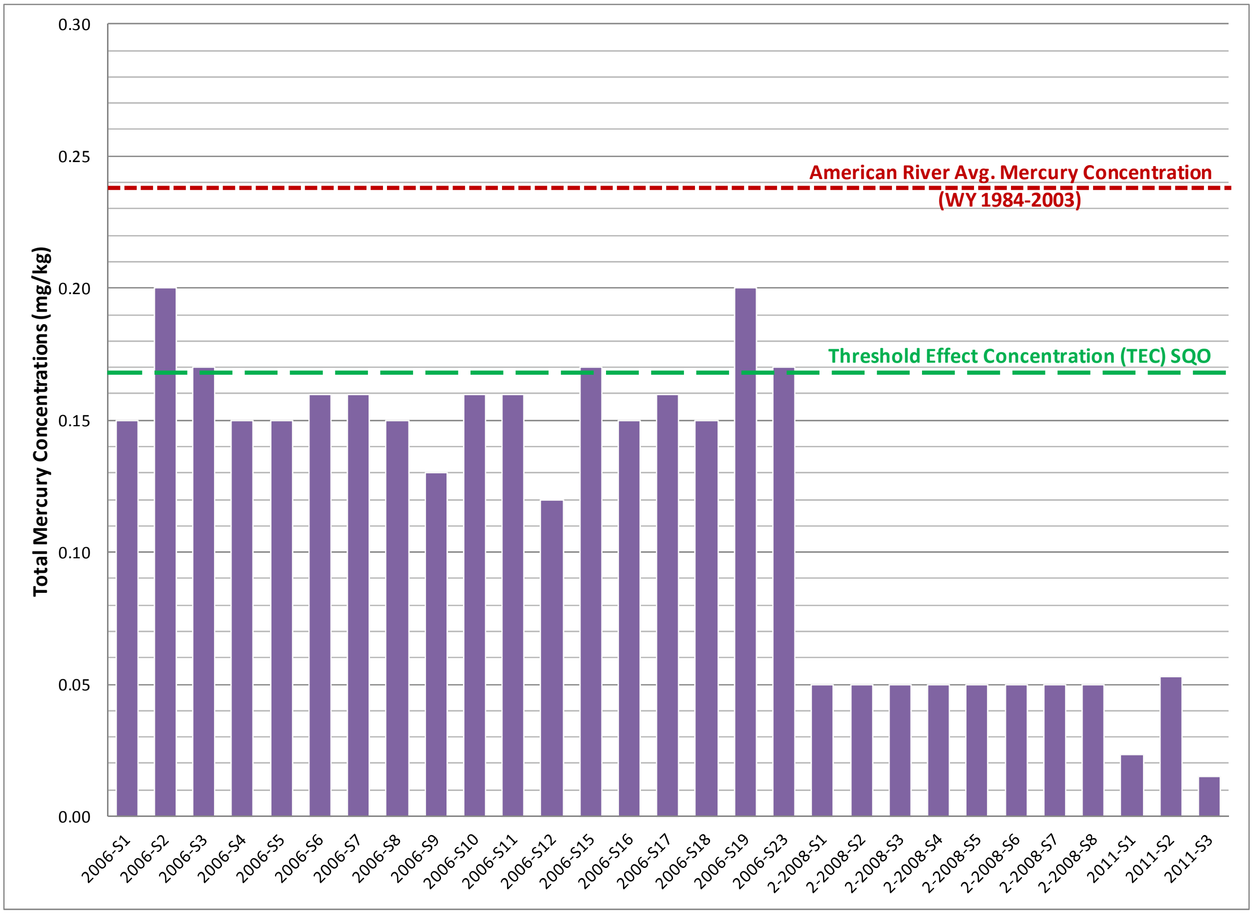

Figure X.8. Total Mercury in Sediment Samples from the Project Area, 2006, 2008 and 2011

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APPENDIX D

SECTION 404(b)(1) WATER QUALITY EVALUATION

FOLSOM DAM SAFETY AND FLOOD DAMAGE REDUCTION
FOLSOM DAM JOINT FEDERAL PROJECT

FOLSOM DAM MODIFICATION PROJECT
APPROACH CHANNEL

SACRAMENTO COUNTY, CALIFORNIA

This document constitutes the Statement of Findings, and review and compliance determination according to the Section 404(b)(1) guidelines for the proposed work (preferred alternative) described in the Draft EIS/EIR issued by the Sacramento District. This analysis has been prepared in accordance with 40 CFR Part 230- Section 404(b)(1) guidelines and USACE Planning Guidance Notebook, ER 1 105-2- 100.

I. Project Description

a. Proposed Project

Information on alternatives is taken from Section 2.0 of the Draft SEIS/EIR.

The Folsom Joint Federal Project (Folsom JFP) project is a cooperative effort by the U.S. Bureau of Reclamation (Reclamation), the U.S. Army Corps of Engineers (Corps) and the Corps' non-federal sponsors. The Corps have created a Draft Environmental Impact Statement/ Environmental Impact Report (EIS/EIR), dated July 2012. The Draft Supplemental Folsom Dam Modification Project Approach Channel Environmental Impact Statement/ Environmental Impact Report (SEIS/EIR) will be referenced throughout the document to describe the existing conditions near the project site, as well as, some potential impacts of the proposed project and the other alternatives.

The primary and permanent structures proposed consist of a 1,100 foot long excavated approach channel and a spur dike and the construction of a concrete secant pile cutoff wall to provide seepage control during approach channel excavation (Plate 2). A transload facility and concrete batch plant will be constructed as necessary temporary structures to facilitate the construction. Additional existing sites and facilities that would be utilized for the length of the project include the existing Folsom Overlook, the MIAD disposal area, Dike 7, and Dike 8. These sites and facilities are connected by an internal project haul road.

The proposed project requires discharges of dredged or fill material into waters of the U.S. under Section 404 of the Clean Water Act and includes the following proposed elements:

Approach Channel - To begin construction of an approach channel a temporary transload facility and a haul road embankment would be required to gain/ maintain access to the project area. Dredging the footprint of these structures is required to create a stable foundation prior to construction. In addition, the footprint of the approach channel would need to be dredged prior to excavation. The proposed approach channel including the transload facility and haul road embankment would involve the discharge of 180,000 cy of dredge material and 440,000 cy of rock material into 91.0 acres of waters of the U.S., including 88.5 acres of open waters, and 2.5 transitional wetlands.

Spur Dike - Construction of a spur dike is required to induce a free, even flow of water into the approach channel. Dredging the footprint of the spur dike is required to create a stable foundation prior to construction. The spur dike would involve the discharge of approximately 40,000 cy to 80,000 of dredge material and up to 1.4 million cy of rock material into 22 acres of open waters.

b. Location

Location information is taken from Section 1.3 of the Draft SEIS/EIR.

The project area is located in the city of Folsom at Folsom Dam, approximately 20 miles northeast of Sacramento. The “project area” consists of the ongoing auxiliary spillway construction area; the footprint of the approach channel, as described in the EIS/EIR; the existing project haul routes; the existing project staging areas at the Folsom Overlook and Folsom Prison sites; proposed new disposal sites at Dike 8 and in-reservoir; and the existing project disposal areas at MIAD and Dike 7. The project area can be seen on the map in Plate 1.

c. Purpose and need

The current spillway and outlets at the Folsom facility do not have sufficient discharge capacity for managing the predicted probable maximum flood (PMF) and lesser flood event inflows above a 100-year event (an event that has a 1% chance of occurring in any given year). Structural modifications associated with the Folsom JFP are proposed to address increasing discharge capability and/or increasing storage during extreme flood events above the 200-year event level.

An auxiliary spillway adjacent to Folsom Dam was selected in 2007 as the plan to safely pass part or the entire PMF event. The auxiliary spillway consists of a 1,000 foot long approach channel into Folsom reservoir, a grated control structure including six submerged retainer gates, a 3,000 foot long spillway chute, and a stilling basin. Construction of the auxiliary spillway began in 2008. Section 1.2 of the Draft SEIS/EIR includes additional description on the background of the Folsom Modification project.

This phase of the project addresses the construction of the approach channel and associated spur dike. The approach channel and its related features, as evaluated in the SEIS/EIR, are necessary functional features of the auxiliary spillway. Without the completion of these features, the auxiliary spillway would not be completed and the Folsom facility would remain unable to pass the PMF and provide a higher level of flood damage reduction. As a result, the 200-year level of protection would not be accomplished, and the Sacramento area would remain at risk for a more frequently occurring potential flood event.

d. Authority

The Folsom Dam Modifications Project was authorized by Section 101(a)(6) of the WRDA 1999 (1111 Stat. 274). Further authorization and guidance for the collaboration between the Corps and the USBR under the Folsom JFP was provided by the Energy and Water Development and Appropriations Act of 2006 (119 Stat. 2259). Formal authorization for the Folsom JFP was included in Section 3029(b) of WRDA 2007. The relevant text of these public laws is included in Section 1.2 of the Draft SEIS/EIR.

e. Alternatives [40 CFR 230.10]: Unless otherwise noted, the information is from the Draft SEIS/EIR.

(1) No action: The no action alternative would have no impacts to wetlands or other waters of the U.S., however, this would not achieve the dam safety and flood damage reduction improvements to the Sacramento area and enhanced public safety would not be realized. This alternative is not practicable, as it would not meet the purpose and need of the proposed project.

(2) Other project designs:

Alternative 2 - Approach Channel Construction with Cutoff Wall.
Alternative 2 includes a cutoff wall, concrete batch plant operations, spur dike and transload facility. The final phase of the Folsom Modification project is the completion of the approach channel and spur dike. The cutoff wall would provide seepage control to the spillway excavation between the rock plug and the Control Structure. A trans-load facility and concrete batch plant are necessary for construction. A full description of Alternative 2 is in Section 2.4 of the Draft SEIS/EIR.

This alternative has been retained as a potential alternative. Therefore, this alternative will be retained as a practicable alternative and an evaluation of the impacts of Alternative 2 will be discussed throughout this document.

Alternative 3 - Approach Channel Construction with Cofferdam.
Alternative 3 includes a cofferdam, concrete batch plant operations, spur dike and transload facility. The final phase of the Folsom Modification project is the completion of the approach channel and spur dike. A cofferdam would be utilized to maximize construction activities in-the-dry. A transload facility and concrete batch plant are necessary for construction. A full description of Alternative 3 is in Section 2.5 of the Draft SEIS/EIR.

Although this has a higher risk to maintaining dam safety during construction, it has been determined that this alternative is practicable. Therefore, this alternative will be retained as a practicable alternative and an evaluation of the impacts of

Alternative 3 will be discussed throughout this document in order to determine if it is the least environmentally damaging practicable alternative (LEDPA).

f. General Description of Dredged or Fill Material

(1) General Characteristics of Material

Fill is required below ordinary high water for the purpose of 1) construction of the spur dike 2) construction of the temporary features (transload facility and haul road embankment) and 3) disposal of dredge materials. Completion of these actions would require dredging of fines and excavation of the rock plug. Substrate is mostly fine sand and silt, and granitic rock.

Transload facility would be constructed from 3 inch maximum graded fill with less than five percent fines and ¼ ton riprap placed on top protection from wave action. Haul road embankment would be constructed from 6 inch minus crushed rock with slope protection consisting of two layers of 1/4 ton rock.

The proposed fill for other practicable build alternative would come from on-site construction or imported fill material. The no action/no project alternative would result in no changes.

(2) Quantity of Material

Approximately 260,000 cubic yards of material would be dredged and redistributed within the designated disposal areas. Approximately 1.4 million cubic yards of granitic material would be excavated from the approach channel (rock plug) area and used for the construction of the spur dike or disposed of within the designated disposal areas.

(3) Source of Material

Material for the transload facility and haul road embankment would be imported from a licensed, permitted facility that meets all Federal and State standards and requirements, or use onsite materials from Dike 7 or MIAD. The material would be transported along existing roadways and construction access roads. The spur dike would utilize the onsite material excavated from the approach channel.

g. Description of the Proposed Discharge Site

(1) Location

The location of the discharge sites would be in the designated lake disposal area, spur dike, adjacent to the rock plug, MIAD, Dike 7 or Dike 8 (Plate 1).

(2) Size

Table 1 shows the acreage of each disposal site and estimated capacity in cubic yards. In-water dredge disposal site is 85 acres, spur dike location is 22 acres, transload facility is 2.5 acres, haul road embankment is 1 acre.

Upland disposal sites, if available, included 9 acres at Dike 7, and 93 acres at MIAD (D1, 22 acres and D2, 71 acres). These sites are previously disturbed and would not generate discharge into waters of the U.S.

Table 1. Estimated Acreage of Disturbance

Proposed Discharged Site	Estimated Capacity (cy)	Acres
In-reservoir	up to 220,000 cy	85
Spur Dike	up to 1.4 million cy	22
Transload Facility	40,000 cy	2.5
Haul Road Embankment	400,000 cy	1
Dike 8	up to 730,000 cy (both sides)	16

The other practicable build alternative would encompass the same disposal sites. However, Alternative 3 would generate a larger amount disposal material due to the cofferdam. The cofferdam would be constructed over 2 acres of open water. The no action/no project alternative would have no have impacts to disposal sites.

(3) Type of Site

The type of disposal site is a lake bed and previously disturbed upland disposal sites.

(4) Type of Habitat

The following habitat types were identified at and around the project area:

Open Water
Approximately 175 acres of open water habitat is located within the project area from the Dike 8 staging area to Folsom Outlook Point. Open water habitat in the study area is largely unvegetated. Open water habitat provides foraging habitat for waterfowl and other wetland species.

Transitional Wetland
This habitat type occurs primarily in low areas of the shoreline, in pools of shallow standing water or in saturated soil. This habitat occurs mostly during the high lake levels (about April through October) are defined as transitional wetland. Approximately 2.5 acres at Dike 8, are dominated by low sedges, water-tolerant grasses, and cottonwood. Emergent vegetation may occur in a continuous patch, or may exist in small areas of standing or slowly flowing water.

Upland
Upland areas beyond the floodplain, mostly ruderal and barren areas occur along the haul road and within the construction site. Also includes disturbed areas

dominated by yellow star thistle, introduced pasture grasses, and other weedy forbs and grasses.

Oak Woodland and Savanna
This habitat is adjacent to the project area. Dominant vegetation included blueoak, and interior live oak. A herbaceous layer includes introduced pasture grasses, and a variety of other native or weedy forbs. Oak woodlands and savannas offer diverse, abundant, and valuable wildlife habitat.

(5) Timing and Duration of Discharge

Construction of the project would be conducted over four years, beginning in 2013 and continuing through fall 2017. Dredging and construction of the transload facility and haul road would begin in Summer 2013. Dredging and construction of the approach channel and spur dike would begin in 2015 and continue through 2017. Timing of construction would correspond to low lake levels, when feasible, to minimize impacts to water quality and to reduce the quanity of dredged materials. When lakes levels are low, more material would be removed and/or constructed in dry conditions. Revegetation would occur immediately after construction from October to December.

h. Description of Disposal Method

The description of the disposal methods within the proposed project area are taken from the Draft SEIS/EIR.

Hydraulic cutterhead dredging is proposed for dredge material that does not require blasting prior to excavation or dredging. Hydraulic cutterhead dredging is necessary for site preparation of the transload facility, spur dike, approach channel, and the haul road embankment. If mechanical clamshell dredging is utilized, dredged material will be placed on a barge by clamshell and transported to the transload facility. Dredged sediment will then be transferred to trucks and placed at the Morman Island Auxiliary Dam site.

The dredging equipment that could be utilized for the approach channel excavation and spur dike construction includes barges, excavators and airlifts. The dredging equipment that could be utilized for this project includes barges, excavators, and airlifts:

- A barge-mounted large long reach excavator, with an effective excavating depth of 90 to 95 feet, would be used. Different size buckets can be changed out for the various soil and rock materials to be encountered during construction. The excavator method is limited by its effective digging depth. Accordingly, a 3½ month (mid-November to end of February) low lake level window would be required to effectively dredge to the final grades.
- A 225-ton class barge-mounted crawler crane clam shell unit would supplement the hydraulic excavator to dredge shot rock and common material to grade in

periods where the lake level is too high for the hydraulic excavator to dredge to final grade.

- An airlift or sweep would be set up on the drill barge to perform foundation clean up.

The long reach excavator, conventional clam shell, and other overwater equipment would be mounted on portable *"Flexifloat"* units, sized and assembled to maintain stability and manage the excavation sets. The size of the *"Flexifloat"* barges would be approximately 180 to 200 feet by 40 to 50 feet by 7 feet deep. The barges would be held in position by large winch controlled spuds, or in water over 50 feet deep, by a four-point mooring system using bottom founded anchors.

The cleanup of rock fragments would be removed from the channel by airlift systems. Following the use of airlifts, in-the-wet inspection of the lakebed would take place to identify areas where rock fragments remain and designate areas that have been cleared. The airlift and inspection divers would work iteratively until all grid areas have been verified to be free of rock fragments.

The other practicable build alternative would utilize similar disposal methods. The no action/no project alternative would not require the disposal of materials.

II. Factual Determinations

a. Physical Substrate Determinations (Sections 230.11 (a) and 230.20)

(1) Comparison of Existing Substrate and Fill

The description of the current substrate within the proposed project area is taken from Section 3.11.2 of the Draft SEIS/EIR.

The soils within the proposed project area are mapped as Andregg, Argonaut, Auburn, Inks, Xerolls, and Xerothents. Large areas of the project area have been graded and altered during the original construction of Folsom Dam and its supporting infrastructure, with further modifications performed as part of routine maintenance activities.

Fill material used during project construction would come from existing on-site substrate excavated as part of construction of the new auxiliary spillway and would be placed at locations both inside and outside of Folsom Reservoir. Fill material placed outside of Folsom Reservoir would be placed on Federal property. Fill material would be of granitic rock origin and lake sediment.

(2) Changes to Disposal Area Elevation

The description changes to the disposal sites within the proposed project area are taken from Section 2.4.3 and 4.4.4 of the Draft SEIS/EIR.

Dredge materials deposited in the lake disposal area would be discharged uniformly as to not significantly alter substrate elevation and create new features.

The spur dike would be a permanent expansion of the Folsom Overlook area. The construction of the spur dike would alter approximately 1% of Folsom Reservoir's 75-miles of shoreline. The spur dike would alter substrate elevation and reduce the surface area of the Folsom Reservoir by 9 acres. The spur dike is part of the project description to direct water into the approach channel. The overall circulation, depth, current pattern, and water fluctuation of the Folsom Reservoir would not change from the spur dike.

The disposal materials deposited on land would contrast with the existing landscape during temporary disposal activities, and would permanently alter the natural landscape after the completion of construction.

With the mitigation measures proposed to avoid and minimize impacts, the impacts of the proposed project would be minimal.

The other practicable build alternative would cause similar impacts to the disposal sites. The no action/no project alternative would not modify the substrate elevation or bottom contours.

(3) Migration of Fill

The description of materials and placement are taken from Section 2.4.2 and 4.4.4 of the Draft SEIS/EIR.

The proposed action would involve the removal of approximately one million cubic yards and the addition of 1.4 million cubic yards of material into Folsom Reservoir for the construction of the approach channel and spur dike. Because the reservoir is well regulated and because the fill material would consist of granitic material, as long as the contractor utilizes BMP's to prevent erosion during construction activities, the proposed project would have minimal effects on erosion and accretion patterns. Mitigation measures, including BMPs are in Section 4.4.6 of the Draft SEIS/EIR.

The other build alternative to the proposed project would have the same impacts on erosion and accretion patterns and would be minimized with the use of BMP's. Additional information on Alternative 3 is in Section 2.5.2 and Section 4.4.5 of the Draft SEIS/EIR.

The no action alternative would not result in any change to erosion and accretion patterns.

(4) Duration and Extent of Substrate Change

The proposed action would result in the removal of some native substrate as well as cause the soils at the site to become compacted and could reduce the water storage capacity of the soils. However, because the project is to provide for flood damage reduction and dam safety modifications, this impact to the soil would not reduce the flood storage capacity of the Folsom Reservoir.

The other practicable build alternative would cause similar impacts to substrate. The no action/no project alternative would not modify the substrate.

(5) Changes to Environmental Quality and Value

Folsom Reservoir is a regulated facility and the in water disposal site is devoid of vegetation. The proposed project would not adversely change the environmental value of the lake. Upland disposal sites at MIAD and Dike 7 are previously disturbed designated disposal area. Placement of material at these locations would be consistent with current land use. Disposal at Dike 8 would change the current land use and impact 2.5 acres of transitional wetlands. Additional information on vegetation and wildlife is in Section 3.12 of the Draft SEIS/EIR.

The other practicable build alternative would cause similar changes in environmental quality and value. The no action/no project alternative would not modify the environmental quality and value.

(6) Actions to Minimize Impacts

Construction would have minor, short-term impacts. Standard erosion prevention practices would be employed such as silt fences and silt curtains to contain turbidity. These BMPs would minimize erosion and transport of soils and substrate. Additional information on mitigation measures, including BMPS is in Section 4.4.6 of the Draft SEIS/EIR.

<u>b. Water Circulation, Fluctuation, and Salinity Determinations</u>

(1) Alteration of Current Patterns and Water Circulation

The Folsom Reservoir is located within the American River Basin, which covers an area of approximately 2,100 square miles and has an average annual unregulated runoff volume of 2,700,000 acre-feet, however, because Folsom Reservoir is managed as a flood control facility, the annual runoff volume has varied in the past from 900,000 acre-feet to 5,000,000 acre-feet. The Folsom Reservoir is fed by the North Fork American River and the Middle Fork American River, and the water is released on a regulated basis into Lake Natoma and the South Fork American River. Folsom Reservoir is the principal reservoir on the American River, impounding runoff from a drainage area of approximately 1,875 square miles.

Because the Folsom Dam and Reservoir is an already regulated system designed for flood protection, the impacts of the proposed project and all other practicable build alternatives would have minimal impact to current, circulation and drainage patterns.

The no action/no project alternative assumes no action would be taken. This would cause the currents, circulation and drainage patterns of Folsom Reservoir to remain the same.

(2) Interference with Water Level Fluctuation

Because the Folsom Facility is regulated to allow a specific amount of water to be released into Lake Natoma and the lower American River, the proposed project, the other practicable build alternative and the no action/no project alternative would not change water level fluctuation patterns.

(3) Salinity Gradients Alteration

Salinity gradients would not be affected.

(4) Effects on Water Quality

The description of the current water quality condition of the reservoir is taken from Section 3.4.2 of the Draft SEIS/EIR.

The water quality within Folsom Reservoir is currently good, with the water being utilized for: 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.

(a) Water Chemistry

Project activities involving concrete and concrete wash water have the potential to affect pH, turbidity, and hexavalent chromium in receiving waters. Concrete wash water tends to have relatively high pH (between 10 and 14). Approved BMPs for managing concrete wash water include curing / air drying, off hauling for treatment, and active treatment onsite using carbon dioxide or a stronger acid such as sulfuric or acid. Hexavalent chromium is present in Portland Cement Concrete (PCC) and PCC grindings. Active treatment systems (ATS) targeting pH and turbidity may not remove hexavalent chromium, unless they are augmented with ferrous sulfate or some other chemical agent to reduce hexavalent chromium to trivalent chromium.

Mitigation measures proposed for pH and turbidity would be development and implementation of an approved Stormwater Pollution Prevention Plan (SWPPP), including an ATS if needed to attain water quality objectives. To mitigate for hexavalent chromium risks, the ATS plan would include monitoring and treatment measures to attain no significant increase of hexavalent chromium in receiving waters.

(b) Salinity

The project would not change salinity levels.

(c) Clarity

Excavation and placement of excavated material in the disposal area would temporarily reduce clarity due to an increase in total suspended solids. However, the reduction of clarity caused by construction activities would be short in duration and would return to pre-construction levels upon project completion.

(d) Color

Excavation and placement of excavated material in the disposal area would temporarily induce a color change due to an increase in turbidity. However, conditions would return to pre-construction levels upon completion of the project.

(e) Odor

The project would not affect odor.

(f) Taste

The project would not affect taste.

(g) Dissolved Gas Levels

The proposed project would have temporary impacts on dissolved gas levels. Dissolved gas levels would be affected by the release of dewatering discharges having high chemical oxygen demand (COD) or biochemical oxygen demand (BOD). Development and implementation of an approved SWPPP would avoid significant negative effects for these two parameters.

(h) Temperature

The excavation activities in-the-wet (dredging and blasting) have the potential to create substantial turbidity, thus affecting water temperature. Proposed mitigation measures, specifically, a silt curtain placed around the perimeter of the excavation would be required to control turbidity and the mobilization of pollutants that may be present in lake sediments.

(i) Nutrients

Release of suspended sediments from project activities could potentially cause turbidity thresholds to be exceeded. This could concurrently cause thresholds for metals and nutrients to be exceeded. Turbidity would be controlled outside the working area using a combination of BMPS, turbidity curtains, and active treatment as appropriate. An approved Active treatment systems plan would also include an assessment of the total residual TDS load in treated water in comparison to receiving water volumes to assure that TDS thresholds are not exceeded.

Development and implementation of an approved SWPPP, along with the initial dredging to remove sediments, would also prevent release of excess nutrients into the Lake.

(j) Eutrophication

The project would not input excess nutrients into the stream or promote excessive plant growth. The project would not contribute to eutrophication.

(5) Changes to Environmental Quality and Value

The proposed project could impact the water quality of the Folsom Reservoir during construction from earth moving operations, dredging operations, storage and handling of construction materials on site and the operation and maintenance of construction equipment on-site. Construction and associated materials, including solvents, paints, waste materials and oil and gas associated with operation and maintenance of construction equipment present on-site could introduce hazardous or toxic materials and silt and debris into surrounding waters and could cause degradation of the water quality within the Folsom Reservoir. Although there may be significant impacts to water quality during project construction, these impacts would be short term. The operation of the newly constructed project would not affect the water quality of the Folsom Reservoir.

(6) Actions to Minimize Impacts

Construction and excavation would be timed with low water levels to minimize impacts. The impacts to water quality due to construction activities would be minimized by the special conditions required by the Section 401 Water Quality Certification, issued by the Central Valley Regional Water Quality Control Board (CVRWQCB).

In addition, proposed mitigation measures would reduce the potential impacts of the proposed project on water quality. These mitigation measures are located in the Water Quality Section (4.4.7) of the Draft SEIS/EIR.

The contractor would be required to implement the proposed mitigation measures during project construction, therefore, impacts to the water quality within Folsom Reservoir from project construction would be minimal.

c. Suspended Particulate/Turbidity Determinations

(1) Alteration of Suspended Particulate Type and Concentration

According to the EIS/EIR, the runoff from the relatively undeveloped watershed is of very high quality, rarely exceeding the State of California's water quality objectives. In the past, however, 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.

Within Folsom Reservoir, turbidity should be less than or equal to 10 Nephelometric Turbidity Units (NTUs), except for periods of storm runoff, according to the CVRWQCB Basin Plan. The turbidity within the Folsom Reservoir, as tested between February 2001 and February 2002, ranged between a minimum of 1.0 NTU to a maximum of 126.9 NTU, with an average of 8.4 NTU. The turbidity within Lake Natoma between January 2001 through June 2002 range from 0.5 NTU to 5.0 NTU. It is likely that the maximum turbidity level within Folsom Reservoir occurred following a storm event.

During construction, there could be increased levels of turbidity as soils are exposed and during rain events, which may erode these soils into the reservoir. In addition, the dredging of material and placement of fill materials could cause a release of suspended sediments and increased turbidity into the reservoir. This exposed material could be eroded by wave action or storm runoff. The water could enter the Folsom Reservoir, and could migrate into Lake Natoma to the south. It is likely, however, that the suspended particulates would settle within Lake Natoma and it is unlikely that the lower American River would be affected. The use of best management practices (BMP's), such as utilizing erosion control devices (silt fencing, silt curtains) within the project area, and stabilizing the side slopes of all exposed fills until they can be revegetated would minimize any increases in suspended sediments or turbidity associated with the proposed project. Additional information on water quality is in Section 3.4 and 4.4 of the Draft SEIS/EIR.

The no action/no project alternative would result in the project not being completed, which would result in no impacts to suspended sediment and turbidity.

(2) Particulate Plumes Associated with Discharge

Temporary and local particulate plumes may occur during construction activities but would quickly dissipate after construction is complete.

(3) Changes to Environmental Quality and Value

Particulate plumes resulting from any construction activity are not expected to persist after project completion. Particulates suspended within the disposal area are not expected to differ in type from particulates currently within the project area.

(4) *Actions to Minimize Impacts*

Effects would be minimized by performing work during low lake level periods. The duration of construction would be limited to the shortest timeframe practicable.

As a result of mitigation measures listed in Section 4.4.6 of the Draft SEIS/EIR, increases in sedimentation and turbidity would be minimized and temporary.

d. Contaminant Determinations

The potential biological hazard for sediments within Folsom Reservoir stems from mercury released into the American River and its tributaries from historic mining activities. Chemical testing of reservoir sediment has not identified concentrations of mercury above background in areas where in-reservoir work may occur. There may also be residual contaminants on the downstream side of the reservoir from the original construction of the Folsom Facility, likely as a result of spills of petroleum products during initial construction. The soil contamination is being handled through standard hazardous materials protocols and is not at risk of being released into the terrestrial or aquatic environments.

In order to ensure that there are no contaminants within the proposed borrow or fill material, BMPs listed in the Water Quality Section (Section 4.4.7) of the Draft SEIS/EIR would be implemented. Provided these mitigation measures are implemented by the contractor, there would be minimal impacts to aquatic resources from contaminants.

Because the other practicable build alternative involves the use of borrow material, the impacts from contaminants to the aquatic ecosystem would be similar. The no action alternative would result in no impacts due to potential contaminants.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Plankton are drifting organisms that inhabit the pelagic zone of oceans, seas, or bodies of fresh water. Construction of the project would be temporary and short termed. Effects to plankton would be temporary and not significant.

(2) Effects on Benthos

Benthic organisms are found in the benthic zone which is the ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers. Dredging may initially result in the complete removal of benthic organisms from the excavation site. However, recovery would occur relatively quickly since the discharge material is from the same parent source. Benthic organisms will be smothered by the discharge of excavated material at disposal areas; however, benthic organisms from adjacent habitat would recolonize substrate material in the disposal areas. Additional information on impacts to benthic organisms is in Section 4.4.4 of the Draft SEIS/EIR.

(3) Effects on Nekton

Nekton are of actively swimming aquatic organisms. Descriptions of fish and other aquatic resources are from Section 3.5 of the Draft EIS/EIR.

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 75 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.

The Folsom Reservoir provides habitat for game fish such as: Rainbow trout (*Oncorhynchus mykiss*), Chinook Salmon (*Oncorhynchus tsawytcha*), Brown Trout (*Salmo trutta*), Bluegill (*Lepomis macrochirus*), Redear sunfish (*Lepomis microlophus*), Green sunfish (*Lepomis cyanellus*), White crappie (*Promoxis annularis*), Black crappie (*Promoxis nigromaculatus*), Largemouth bass *(Micropterus salmoides)*, Spotted bass *(Micropterus punctulatus)*, Brown bullhead *(Ameiurus nebulosus)*, White catfish *(Ictalurus catus)*, and Channel catfish *(Ictalurus punctatus)*. Native, non-game fishes present within the project area include: Hardhead *(Mylopharodon conocephalus)*, Sacramento pikeminnow *(Ptychocheilus grandis)*, California roach *(Lavinia symmetricus)*, Sacramento sucker *(Catostomus occidentalis)*, and Riffle sculpin *(Cottus gulosus)*. Introduced, non-game fishes common to the Folsom Reservoir include: Threadfin shad *(Dorosoma pretenense)* and Wakasagi smelt *(Hypomesus nipponensis)*,

The proposed project would result in the permanent loss of approximately 11.5 acres of potential fish habitat. In addition, construction activities could result in adverse impacts to habitat from an increase in suspended sediments and turbidity associated with the proposed project. Impacts to habitat can be minimized through the use of BMP’s and other mitigation measures proposed which are described in Section 4.4.7. Provided the proposed mitigation measures and compensatory mitigation are conducted, the proposed project would have minimal impacts on fish and aquatic wildlife habitat.

Due to the common footprints of the other practicable build alternative, the impacts to fish and other aquatic organisms would be the same as for the proposed project. The no-action alternative would result in no losses of habitat for fish and other aquatic organisms.

(4) Effects on Aquatic Food Web

Description of ecological effects is taken from Section 4.5 of the Draft EIS/EIR.

Excessive turbidity in aquatic systems can lead to light altered regimes that can directly affect primary productivity, species distribution, behavior, foraging, reproduction and survival of aquatic biota (Wilber and Clarke 2001). Aquatic system productivity can also be reduced. As an indirect effect, the suppression of aquatic productivity is not as apparent as direct effects on larger organisms. Sustained turbidity can cause the shading of primary phytoplankton, zooplankton and invertebrates which serve as food for smaller fish, and larval fish upon which game fish forage (Lloyd 1987). Sufficient turbidity can result in direct lethal or sublethal effects on fish (Newcombe and Jensen 1996). An increase of resuspended dissolved or particulate organic carbon from the sediment may decrease dissolved oxygen (DO) concentrations. Reduction in DO availability for aquatic species causes reduced oxygen uptake. Turbidity can clog fish and amphibian gills and cause physical abrasion to the level of sub-lethal or lethal effect. Settling of suspended sediment can coat fish and amphibian eggs, reducing or eliminating DO uptake required for development or survival.

Implementation of BMP's and other mitigation measures proposed (Section 4.5.6.) would result in minimal impacts on fish and aquatic wildlife habitat.

Due to the common footprints and similar construction methods of the other practicable build alternative, the impacts to fish and other aquatic organisms would be the same as for the proposed project.

The no-action alternative would result in no effect fish and other aquatic organisms.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges

No sanctuaries and refuges are within the project area.

(b) Wetlands

Wetland vegetative communities were mapped inside the reservoir-influenced zone. The wetland area within the project area is seasonal. These communities experience wetland hydrology for a limited period of time, although it may be for long enough duration to develop indicators of wetland soil and hydrology and to seasonally host hydric vegetation. Additionally, wetlands are found below the ordinary high water mark of 466 feet.

The proposed project would involve the discharge of material into approximately 2.5 acres of wetlands on the project site. This would cause the permanent loss of 2.5 acres of wetlands for the disposal of material.

(c) Mud Flats

No mud flats are within the project area.

(d) Vegetated Shallows

No vegetated shallows are within the project area.

(e) Coral Reefs

No coral reefs are within the project area.

(f) Riffle and Pool Complexes

No riffle and pool complexes are within the project area.

(6) Threatened and Endangered Species

The proposed activity may affect Federally-listed and California- listed endangered or threatened species or their critical habitat. Chapter 3 Section 13 and Chapter 4 Section 13 of the Draft SEIS/EIR discuss Federal and State listed species in detail. If the proposed Dike 8 disposal site would be used during project construction, formal consultation would be initiated with USFWS pursuant to Section 7 of the Endangered Species Act and with CDFG pursuant to the California Endangered Species Act. Habitat exists for the valley elderberry longhorn beetle and, white-tailed kites.

Use of the proposed Dike 8 disposal area would result in direct and indirect effects to the four elderberry shrubs. Direct effects would include removal or trimming of the shrubs. Indirect effects, if the shrubs are not removed, would include physical vibration and an increase in dust during disposal activities. These effects would be considered significant, unless the mitigation is implemented.

Use of the proposed Dike 8 disposal area could potentially result in direct and indirect effects to the white-tailed kite if they begin nesting in the area. Construction activities in the vicinity of a nest have the potential to result in forced fledging or nest abandonment by adult kites. Therefore, if present, the white-tailed kite could be adversely affected by use of the disposal site.

Prior to use of the proposed Dike 8 disposal area, preconstruction surveys would be conducted to determine if there are nests present within 1,000 feet of the disposal area. If the survey determines that there are active nests in the project area, CDFG would be contacted to determine the proper course of action. If necessary, a buffer would be delineated and the nests would be monitored during construction activities. With coordination and mitigation, as discussed below, it is anticipated that effects to white-tailed kite would be less than significant.

The no action alternative would not result in direct impacts to endangered and/or threatened species.

(7) Other Wildlife

The project could have short-term effects on resident mammals, birds, reptiles, and amphibians. Noise from construction equipment and increased human presence could temporarily displace some wildlife, and temporary alteration of riparian and aquatic habitat would occur.

Species utilizing the project area should be accustomed to the noise and activity of the area, due to the long-term nature of the Folsom JFP. The construction of the approach channel, transload facility, and spur dike would not increase disturbance to the area's wildlife species beyond current operations, with the exception of the increase of in-water work associated with the approach channel excavation, which has the potential to affect acquatic species.

To ensure that there would be no effect to migratory birds, preconstruction surveys would be conducted, if needed, in and around the project area. If any migratory birds are found, a protective buffer would be delineated, and USFWS and CDFG would be consulted for further actions. Recommendations proposed by the USFWS in their Fish and Wildlife Coordination Act Report are listed in Section 4.15.

The majority of the project area is previously disturbed due to ongoing Folsom JFP construction. The previously undisturbed areas include the in-reservoir disposal site and Dike 8. The in-reservoir disposal site has no vegetation associated with it, and consists of open water habitat.

The Dike 8 disposal area consists of up to 15.8 acres of currently undisturbed habitat. Use of the Dike 8 disposal area would result in the permanent loss of 6.1 acres of ruderal herbaceous, 4.2 acres of oak savannah, and 2.5 acres of transitional wetland habitats on the waterside of the dike. On the landside of the dike, 3.0 acres of primarily disturbed, non-native grasslands would be permanently lost. A detailed analysis of impacts to vegetation is in Section 4.12. The loss of vegetation habitat would be potentially significant, however, with the implementation of the proposed mitigation measures, impacts would be considered less than significant.

In order to preemptively avoid direct effects to amphibian and wetland species, the culvert under the haul route that allows the flooding of the Dike 8 area would be closed during low water levels prior to use of the Dike 8 area. As a result, this area would not flood, and the seasonal habitat would not be created for these species during the construction period. Since the flooding of this area fluxuates depending on reservoir levels, and does not annually flood, this would be considered a less than significant direct impact on these wildlife species. However, since the loss of the transitional wetland habitat would likely be permanent, this long-term habitat loss would be considered a significant indirect effect to these species, as they would no longer be able to seasonally access this habitat. As a result, mitigation for the permanent loss of transitional wetland habitat would be required.

The other practicable build alternative would occupy similar footprints; therefore, result in similar impacts to wildlife. The no action alternative would result in nodirect impacts to endangered and/or threatened species.

(8) Actions to Minimize Impacts

Many mitigation measures to avoid and minimize impacts to the aquatic environment, as well as, compensatory mitigation measures in order to compensate for unavoidable impacts are proposed. Mitigation measures is listed in Section 4.4.7 of the Draft SEIS/EIR.

The Folsom Reservoir is a man-made facility that is well regulated. While many fish species currently inhabit the reservoir, a majority of them are either stocked in the reservoir and/or are non-native species. The proposed project would cause the placement of fill material into approximately 113.0 acres of waters of the U.S., including 110.5 acres of open water habitat.

Although it would result in the placement of fill material into 22 acres of open waters of the U.S, the spur dike would not cause the permanent loss of functions and/or values of the water. The net loss of functions and services of aquatic resources due to the spur dike is 9 acres of surface waters that would be converted to upland.

The proposed location of the spur dike is adjacent to previous fill placed by Reclamation. Reclamation is required to construct approximately 10 acres of riparian wetland habitat for compensatory mitigation to impacts to open water habitat. The compensatory mitigation required for the impacts by Reclamation is sufficient to compensate for the Corps' impacts from the construction of the spur dike. Compensatory mitigation has already been required to off-set those losses of functions at the Overlook. The additional fill from the spur dike will not result in additional acreage impacts or losses in functions that have not been already accounted for. The Corps will be required to assist Reclamation with their mitigation requirements to ensure the 10 acres of riparian wetlands would be initiated by 2013.

The discharge of dredge materials would temporarily impact approximately 85 acres of waters of the U.S. The haul road embankment and transload facility are temporary project elements and would be removed after three to four years. Through the incorporation of mitigation measures which would require the restoration of temporary impact zones, impacts would be minimal. However, the Corps would also assist Reclamation to create an additional 2 to 5 acres of riparian wetlands at Mississippi Bar to compensate for temporal losses from these elements.

It has been determined that the ordinary high water mark of the Folsom Reservoir is at 466’ elevation, which is the upper limit of the fluctuation zone for the Folsom Reservoir. However, Attachment 2 shows a graph showing the “Folsom Dam Reservoir Water Surface Elevations” between 1955 and 2005. This document shows the percentage of time that the Folsom Reservoir water levels are over a certain elevation. According to the table, the water level within the reservoir only reaches the 466’ elevation approximately 1.1% of the time. In addition, almost 50% of the time, the reservoir is above the 429’ elevation, and 100% of the time is above the 347’ elevation.

The proposed fill material at Dike 8 would generally be placed between the reservoir elevation of 420-feet and 460-feet. Based on Attachment 2, the fill material would be under water and suitable for fish habitat between approximately 1% and 68% of the time, with the majority of the fill material being suitable fish habitat less than 50% of the time. In addition, the proposed fill material, which would consist of primarily gravel and cobble material, and would have only minor impacts to aquatic wildlife habitat.

Therefore, a mitigation ratio of less than 1:1 for compensatory mitigation is appropriate to mitigate for losses to fish habitat function of the Folsom Reservoir. However, because the areas to be filled would provide suitable fish habitat for an average of 50% of the time, compensation for the loss of functions of the Folsom Reservoir related to fish habitat is required.

If Dike 8 is used as a disposal area then the Corps would purchase 2.5 acres of seasonal wetlands at an approved bank to compensate for the loss of fish habitat function. In the event that mitigation is not initiated within a two-year period, the mitigation ratios would increase by 0.5:1 if initiated within two to five years, and by 1:1 if mitigation is initiated more than five years after the impacts occur.

Although this mitigation is off-site and out-of-kind mitigation, it would compensate for losses at Folsom Reservoir, and would provide valuable fish and wildlife habitat at an alternate location. The off-site mitigation would provide fish and wildlife habitat within an area that is not heavily regulated for flood control and water supply, which would provide more benefits to fish and wildlife species than additional mitigation within the Folsom Reservoir. The proposed off-site mitigation would be sufficient to compensate for the losses of function at the Folsom Reservoir due to the proposed project.

In addition, 33 C.F.R. Part 332, Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule) gives preference to the use of mitigation banks. Currently, there is one mitigation bank that has seasonal wetland credits available to compensate for the impacts associated with Dike 8.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Size Determination

The proposed project would involve placement of dredged material, which would be removed from the construction of the approach channel as well as the proposed dredge material disposal site, below the ordinary high water mark of the Folsom Reservoir. Some work may be conducted within open waters of the Folsom Reservoir. Because the excavated material would be granitic in nature, and appropriate BMP's, including silt fencing and/or silt curtains, would be implemented these impacts would be minimal.

Alternative 3 would result in the excavation and placement of less dredge material than the proposed alternative, and therefore would cause fewer impacts to the mixing zone. Alternative 2, would involve the excavation and placement of more fill material than the proposed alternative, however, because the material that would be placed would be granitic in nature and because BMP's would be utilized, the impacts of these alternatives on the mixing zone would be minimal.

The no action/no project alternative would result in no impacts to the mixing zone.

(2) Determination of Compliance with Applicable Water Quality Standards

The fill material would not violate Environmental Protection Agency or State water quality standards or violate the primary drinking water standards of the Safe Drinking Water Act (42 USC 300f - 300j). Project design, standard construction and erosion practices would preclude the introduction of substances into surrounding waters.

The proposed project would not affect existing or potential water supplies, nor would the other alternatives, including the no-action alternative.

(3) Potential Effects on Human Use Characteristics

a) Municipal and Private Water Supplies

The fill material would not violate Environmental Protection Agency or State water quality standards or violate the primary drinking water standards of the Safe Drinking Water Act (42 USC 300f – 300j).

Project design, standard construction and erosion practices would preclude the introduction of substances into surrounding waters. Materials removed for disposal off-site would be disposed of in an appropriate landfill or other upland area.

b) Recreation and Commercial Fisheries

The Folsom Reservoir is heavily used for recreational fishing for both warm and cold water fish such as rainbow trout, brown trout, black bass, catfish, crappie, and bluegill. A description of these game fish was given in Fisheries, Section 3.5. The proposed project could affect recreational fisheries in the project area, as temporary access restriction may be necessary at some locations while construction is occurring. Proposed mitigation measures are located in Section 4.5.6 in the Draft SEIS/EIR, including providing advanced notification to the public of any closures, and directing the public to alternative lake access sites for recreational fisheries. The proposed mitigation measures for notifying recreational users of closures and to minimize impacts from suspended sediments and turbidity, as well as the proposed compensatory mitigation for the unavoidable loss of fish and habitat would reduce potential impacts to recreational fisheries to less than minimal.

The other practicable build alternative to the proposed project would result in similar impacts to recreational fisheries; although Alternatives 3 would likely cause a slight increase in these impacts, since the cofferdam has the potential to entrap a larger number of fish. The no-action alternative would result in no impacts to recreational fisheries.

c) Water-related recreation

In addition to recreational fishing, Folsom Reservoir is a popular location for picnicking, swimming and boating. Temporary access restrictions may be necessary at some locations while construction and excavation is occurring. The public will be notified in advance of any closures and will be directed to alternative lake access sites for recreational opportunities. The reservoir itself would not be closed during construction and the public would be allowed access to launch boats and are expected to continue recreational activities. Therefore, the impacts to other water related recreation from the proposed project would be less than minimal. Additional information on recreation is in Section 4.7 of the Draft SEIS/EIR.

All of the practicable build alternatives would have similar impacts to other water related recreation as the proposed alternative. The no-action alternative would result in no impacts to other water related recreation.

d) Aesthetics

The project site is within a reservoir that was created through the construction of 4 dams and 8 dikes. In addition, the area surrounding the Folsom Reservoir is a growing urban development with electric transmission facilities, industrial areas, and residential subdivisions and roadways.

Although the manmade reservoir was created for flood control, water supply and power generation, and there is a growing urban development near the site, the resulting waterfront setting gives a dramatic panorama of the water and the surrounding natural landscape. These resources include a combination of 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. Because of the large fluctuations in the water level within the Folsom Reservoir (up to 70 feet in a year), the reservoir sides are void of vegetation. Therefore, as the water levels within the reservoir decrease during the dry season, so does the quality of the visual aesthetic along the 85 miles of coast within the Folsom Reservoir.

The proposed project would temporarily negatively affect the aesthetics of the area during construction. The proposed project site would consists of exposed piles of soil, gravel and rock, large amounts of construction equipment, a haul road within the reservoir, and excavation sites. In addition, there would be a loss of waters within the project site which could negatively affect the aesthetics of the Folsom Reservoir. Finally, the approach channel and spur dike would permanently alter the aesthetics of the site, as it would convert the area into open water and upland areas.

The impacts to the aesthetics within the project area due to construction activities would be temporary, and would mainly affect only those that live adjacent to the reservoir and visitors. However, because these impacts would be temporary and the site already consists of man-made structures, it is expected that these impacts would be minor. Although the approach channel would change the aesthetics of the area, the proposed project would convert a current construction area into an area of open water, which would not negatively affect the aesthetics of the area. Additional information on aesthetics is in Section 4.6 of the Draft SEIS/EIR.

The other practicable build alternative to the proposed project would cause similar impacts to the aesthetics of the area, while the no-action alternative would not alter the aesthetics and therefore would have no impacts.

e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves.

Folsom Lake State Recreation Area (FLSRA) is managed by the California Department of Parks and Recreation. This area attracts approximately a million visitors annually for boating, swimming, hiking, biking, equestrian activities, and picnicking. Additional information on recreation is in Section 3.7 of the Draft SEIS/EIR.

Proposed mitigation measures to avoid and minimize impacts of the proposed project on the state recreation area are located in Section 4.4.6 in the Draft SEIS/EIR. These mitigation measures would reduce the impacts of the proposed project on the state recreation area to minimal.

The other practicable build alternative would result in the potential for similar impacts, although Alternative 3 would likely cause slightly greater impacts, as it would involve the excavation of a larger quantity of material due to the removal of the cofferdam. The no action alternative would not affect the current state recreation area.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

The proposed project would permanently impact approximately 11.5 acres of waters of the U.S., including the permanent loss of approximately 10.5 acres of open water and 2.5 acres of transitional wetlands. Impacts would be minimized to these waters through the use of BMP’s. In order to compensate for the loss of these waters, 2.5 acres of seasonal wetlands would be purchased at a USFWS approved mitigation site. In addition, in order to compensate for unavoidable impacts to waters of the U.S. the Corps is proposing to assist Reclamation in developing 10 acres of riparian habitat within the Folsom Reservoir. Because of the amount of waters of the U.S. existing within the analysis area and the proposed and completed mitigation measures, cumulative impacts of the proposed project are expected to be minor.

h. Determination of Secondary Effects on the Aquatic Ecosystem

Secondary impacts to the proposed project area could include: the discharge of fill material outside of the proposed project area, an increase in contaminants from vehicles parking at the Overlook, vehicles accessing the Folsom Reservoir via the haul roads, an increase in animal predation, and adverse impacts from future maintenance activities at the project site.

The proposed project could result in the unintentional placement of dredge and/or fill material outside of the proposed project area. This could result in additional adverse impacts to water quality, erosion and accretion patterns, aquatic and other wildlife habitat, recreation, aesthetics and air quality. In order to minimize impacts associated with the placement of fill material outside the proposed project area, a special condition would require that the contractor mark the project boundaries, and that all work be conducted either when the project area is dewatered or that the contractor install erosion control (i.e. silt fencing, silt curtains) within any standing waters.

At the spur dike location, fill material from the approach channel excavation, is proposed to to induce a free, even flow of water into the approach channel. The spur dike could have the indirect effect of causing an increase in runoff and contamination within Folsom Reservoir from vehicles parking at the Overlook. Although these activities may increase contamination in Folsom Reservoir from petroleum products, it is likely that these vehicles would be associated with the operation and maintenance of the Folsom Facility and would already be located at one of the additional parking areas and/or access points to Folsom Reservoir. Therefore, these impacts are expected to be minor and not significant.

The proposed project may also cause the indirect effect of increasing predation of animals. Because the proposed project would cause permanent impacts to approximately 11.5 acres of the 175 acres of waters of the U.S. that were identified within the project area, this would lead to the conversion of open water and wetlands that contain wildlife habitat, to areas cleared of vegetation. Therefore, any small mammals, avian species and other wildlife that use these cleared areas as transportation corridors may face a greater risk of predation from other animals. However, because these areas are a small percent of the overall project area, and because it is unlikely that wildlife would use these cleared areas as habitat, it is expected that these impacts would not be significant.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

(1) No significant adaptations of the guidelines were made relative to this evaluation.

(2) No practicable alternative exists which meets the study objectives that does not involve discharge of fill into waters of the United States.

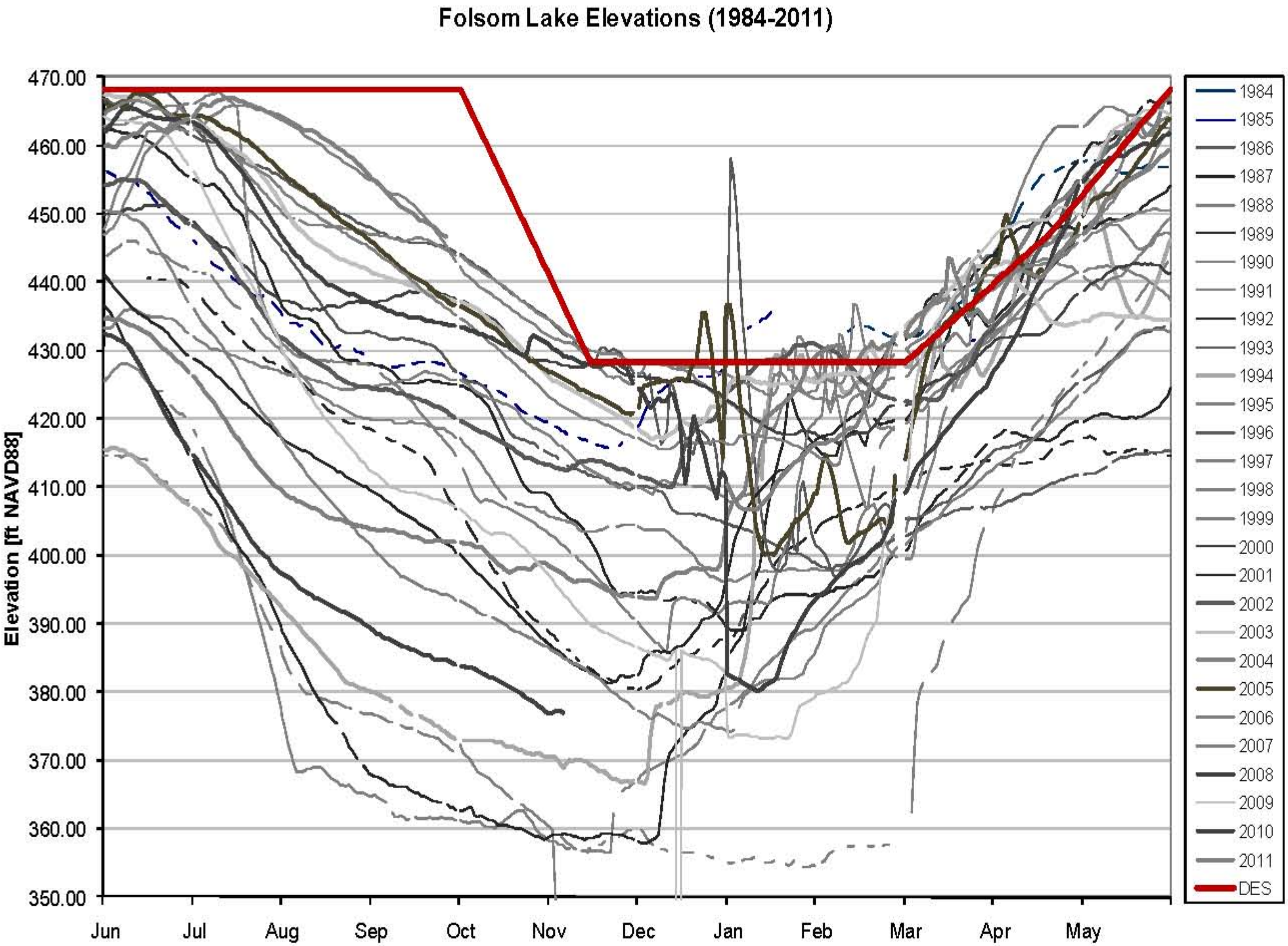
(3) The discharges of fill materials will not cause or contribute to, after consideration of disposal site dilution and dispersion, violation of any applicable State water quality standards for waters. The discharge operations will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

(4) The placement of fill materials in the project area(s) will not jeopardize the continued existence of any species listed as threatened or endangered or result in the likelihood of destruction or adverse modification of any critical habitat as specified by the Endangered Species Act of 1973.

(5) The placement of fill materials will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic species and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values will not occur.

(6) Appropriate steps to minimize potential adverse impacts of the discharge on aquatic systems will be implemented.

(7) On the basis of the guidelines the proposed disposal site for the discharge of dredged material is specified as complying with the requirements of the guidelines with the inclusion of appropriate and practicable conditions to minimize pollution or adverse effects to the aquatic ecosystem.


Folsom Lake Elevations (1984-2011)
Elevation [ft NAVD88]
470.00
460.00
450.00
440.00
430.00
420.00
410.00
400.00
390.00
380.00
370.00
360.00
350.00
Jun
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U.S. Army Corps of Engineers - Sacramento District

Folsom Dam Joint Federal Project
Folsom Dam, CA

Approach Channel Excavation - Preliminary Engineering Assessment of Dredging Feasibility

1 Introduction

An auxiliary spillway adjacent to Folsom Dam has been selected to meet the objectives of the Folsom Modification authorized project. The proposed spillway consists of a 1,100-ft long approach channel into Folsom reservoir, a gated control structure including six submerged tainter gates, a 3,000-ft long spillway chute, and a stilling basin. Flows from the auxiliary spillway empty into the American River about 1,500-ft downstream of the main dam.

Both the U.S. Bureau of Reclamation (USBR) and the U.S. Army Corps of Engineers (USACE) are participating in this project. USBR is responsible for the excavation of the spillway chute and stilling basin and is doing a partial excavation for the control structure. The USACE is responsible for the final excavation for the gated control structure and the approach channel, as well as the construction of the concrete structures.

The project is being phased such that the excavation and construction of the gated control structure is done using the existing topography and natural rock formation as a natural dam or plug. After the control structure becomes operational, final excavation of the approach channel will be performed, which will include removal of soil and rock by excavation in the dry and dredging.

The present memorandum summarizes a preliminary feasibility assessment of dredging operations with emphasis on turbidity control. It also outlines additional turbidity analyses and evaluations that will be performed as it relates to dredging and in-lake disposal of dredged materials for the excavation of the Folsom Dam auxiliary spillway approach channel.

2 Dredging and Disposal Operations

Dredging would take place in connection with the construction of both permanent and temporary features of the project. Dredging is currently planned for the following project features:

- Auxiliary spillway approach channel

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Version	1.0
Date of issue	June 19, 2012
Prepared	CXB
Checked	MPJ
Approved	MKOS

- Temporary rock embankment foundation
- Spur dike foundation
- Transload facility at Dike 7.

The dredging methods envisioned include:

- Hydraulic dredging using small portable units
- Mechanical dredging using a water crane-operated clamshell and/or a barge-mounted long reach hydraulic excavator.

The rock formation in the approach channel prism will require underwater drilling and blasting prior to dredging the material for subsequent disposal. Disposal of dredged materials could be in-lake and upland, or a combination thereof.

In-lake disposal would be practical for the soft sediment/soil layer overlaying the rock formation and for the final clean-up of the final invert of the approach channel. The in-lake disposal area is planned to be located in the Dike 7 vicinity. If hydraulically dredged, the discharge line length would then be less than one mile. In addition, the final clean-up to remove rock fragments that remain following production dredging on the floor of the approach channel would be disposed of in-lake. It is anticipated the clean-up would be performed hydraulically.

Suitable dredged material may be placed in the prism of the Spur dike and north of the existing Overlook area. The placement in this area would be a combination of in-lake and upland operations.

3 Turbidity Control Measures

To limit the turbidity in the lake to acceptable levels, a series of silt curtains could be applied to encircle all dredging and disposal operations. Considering that the currents in the lake are low, full depth silt curtains would be an effective method to mitigate the migration of suspended solids.

From an operational standpoint the silt curtains would require deployment to permit marine equipment ingress and egress. The silt curtain system is anticipated to have movable gates. This system may consist of primary disposal gated containment and an access/transition zone gated containment. To quantify the effectiveness of plausible silt curtain layouts and material specification, a turbidity analysis/plume analysis would be performed to quantify the expected turbidity from dredging and marine operations.

4 Turbidity Analysis

A turbidity analysis would be performed that quantifies the turbidity intensity in zones within and outside of the silt curtain. The analysis would consider:

1. The nature of the dredged materials, grain size distribution and fines content.

2. Anticipated types of marine equipment used for dredging and disposal operations.

3. Anticipated method(s) of dredging and disposal.

4. Silt curtain containments with a series of encirclements to isolate the disposal, transition and entry zones.

5. Anticipated marine operations such as material transport/tows to facilitate dredging and disposal of dredged material.

5 Preliminary Dredging Feasibility Evaluation

From a constructability point of view, Ben C. Gerwick, Inc. finds that the planned approach channel excavation can be performed in compliance with environmental turbidity requirements by confining the zones where dredging and in-lake disposal of dredged materials would take place. The confinement of areas with higher turbidity would be achieved by deployment of fixed and moveable silt curtains during the dredging operations.

Joint Federal Project (JFP) at Folsom Dam, Approach Channel Excavation

Traffic Analysis Technical Memorandum

Sacramento, CA

Draft

February 2012

U.S Army Corps of Engineers, Sacramento District

U.S. Army Corps of Engineers
Sacramento District

Table of Contents

Acronyms

USACE	U.S. Army Corps of Engineers
ADT	Average Daily Traffic
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
EA	Environmental Assessment
EIR	Environmental Impact Report
HCM	Highway Capacity Manual
I-80	Interstate 80
LOS	Level of Service
NEPA	National Environmental Protection Act
Reclamation	U.S. Bureau of Reclamation
SACOG	Sacramento Area Council of Governments
SR	State Route

Tables

Figures

Executive Summary

URS Corporation has been contracted to evaluate the potential traffic effects associated with project alternatives for the construction of the Folsom Approach Channel Project or "the project" and recommend potential mitigation measures to reduce traffic effects. Based on the results of the traffic effect assessment, all project construction alternatives were determined to generate traffic below levels of significance. Since the project would not exceed the traffic effects thresholds, no traffic effects mitigations are explicitly proposed.

The following measures would be implemented not as a result of direct project action effects but rather as proactive measures customary to project construction activities. Due to the dynamic nature of the project construction environment, the following individual measures or combination of measures might need to be implemented in response to the needs of the construction activities at the project site.

- T-1: In conjunction with the development and review of more detailed project design and construction specifications, a peak hour capacity analysis would 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 effects 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 effects, 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.

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1.0 INTRODUCTION

The purpose of this Traffic Impact Analysis (TIA) Report is to analyze traffic impacts associated with the Folsom Dam Approach Channel project. This study was prepared according to the County of Sacramento (County) and Caltrans traffic study guidelines. The final phase of the Folsom Modification project is the completion of the approach channel and spur dike. The preferred alternative for this phase is a cutoff wall that would provide seepage control to the spillway excavation between the rock plug and the control structure. The cutoff wall would be installed to maximize the in-the-dry excavation of the rock plug.

Folsom Dam is located in the City of Folsom (City) north of US Highway 50. **Figure 1** shows the project vicinity map in context to the regional circulation system.

The analysis focuses on the potential traffic effects to the surrounding roadway circulation system and the development of mitigation measures at affected locations.

The following scenarios were typically evaluated:

- Existing Conditions (2011) - Current year traffic volumes and peak hour LOS analysis of affected study roadway segments.

- Future 2013 Conditions (Existing Conditions Plus Growth Without Construction) - Peak hour LOS analysis used as Year 2013 baseline.

- Future 2013 Conditions with Construction (Alternatives B and C) – includes project rip generation, distribution, and assignment during Year 2013 when project Alternatives B and C are under construction.

- Future 2014 Conditions (Existing Conditions Plus Growth Without Construction) - Peak hour LOS analysis used as Year 2014 baseline.

- Future 2014 Conditions with Construction (Alternatives B and C) – includes project trip generation, distribution, and assignment during Year 2014 when project Alternatives B and C are under construction.

- Future 2015 Conditions (Existing Conditions Plus Growth Without Construction) - Peak hour LOS analysis used as Year 2015 baseline.

- Future 2015 Conditions with Construction (Alternatives B and C) – includes project trip generation, distribution, and assignment during the Year 2015 when project Alternatives B and C are under construction.

- Future 2016 Conditions (Existing Conditions Plus Growth Without Construction) - Peak hour LOS analysis used as Year 2016 baseline.

- Future 2016 Conditions with Construction (Alternatives B and C) – includes project trip generation, distribution, and assignment during Year 2016 when project Alternatives B and C are under construction.

- Future 2017 Conditions (Existing Conditions Plus Growth Without Construction) - Peak hour LOS analysis used as Year 2017 baseline.

- Future 2017 Conditions with Construction (Alternatives B and C) – includes project trip generation, distribution, and assignment during Year 2017 when project Alternatives B and C are under construction.

Figure 1. Regional Vicinity Map

ANALYSIS METHODOLOGY

Level of Service Description

The evaluation of transportation effects associated with the project 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. 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 (LOS) 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

- 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.

Road Segment Level of Service Standards and Methodology

Fehr & Peers developed a listing of LOS thresholds based on daily volumes, number of lanes and facility type as presented in **Table 1** (from 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 project.

Table 1. LOS Thresholds

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

Notes:

(1) Used to analyze roadways within County of Sacramento. LOS Capacity Thresholds from Traffic Impact Analysis Guidelines, County of Sacramento, July 2004

(2) Includes mixed flow lanes only. HOV lanes and volumes are excluded from the analysis because a review of existing HOV counts and forecasts showed the HOV lanes to be operating under capacity.

Assessment Criteria

Transportation effects associated with the project 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 7pm.
- Equipment hauling activity will occur during normal work hours, from 7am to 7pm.

- The construction schedule would be 10 hrs a day, 6 days per week, except dredging and underwater drilling for which double shifts. The 24 hours shifts schedule may be requested under special requirements to meet the schedule, or other special circumstances; double shifts schedule would be temporary and short-term.

The first component of the traffic impact analysis is an evaluation of the increase in traffic volumes on a daily basis. Most of the thresholds in the area 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. 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 project would typically be evaluated for hourly impacts, which is normally the second component of detailed traffic impact analysis conducted for a specific project.

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 project, 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 1** were taken into account in evaluating whether the project's traffic impacts are significant.

EXISTING CONDITIONS

This section describes the existing study area roadway circulation system, key study intersections and roadways segments, existing daily roadway and peak hour intersection traffic volume information and LOS analysis results for existing conditions.

Existing Roadway Network

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.

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.

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.

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.

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.

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 Dam 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

Folsom Dam Road was closed to the public in February 2003 by the U.S. Bureau of Reclamation (Reclamation) indefinitely for reasons of security and public safety. Subsequently a new Folsom Dam bridge and roadway alignment (Folsom Lake Crossing Road) was constructed downstream of the dam. In March of 2009, the construction of Folsom Lake Crossing Bridge was completed. The 1,000-foot bridge links Folsom-Auburn Road to East Natoma Street and the newer areas of Folsom to Old Folsom, along Folsom Lake Crossing Road.

Folsom Lake Crossing Road

Folsom Lake Crossing Road was formed as part of the new bridge and roadway alignment that bypasses and replaces the previous Folsom Dam road alignment that previously routed traffic directly over the Folsom Dam. The construction of this road involved the realignment of East Natoma Street to link with Folsom-Auburn Road via the new bridge just west of the dam. The balanced cantilever cast-in-place segmental bridge is approximately 1,000 feet in length with a 430-foot center span and two 270-foot connecting spans. The estimated project opening traffic was 26,000 vehicles per day as compared to the 18,000 vehicles per day that used to traverse the dam at the time of closure in 2003. The new bridge design and cross-section provides four travel lanes plus bicycle lanes and could accommodate up 40,000 vehicles per day.

East Bidwell Street

East Bidwell Street is a north-south roadway that connects Highway 50 with downtown Folsom. Within the project 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.

Oak Avenue Parkway

Oak Avenue Parkway is a six-lane divided roadway. Within the project 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.

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 study area is predominantly residential and small commercial/retail.

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 Highway70 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.

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.

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

Existing Level of Service Analysis

The key study area roadway segments shown in **Table 2** have been identified for analysis in the traffic study.

The existing traffic data was obtained from the Control Structure EA/EIR (2010). Existing 2010 ADTs from the Control Structure Study were increased with an annual 2% growth rate per the methods described in Section 2.3.

LOS analyses under existing conditions were conducted using the methodologies described in Section 2.0. **Table 2** summarizes the results of the existing roadway segment analysis. As shown in the tables, the following roadway segments are currently operating at LOS E or F:

- Douglas Boulevard – Barton Rd to Folsom-Auburn Rd

- Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd
- Folsom Boulevard – Folsom Dam Rd to Greenback Ln
- Folsom Boulevard – Greenback Ln to Iron Point Rd
- East Natoma Street – Folsom Dam Rd to Green Valley Rd
- Green Valley Road – East Natoma St to Sophia Pwy
- U.S. 50 – Hazel Ave to Folsom Blvd
- U.S. 50 - Folsom Blvd to East Bidwell St
- U.S. 50 – East Bidwell St to County line
- SR-80 – north of Douglas Blvd
- SR-80 – Douglas Blvd to Greenback Ln
- SR-80 – south of Greenback Ln

Table 2. Existing LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2011 Traffic Volumes	
			Traffic Volumes	LOS
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	44,806	F
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	44,918	F
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	36,335	E
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	42,131	F
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	26,861	C
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	18,502	D
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	30,205	F
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	35,667	F
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	24,744	C
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	43,803	D
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	21,734	D
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	130,183	F
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	110,344	F
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	91,284	F
Folsom Lake Crossing Bridge	4AHD	40,000	29,425	C
SR-80 – north of Douglas Blvd[1]	6F	107,100	156,060	F
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	182,580	F
SR-80 – south of Greenback Ln[1]	6F	107,100	190,000	F

PROJECT DESCRIPTION

The final phase of the Folsom Modification project is the completion of the approach channel and spur dike. A trans-load facility and concrete batch plant are necessary for construction and discussed in detail below. Two Approach Channel alternatives are proposed for this final phase of construction.

Alternative B

Alternative B consists of approach channel excavation with a cutoff wall. The propose cutoff wall would be located adjacent to Folsom Lake southeast of the Left Wing Dam and east of the Auxiliary Spillway chute excavation. The cutoff wall would provide seepage control to the spillway excavation between the rock plug and the Control Structure. The cutoff wall would consist of a reinforced concrete secant pile wall installed across the width of the future approach channel. The total length of the wall would be approximately 1,000 feet. The wall would be socketed into the underlying highly weathered granitic rock.

Alternative C

Alternative C consists of a medium size cofferdam located downstream, near the rock plug, at about Station 4+00. The location of the cofferdam is based on a trade-off between cofferdam size and the amount of in-the-wet excavation. To prepare the foundation for the cofferdam, soft materials would be dredged until the decomposed granite is reached. Once the foundation is set, the cofferdam would be constructed as described below. After the cofferdam is installed, the downstream area would be dewatered. Timing would be coordinated with the completion of the control structure. When the control structure is operational the rock plug would be excavated and the approach channel slab and walls would be installed. Once the approach channel is excavated to final grade the cofferdam would be removed. Any remaining materials would be dredged using a barge-mounted clam shell or hydraulic excavator dredge until elevation 350 is reached (that matches the slab).

Project Trips Generation and Distribution

Trip Generation
New trips have been determined by calculating the number of one-way trips (round trips multiplied by 2) generated by quantity of materials and equipment deliveries required for the project construction as well as trips generated by construction labor forces. **Table 3** below shows the trip generation estimates for both alternatives.

Table 3. Project Trip Generation

Construction Year	Alt B				Alt C			
	Worker	Aggregate	Delivery	Total	Worker	Aggregate	Delivery	Total
2013	0	265	0	*265*	12	256	0	*268*
2014	16	14	3	*33*	24	9	3	*36*
2015	40	14	3	*58*	40	10	3	*53*
2016	36	14	3	*53*	40	10	3	*53*
2017	40	256	2	*298*	48	256	2	*306*

Source: URS AQ Input parameters_v2 (January 12, 2012) Notes: Aggregate and Delivery truck traffic with 2.5 PCE.

The above trip generation assumptions were based from and consistent with the Air Quality analysis assumptions developed from data provided by the Corp's Equipment Estimates summary dated October 31, 2011 incorporating worker commute data, onsite vehicle movements (not included) and material and equipment delivery trips (included) along the project study roadway segments.

Trip Distribution

The project site will receive aggregate and batch plant materials from the Tiechert Prairie City Borrow Source located on Scott Road south of White Rock Road in Sacramento County. Offsite materials and equipment will be delivered to the site via US Highway 50.

Labor Force

Since 82% of the unemployed are located in Sacramento area, with 11% in Placer County and 7% in El Dorado County. **Table 4** presents the assumptions used on where the workers are expected to originate their trips.

Table 4. Distribution of Labor Force

Region	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%

Figure 2 outlines the project routes.

Figure 2. Proposed Project Routes

BASELINE CONDITIONS

This section will evaluate the performance of the baseline without project condition for Future Year 2013 to 2017.

Based on the review of the 8 cumulative projects identified in the Control Structure EA/EIR (2010), none of those projects will overlap with the proposed action under the 2013-2017 construction timeframe. Additionally, the 7 cumulative projects identified for this project were examined and the majority of the projects were found to be either completed, geographically distant, have low trip generation potential and non-concurrent with the exception to the Folsom DS/FDR project's ongoing construction activities which are adequately covered in the effects analysis. Since the dam construction site is a dynamic work environment in general with many concurrent and ongoing activities along with day-to-day dam operations, the Folsom approach channel project has the potential to cumulatively contribute traffic to the study roadway segments. In acknowledgement, a growth factor of 2% per year consistent with previous studies was applied for future baseline projections on all study roadway segments in the traffic effects analysis to account for potential cumulative activities as well as ambient traffic growth in the area. The aforementioned assumption is conservative given the recent economic downturn and the slow process of recovery that has generally lowered traffic activity statewide.

Should there be any concerns with potential cumulative effects; the Corps would coordinate the scheduling and sequencing of construction activities with Reclamation and DOT to reduce any potential cumulative effects to less than significant. Additionally, close coordination by the Corps with Reclamation, the City of Folsom and the County of Sacramento to monitor traffic conditions is necessary to ensure that the effects of potential cumulative construction activities will be minimized by deploying Pro-active Mitigation Measures T-1 through T-3 including staggering construction-related traffic, thereby reducing the potential for cumulative effects to the study roadway segments.

Table 5 below outlines the results of the analysis.

As shown in the table, all roadways segments operating at unsatisfactory LOS under existing conditions continue to operate at LOS E or F. No roadway segments deteriorate to LOS E or F from acceptable LOS C or D with growth in the area.

Table 5. Existing and Baseline LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2011 Traffic Volumes		Year 2013 Traffic Volumes		Year 2014 Traffic Volumes		Year 2015 Traffic Volumes		Year 2016 Traffic Volumes		Year 2017 Traffic Volumes	
			Trafic Volumes	LOS	Trafic Volumes	LOS	Trafic Volumes	LOS	Trafic Volumes	LOS	Trafic Volumes	LOS	Trafic Volumes	LOS
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	44,806	**F**	46,598	**F**	47,494	**F**	48,390	**F**	49,287	**F**	50,183	**F**
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	44,918	**F**	46,715	**F**	47,613	**F**	48,511	**F**	49,410	**F**	50,308	**F**
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	36,335	**E**	37,788	**F**	38,515	**F**	39,242	**F**	39,969	**F**	40,695	**F**
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	42,131	**F**	43,816	**F**	44,659	**F**	45,501	**F**	46,344	**F**	47,187	**F**
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	26,861	C	27,935	C	28,473	C	29,010	D	29,547	D	30,084	D
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	18,502	D	19,242	D	19,612	D	19,982	D	20,352	D	20,722	D
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	30,205	**F**	31,413	**F**	32,017	**F**	32,621	**F**	33,226	**F**	33,830	**F**
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	35,667	**F**	37,094	**F**	37,807	**F**	38,520	**F**	39,234	**F**	39,947	**F**
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	24,744	C	25,734	C	26,229	C	26,724	C	27,218	D	27,713	D
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	43,803	D	45,555	D	46,431	D	47,307	D	48,183	D	49,059	D
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	21,734	D	22,603	D	23,038	D	23,473	D	23,907	D	24,342	D
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	130,183	**F**	135,390	**F**	137,994	**F**	140,598	**F**	143,201	**F**	145,805	**F**
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	110,344	**F**	114,758	**F**	116,965	**F**	119,172	**F**	121,378	**F**	123,585	**F**
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	91,284	**F**	94,935	**F**	96,761	**F**	98,587	**F**	100,412	**F**	102,238	**F**
Folsom Lake Crossing Bridge	4AHD	40,000	29,425	C	30,602	C	31,191	C	31,779	C	32,368	D	32,956	D
SR-80 – north of Douglas Blvd[1]	6F	107,100	156,060	**F**	162,302	**F**	165,424	**F**	168,545	**F**	171,666	**F**	174,787	**F**
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	182,580	**F**	189,883	**F**	193,535	**F**	197,186	**F**	200,838	**F**	204,490	**F**
SR-80 – south of Greenback Ln[1]	6F	107,100	190,000	**F**	197,600	**F**	201,400	**F**	205,200	**F**	209,000	**F**	212,800	**F**

Note : Year 2011 traffic volumes from Folsom Control Structure study - calculated from 2010 ADTs (Average Daily Traffic)with an annual 2% growth rate. Future year 2013-2017 volumes calculated using annual 2% growth rate.

* LOS E is the threshold for all roadway segments in Sacramento County while LOS C is applied to Caltrans and Placer County segments. Capacity is calculated as the maximum volume at satisfactory LOS C/E.

1) Data obtained from Caltrans Traffic Data Branch - calculated from 2010 ADTs with an annual 2% growth rate. Future year 2013-2017 volumes calcultated using annual 2% growth rate. Level of Service (LOS) evaluated using Caltrans V/C thresholds.

PROJECT ALTERNATIVES ANALYSIS

This section will evaluate the performance of the future with project condition for both Alternatives B and C for Future Year 2013 to 2017.

Alternative B

The Baseline plus Project analysis builds upon the Future Year 2013 to 2017 Base conditions and incorporates project Alternative B traffic.

Tables 6 through **10** present the traffic effects associated with Alternative B for each construction year from 2013 through 2017. The tables include 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. The basis of comparison for determining the significant effects of each action alternative is any deterioration in LOS rating or an increase in V/C of 0.05 for roadways with an existing LOS of F compared against the No Action/No Project Alternative.

No LOS deteriorations would occur in 2013, 2014, 2015, 2016, or 2017. In addition, there would be some roadways in certain years that would experience an increase in v/c however the increase is less than the 0.05 threshold. Therefore, the project construction activity would have no effect on the roadway network.

Table 6. 2013 Baseline and Alternative B Project LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2013 Traffic Volumes			Year 2013 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	46,598	**F**	1.32	46,598	**F**	1.32
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	46,715	**F**	1.25	46,715	**F**	1.25
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	37,788	**F**	1.01	37,788	**F**	1.01
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	43,816	**F**	1.17	43,816	**F**	1.17
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	27,935	C	0.78	27,935	C	0.78
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,242	D	0.67	19,242	D	0.67
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	31,413	**F**	1.09	31,678	**F**	1.10
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	37,094	**F**	1.28	37,094	**F**	1.28
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	25,734	C	0.46	25,999	C	0.46
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	45,555	D	0.81	45,820	D	0.82
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	22,603	D	0.60	22,869	D	0.61
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	135,390	**F**	1.51	135,390	**F**	1.51
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	114,758	**F**	1.61	114,758	**F**	1.61
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	94,935	**F**	1.33	94,935	**F**	1.33
Folsom Lake Crossing Bridge	4AHD	40,000	30,602	C	0.77	30,602	C	0.77
SR-80 – north of Douglas Blvd[1]	6F	107,100	162,302	**F**	1.52	162,302	**F**	1.52
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	189,883	**F**	1.77	189,883	**F**	1.77
SR-80 – south of Greenback Ln[1]	6F	107,100	197,600	**F**	1.85	197,600	**F**	1.85

Table 7. 2014 Baseline and Alternative B Project LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2014 Traffic Volumes			Year 2014 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	47,494	**F**	1.34	47,499	**F**	1.34
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	47,613	**F**	1.27	47,618	**F**	1.27
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	38,515	**F**	1.03	38,522	**F**	1.03
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	44,659	**F**	1.19	44,662	**F**	1.19
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	28,473	C	0.79	28,476	C	0.79
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,612	D	0.68	19,613	D	0.68
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	32,017	**F**	1.11	32,039	**F**	1.11
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	37,807	**F**	1.31	37,807	**F**	1.31
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	26,229	C	0.47	26,249	C	0.47
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	46,431	D	0.83	46,452	D	0.83
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,038	D	0.62	23,059	D	0.62
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	137,994	**F**	1.54	138,002	**F**	1.54
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	116,965	**F**	1.64	116,970	**F**	1.64
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	96,761	**F**	1.36	96,762	**F**	1.36
Folsom Lake Crossing Bridge	4AHD	40,000	31,191	C	0.78	31,202	C	0.78
SR-80 – north of Douglas Blvd[1]	6F	107,100	165,424	**F**	1.54	165,424	**F**	1.54
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	193,535	**F**	1.81	193,538	**F**	1.81
SR-80 – south of Greenback Ln[1]	6F	107,100	201,400	**F**	1.88	201,406	**F**	1.88

Table 8. 2015 Baseline and Alternative B Project LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2015 Traffic Volumes			Year 2015 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	48,390	**F**	1.37	48,402	**F**	1.37
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	48,511	**F**	1.30	48,523	**F**	1.30
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	39,242	**F**	1.05	39,258	**F**	1.05
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	45,501	**F**	1.22	45,509	**F**	1.22
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	29,010	D	0.81	29,018	D	0.81
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,982	D	0.69	19,984	D	0.69
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	32,621	**F**	1.13	32,651	**F**	1.13
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	38,520	**F**	1.33	38,521	**F**	1.33
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	26,724	C	0.48	26,750	C	0.48
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	47,307	D	0.84	47,334	D	0.85
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,473	D	0.63	23,499	D	0.63
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	140,598	**F**	1.57	140,616	**F**	1.57
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	119,172	**F**	1.67	119,182	**F**	1.67
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	98,587	**F**	1.38	98,589	**F**	1.38
Folsom Lake Crossing Bridge	4AHD	40,000	31,779	C	0.79	31,807	C	0.80
SR-80 – north of Douglas Blvd[1]	6F	107,100	168,545	**F**	1.57	168,547	**F**	1.57
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	197,186	**F**	1.84	197,194	**F**	1.84
SR-80 – south of Greenback Ln[1]	6F	107,100	205,200	**F**	1.92	205,216	**F**	1.92

Table 9. 2016 Baseline and Alternative B Project LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2016 Traffic Volumes			Year 2016 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	49,287	F	1.39	49,297	F	1.39
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	49,410	F	1.32	49,421	F	1.32
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	39,969	F	1.07	39,983	F	1.07
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	46,344	F	1.24	46,351	F	1.24
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	29,547	D	0.82	29,554	D	0.82
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	20,352	D	0.70	20,354	D	0.70
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	33,226	F	1.15	33,254	F	1.15
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	39,234	F	1.36	39,235	F	1.36
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	27,218	D	0.49	27,244	D	0.49
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	48,183	D	0.86	48,209	D	0.86
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,907	D	0.64	23,933	D	0.64
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	143,201	F	1.59	143,218	F	1.59
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	121,378	F	1.70	121,388	F	1.70
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	100,412	F	1.41	100,414	F	1.41
Folsom Lake Crossing Bridge	4AHD	40,000	32,368	D	0.81	32,393	D	0.81
SR-80 – north of Douglas Blvd[1]	6F	107,100	171,666	**F**	1.60	171,668	**F**	1.60
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	200,838	**F**	1.88	200,845	**F**	1.88
SR-80 – south of Greenback Ln[1]	6F	107,100	209,000	**F**	1.95	209,014	**F**	1.95

Table 10. 2017 Baseline and Project Alternative B LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2017 Traffic Volumes			Year 2017 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	50,183	**F**	1.42	50,195	**F**	1.42
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	50,308	**F**	1.35	50,320	**F**	1.35
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	40,695	**F**	1.09	40,711	**F**	1.09
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	47,187	**F**	1.26	47,195	**F**	1.26
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	30,084	D	0.84	30,092	D	0.84
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	20,722	D	0.72	20,724	D	0.72
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	33,830	**F**	1.17	34,099	**F**	1.18
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	39,947	**F**	1.38	39,948	**F**	1.38
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	27,713	D	0.49	27,980	D	0.50
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	49,059	D	0.88	49,326	D	0.88
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	24,342	D	0.65	24,609	D	0.66
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	145,805	**F**	1.62	145,822	**F**	1.62
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	123,585	**F**	1.73	123,595	**F**	1.73
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	102,238	**F**	1.43	102,240	**F**	1.43
Folsom Lake Crossing Bridge	4AHD	40,000	32,956	D	0.82	32,984	D	0.82
SR-80 – north of Douglas Blvd[1]	6F	107,100	174,787	**F**	1.63	174,789	**F**	1.63
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	204,490	**F**	1.91	204,498	**F**	1.91
SR-80 – south of Greenback Ln[1]	6F	107,100	212,800	**F**	1.99	212,816	**F**	1.99

Alternative C

The Baseline plus Project analysis builds upon the Future Year 2013 to 2017 Base conditions and incorporates project Alternative C traffic.

Tables 11 through **15** present the traffic effects associated with Alternative C for each construction year from 2013 through 2017. The tables include 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. The basis of comparison for determining the significant effects of each action alternative is any deterioration in LOS rating or an increase in V/C of 0.05 for roadways with an existing LOS of F compared against the No Action/No Project Alternative.

No LOS deteriorations would occur in 2013, 2014, 2015, 2016, or 2017. In addition, there would be some roadways in certain years that would experience an increase in v/c however the increase is less than the 0.05 threshold. Therefore, the project construction activity would have no effect on the roadway network.

Table 11. 2013 Baseline and Project Alternative C LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2013 Traffic Volumes			Year 2013 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	46,598	**F**	1.32	46,602	**F**	1.32
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	46,715	**F**	1.25	46,718	**F**	1.25
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	37,788	**F**	1.01	37,793	**F**	1.01
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	43,816	**F**	1.17	43,819	**F**	1.17
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	27,935	C	0.78	27,938	C	0.78
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,242	D	0.67	19,243	D	0.67
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	31,413	**F**	1.09	31,672	**F**	1.10
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	37,094	**F**	1.28	37,094	**F**	1.28
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	25,734	C	0.46	25,992	C	0.46
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	45,555	D	0.81	45,814	D	0.82
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	22,603	D	0.60	22,862	D	0.61
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	135,390	**F**	1.51	135,395	**F**	1.51
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	114,758	**F**	1.61	114,760	**F**	1.61
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	94,935	**F**	1.33	94,936	**F**	1.33
Folsom Lake Crossing Bridge	4AHD	40,000	30,602	C	0.77	30,610	C	0.77
SR-80 – north of Douglas Blvd[1]	6F	107,100	162,302	**F**	1.52	162,303	**F**	1.52
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	189,883	**F**	1.77	189,886	**F**	1.77
SR-80 – south of Greenback Ln[1]	6F	107,100	197,600	**F**	1.85	197,605	**F**	1.85

Table 12. 2014 Baseline and Project Alternative C LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2014 Traffic Volumes			Year 2014 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	47,494	**F**	1.34	47,502	**F**	1.34
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	47,613	**F**	1.27	47,620	**F**	1.27
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	38,515	**F**	1.03	38,525	**F**	1.03
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	44,659	**F**	1.19	44,664	**F**	1.19
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	28,473	C	0.79	28,477	C	0.79
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,612	D	0.68	19,613	D	0.68
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	32,017	**F**	1.11	32,036	**F**	1.11
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	37,807	**F**	1.31	37,808	**F**	1.31
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	26,229	C	0.47	26,246	C	0.47
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	46,431	D	0.83	46,448	D	0.83
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,038	D	0.62	23,055	D	0.62
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	137,994	**F**	1.54	138,006	**F**	1.54
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	116,965	**F**	1.64	116,971	**F**	1.64
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	96,761	**F**	1.36	96,763	**F**	1.36
Folsom Lake Crossing Bridge	4AHD	40,000	31,191	C	0.78	31,207	C	0.78
SR-80 – north of Douglas Blvd[1]	6F	107,100	165,424	**F**	1.54	165,425	**F**	1.54
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	193,535	**F**	1.81	193,540	**F**	1.81
SR-80 – south of Greenback Ln[1]	6F	107,100	201,400	**F**	1.88	201,410	**F**	1.88

Table 13. 2015 Baseline and Project Alternative C LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2015 Traffic Volumes			Year 2015 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	48,390	**F**	1.37	48,402	**F**	1.37
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	48,511	**F**	1.30	48,523	**F**	1.30
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	39,242	**F**	1.05	39,258	**F**	1.05
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	45,501	**F**	1.22	45,509	**F**	1.22
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	29,010	D	0.81	29,018	D	0.81
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	19,982	D	0.69	19,984	D	0.69
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	32,621	**F**	1.13	32,646	**F**	1.13
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	38,520	**F**	1.33	38,521	**F**	1.33
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	26,724	C	0.48	26,745	C	0.48
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	47,307	D	0.84	47,329	D	0.85
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,473	D	0.63	23,495	D	0.63
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	140,598	**F**	1.57	140,616	**F**	1.57
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	119,172	**F**	1.67	119,182	**F**	1.67
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	98,587	**F**	1.38	98,589	**F**	1.38
Folsom Lake Crossing Bridge	4AHD	40,000	31,779	C	0.79	31,807	C	0.80
SR-80 – north of Douglas Blvd[1]	6F	107,100	168,545	**F**	1.57	168,547	**F**	1.57
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	197,186	**F**	1.84	197,194	**F**	1.84
SR-80 – south of Greenback Ln[1]	6F	107,100	205,200	**F**	1.92	205,216	**F**	1.92

Table 14. 2016 Baseline and Project Alternative C LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2016 Traffic Volumes			Year 2016 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	49,287	**F**	1.39	49,299	**F**	1.39
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	49,410	**F**	1.32	49,422	**F**	1.32
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	39,969	**F**	1.07	39,985	**F**	1.07
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	46,344	**F**	1.24	46,352	**F**	1.24
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	29,547	D	0.82	29,555	D	0.82
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	20,352	D	0.70	20,354	D	0.70
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	33,226	**F**	1.15	33,250	**F**	1.15
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	39,234	**F**	1.36	39,235	**F**	1.36
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	27,218	D	0.49	27,240	D	0.49
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	48,183	D	0.86	48,205	D	0.86
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	23,907	D	0.64	23,929	D	0.64
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	143,201	**F**	1.59	143,220	**F**	1.59
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	121,378	**F**	1.70	121,389	**F**	1.70
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	100,412	**F**	1.41	100,414	**F**	1.41
Folsom Lake Crossing Bridge	4AHD	40,000	32,368	D	0.81	32,396	D	0.81
SR-80 – north of Douglas Blvd[1]	6F	107,100	171,666	**F**	1.60	171,668	**F**	1.60
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	200,838	**F**	1.88	200,846	**F**	1.88
SR-80 – south of Greenback Ln[1]	6F	107,100	209,000	**F**	1.95	209,016	**F**	1.95

Table 15. 2017 Baseline and Project Alternative C LOS Results

Roadway Segment	Functional Class	Capacity (LOS C/D/E)	Year 2017 Traffic Volumes			Year 2017 + Project Traffic Volumes		
			Traffic Volumes	LOS	V/C	Traffic Volumes	LOS	V/C
Douglas Boulevard – Barton Rd to Folsom-Auburn Rd	4AD	35,400	50,183	**F**	1.42	50,197	**F**	1.42
Folsom-Auburn Road – Douglas Blvd to Folsom Dam Rd	4AD	37,400	50,308	**F**	1.35	50,323	**F**	1.35
Folsom Boulevard – Folsom Dam Rd to Greenback Ln	4AD	37,400	40,695	**F**	1.09	40,714	**F**	1.09
Folsom Boulevard – Greenback Ln to Iron Point Rd	4AD	37,400	47,187	**F**	1.26	47,196	**F**	1.26
Greenback Lane - Hazel Ave to Madison Ave	4AMD	36,000	30,084	D	0.84	30,094	D	0.84
East Natoma Street – Cimmaron Cir to Folsom Dam Rd	4AU	28,900	20,722	D	0.72	20,725	D	0.72
East Natoma Street – Folsom Dam Rd to Green Valley Rd	4AU	28,900	33,830	**F**	1.17	34,102	**F**	1.18
Green Valley Road – East Natoma St to Sophia Pwy	4AU	28,900	39,947	**F**	1.38	39,948	**F**	1.38
Oak Avenue Parkway – Blue Ravine Rd to East Bidwell St	6AD	56,000	27,713	D	0.49	27,982	D	0.50
East Bidwell Street – Clarksville Rod to Iron Point Rd	6AD	56,000	49,059	D	0.88	49,328	D	0.88
Blue Ravine Road – Oak Avenue Pwy to Green Valley Rd	4AD	37,400	24,342	D	0.65	24,611	D	0.66
U.S. 50 – Hazel Ave to Folsom Blvd[1]	4FA	89,800	145,805	**F**	1.62	145,826	**F**	1.62
U.S. 50 - Folsom Blvd to East Bidwell St[1]	4F	71,400	123,585	**F**	1.73	123,596	**F**	1.73
U.S. 50 – East Bidwell St to County line[1]	4F	71,400	102,238	**F**	1.43	102,240	**F**	1.43
Folsom Lake Crossing Bridge	4AHD	40,000	32,956	D	0.82	32,990	D	0.82
SR-80 – north of Douglas Blvd[1]	6F	107,100	174,787	**F**	1.63	174,790	**F**	1.63
SR-80 – Douglas Blvd to Greenback Ln[1]	6F	107,100	204,490	**F**	1.91	204,499	**F**	1.91
SR-80 – south of Greenback Ln[1]	6F	107,100	212,800	**F**	1.99	212,819	**F**	1.99

CONCLUSION

Mitigation measures would be required of the project whenever the effects of the project exceed the thresholds identified in Section 2.2. Since the proposed action would not exceed the traffic effect thresholds identified in Section 2.2, no project traffic effect mitigations are explicitly proposed.

The following measures would be implemented not as a result of direct project action effect but rather as proactive measures customary to project construction activities. Due to the dynamic nature of the project construction environment, the following individual measures or combination of measures might need to be implemented in response to the needs of the construction activities at the project site.

> T-1: In conjunction with the development and review of more detailed project design and construction specifications, a peak hour capacity analysis would 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 effects 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 effects, 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.

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Joint Federal Project (JFP) at Folsom Dam, Approach Channel Excavation

Noise Technical Memorandum

Sacramento, CA

Draft

February 2012

U.S Army Corps of Engineers, Sacramento District

U.S. Army Corps of Engineers
Sacramento District

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Appendices

List of Abbreviations and Acronyms

ADT	Average Daily Traffic
ANSI	American National Standards Institute
Bio-x	Bio measurement site x (x = site number)
BNoise	Blast Noise
CadnaA	Computer-Aided Noise Abatement
CEQA	California Environmental Quality Act
Cfm	Cubic Feet per Minute
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
cy	Cubic yard
dB	decibels
dB(A)	decibel – A-Weighted
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
ISO	International Standard of Organization
Hz	hertz
JFP	Joint Federal Project
kHz	kilohertz
Ldn	day-night sound level
Leq	equivalent sound level
Lmax	maximum sound level
Lmin	minimum sound level
LORS	laws, ordinances, regulations and standards
Lxx	percentile-exceeded sound level
LT-x	long term measurement site x (x = site number)
MIAD	Mormon Island Auxiliary Dam
µPa	micro-Pascals
mph	miles per hour
MR-x	Modeled Receiver x (x = site number)
NAC	noise abatement criteria
NOAA	National Oceanic and Atmospheric Administration

List of Abbreviations and Acronyms (Con't)

NSR	Noise Study Report
OSHA	Occupational Safety and Health Administration
PWL	Sound Power Level
RCNM	Road Construction Noise Model
RMS	root-mean-square
ROD	Record of Decision
SEL	Sound exposure level
SPL	sound pressure level
ST-x	short term measurement site x (x = site number)
NAVD	North American Vertical Datum
TNM	Traffic Noise Model
USBR	United States Bureau of Reclamation
USDOT	US Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1.0 SETTINGS/AFFECTED ENVIRONMENT

1.1 Background

As part of the Folsom Dam Safety and Flood Damage Reduction Project, also referred to as the Joint Federal Project (JFP), an auxiliary spillway is under construction jointly by the U.S. Bureau of Reclamation (USBR) and the U.S. Army Corps of Engineers (USACE). The JFP is intended to provide increased flood damage reduction and mitigate dam safety issues related to a Probable Maximum Flood event. The new auxiliary spillway would be operated in concert with the existing spillway gates and river outlets on Folsom Dam to manage flood flows from Folsom Reservoir.

The final phase of the proposed project is the completion of the approach channel and spur dike. A trans-load facility and concrete batch plant are necessary for construction to be completed. The project would be phased such that maximum excavation of the approach channel, and construction of the spur dike, can be completed during low lake levels in the dry, to minimize both project costs and water quality and biological impacts. There are currently three potential alternatives for the proposed project: Alternative 1, Alternative 2 and Alternative 3. Alternative 1 is the no project Alternative. Alternative 2 includes approach channel excavation with the utilization of a cutoff wall while Alternative 3 includes approach channel excavation with the utilization of a cofferdam.

1.2 Purpose and Scope

This section presents the results of a noise impact analysis for the Folsom Dam JFP and includes relevant noise laws, ordinances, and regulations, the results of a noise survey, and a quantitative analysis of noise environmental impacts during project activities. The analysis includes:

- Discussion of source terrestrial noise emissions from construction schedules and activities such as excavation, blasting, construction of the spur dike, material delivery, batch plant utilization and utilization of the on-site haul road
- Descriptions of the affected environment including identification of human and wildlife sensitive receptors
- Development and use of appropriate air and noise quantification models
- Potential noise impacts
- Qualitative discussion on impacts due to underwater excavation and blasting activities
- Mitigation measures
- Cumulative effects

1.3 Project Components Analyzed for Noise Impacts

The project involves the following aspects depending on whether Alternative 2 or 3 is chosen: approach channel excavation, spur dike construction, transload facility construction, batch plant operations, cutoff wall construction and cofferdam construction.

Approach Channel Excavation

The approach channel for the auxiliary spillway extends approximately 1,100 feet upstream of the concrete control structure. The approach channel converges as it approaches the control structure. The approach slab is a 5-foot thick, reinforced concrete slab that extends approximately 150 feet upstream of the control structure. The approach channel excavation includes excavation of rock material within the envelope of the approach channel, shaping and scaling of the channel surfaces, excavation of any rock trap recesses in the floor of the channel, placement of the approach slab, armoring of any side slopes susceptible to erosion. Excavation would occur both in-the-dry and in-the-wet.

An estimated volume of 932,500cy of material would be excavated for the approach channel. A portion of the approach channel excavation would be executed using land based techniques above the seasonal low water pool. The remainder of the approach channel would be excavated from barge mounted equipment.

Land based rock excavation would be accomplished with conventional drilling and blasting methods and rock excavation underwater would be accomplished by drill and blast methods (URS, 2009). In dry holes, ANFO (ammonium nitrate-fuel oil) would be utilized and primed with cast boosters. Blasting would typically consist of approximately 15,000 cubic yards rock shots. Rock excavation under water would be accomplished by drill and blast methods (URS, 2009). Each blast would produce approximately 2,000 cubic yards of rock. Water-resistant emulsified slurry would be required since water intrusion is anticipated. Explosives would be stored off-site. The explosives storage facility is assumed to be located in Jamestown, California, approximately 80 miles from the site. Explosives would be trucked to the site on a daily basis.

To limit the blast over-pressures, all charges would be confined by rock burden and crushed stone stemming in amounts that are at least 20-charge diameters. A bubble curtain would reduce the blast-induced dynamic water pressure that could be transmitted to the lake.

Spur Dike Construction

A spur dike is an embankment designed to direct water into an opening; in this case the opening would be the approach channel. The proposed elliptical-shaped spur dike would be located directly to the northwest of the approach channel. The core of the spur dike would be constructed of a decomposed quartz diorite core, commonly known as decomposed granite. This would be followed by a compacted random rock fill followed by a stone riprap cap. The quantity of material estimated to complete the spur dike is 395,000 cy. Material for the spur dike construction would come from the excavation of the approach channel excavation, or Mormon Island Auxiliary Dam (MIAD) disposal area. The construction equipment needed to build the spur dike consists of normal scrapers, bulldozers, and sheep-foot rollers for the body of the spur dike, and backhoes, bulldozers, and smooth rollers for the bedding, riprap, and surfacing materials. The construction would take place over 9 months in 2016 and 2017.

Transload Facility Construction

A transload facility would be needed for mobilization/demobilization of marine equipment (e.g., sectional barges and heavy cranes), dredge spoil off-loading from barges to trucks, marine equipment fuel and explosives transfer to support barges, equipment maintenance, and marine crew deployment. The proposed trans-load facility would be comprised of a ramp, crane and crane pad, and a fuel transfer station. The transload facility would be located adjacent to Dike 7. The transload facility is temporary and would be removed after the completion of the approach channel project in 2017. Ramp material would be removed with excavators and hauled for disposal at the MIAD disposal area.

Batch Plant and Staging Area Operations

Definitive uses of each staging area have not been determined. The four locations for the staging areas are the Folsom Prison staging area, MIAD staging area, Overlook staging area and Dike 7 staging area. The construction of the approach channel and cutoff wall would require large quantities of temperature controlled concrete. This would necessitate the use of a contractor-provided, on-site concrete batch plant and deliveries of large quantities of concrete aggregate, concrete sand, and cement. The batch plant would be powered by electricity from overhead Sacramento Municipal Utility District lines.

Cutoff Wall Construction

A cutoff wall is proposed for Alternative 2. The proposed cutoff wall would be located adjacent to Folsom Lake southeast of the Left Wing Dam and east of the Auxiliary Spillway chute excavation. The cutoff wall would consist of a reinforced concrete secant pile wall installed across the width of the future approach channel. The total length of the wall would be approximately 1,000 feet. The wall would be socketed into the underlying highly weathered granitic rock.

The secant wall would be constructed by initially drilling 3-foot diameter holes for the primary piles on 4-foot centers. After the drilling, the hole would be filled with concrete and a reinforcing cage. The top section of the piles would be drilled with a steel casting used to support the layers of cobbles and boulders. The bottom section of the pile that penetrates the decomposed and highly weathered granite would not require casing. The casing would be removed as concrete is placed in the hole. The average pile length is estimated to be 85 ft.

Three-foot diameter holes for the secondary piles would then be drilled on 4-foot centers between the primary piles. The secondary piles would be reinforced and constructed with concrete and a reinforcing cage. Both primary and secondary piles would be filled with concrete. No impact or vibratory pile driving is anticipated under this alternative (Mike Forrest, pers com to R. Verity, Jan 3 2012).

Cofferdam Construction

A cofferdam is proposed for Alternative 3. The cofferdam consists of a series of 84-foot diameter circular sheet pile cells constructed using 85-foot-long flat sheet piles.

The construction of the cells requires sheet piles to be installed using a template. The template consists of two to three horizontally mounted ring wales provide support for the vertical flat sheets. The sheet piles are installed using a vibratory hammer, working progressively around the ring. Once erected, the cells would be filled with well-graded crushed rock. The same plan dimension is maintained throughout the cofferdam, allowing for one sheet pile installation template to be utilized for construction of all of the circular cells. A layer of riprap would be placed along the upstream toe of the cells for scour protection. The cells are founded directly on the decomposed granite. The cofferdam accommodates a high design lake level of elevation 468 feet.

The cofferdam would have a provision for controlled but rapid flooding of the approach channel area to allow for quick equalization of hydraulic loads on both sides of the cofferdam. Rapid flooding of the approach channel excavation would be achieved by two or more flood gates installed in the connector cells. Each gate would consist of an approximately 100-foot-long, 4-foot diameter pipe mounted with a slide gate on the upstream side of the cofferdam. Accounting for energy losses at the inlet, outlet, and friction along the pipe walls and at the slide gate, two pipes would allow for infilling of the approach channel excavation area up to the high lake level at elevation 468.34 feet within about 6 hours.

Prior to cofferdam construction, lake sediments and other soils would be dredged to expose decomposed granite. A silt curtain placed around the perimeter of the excavation will be required to control turbidity in the lake. The total estimated volume of cofferdam fill materials would be 149,600 cy, almost all of which is cell fill.

Potential noise impacts were assessed at noise-sensitive human and wildlife receptors within the vicinity of the proposed project. Project activities that were assessed include: approach channel excavation and spur dike construction activities, blasting and traffic. A qualitative discussion of potential negative effects on fish species residing in Folsom Lake in the vicinity of underwater approach channel excavation and blasting activities will be developed. Potential noise-sensitive human receptors within the City of Folsom, Sacramento County, Placer County and El Dorado County were considered. Potential noise-sensitive wildlife is assessed within a five-mile radius of the proposed approach channel excavation and spur dike construction area.

1.4 Fundamentals of Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to typical environmental noise exposure levels is annoyance. The responses of individuals to similar noise events are diverse and influenced by many factors including the type of noise, the perceived importance of the noise, its appropriateness to the setting, the time of day and the type of activity during which the noise occurs, and noise sensitivity of the individual.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, which are sensed by the human ear. Sound is generally characterized by several variables, including frequency and amplitude. Frequency describes the sound's pitch (tone) and is measured in cycles per second (Hertz [Hz]), while amplitude describes the sound's pressure (loudness). Because the range of sound pressures that occur in the environment is extremely large, it is convenient to express these pressures on a logarithmic scale that compresses the wide range of pressures into a more useful range of numbers. The standard unit of sound measurement is the decibel (dB).

Hz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second it generates a sound pressure wave that is oscillating at 100 Hz, and is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the healthy human ear.

Sound level is expressed by reference to a specified national/international standard. The Sound Pressure Level (SPL) is used to describe sound at a specified distance or specific receptor location. In expressing sound pressure level on a logarithmic scale, sound pressure is compared to a reference value of 20 micropascals (μPa). SPL depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source (absorption, reflection, etc.).

Outdoor sound levels decrease logarithmically as the distance from the source increases. This is due to wave divergence, atmospheric absorption, and ground attenuation. Sound radiating from a source in a homogeneous and undisturbed manner travels in spherical waves. As the sound waves travel away from the source, the sound energy is dispersed over a greater area decreasing the sound pressure of the wave. Spherical spreading of the sound wave from a point source reduces the noise level at a rate of 6 dB per doubling of distance.

Atmospheric absorption also influences the sound levels received by an observer. The greater the distance traveled, the greater the influence of the atmosphere and the resultant fluctuations. Atmospheric absorption becomes important at distances greater than 1,000 feet. The degree of absorption varies depending on the frequency of the sound as well as the humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e., sound carries further) at high humidity and high temperatures and lower frequencies are less readily absorbed (i.e., sound carries further) than higher frequencies. Over long distances, lower frequencies become dominant as the higher frequencies are more rapidly attenuated. Turbulence, gradients of wind and other atmospheric phenomena also play a significant role in determining the degree of attenuation. For example, certain conditions, such as temperature inversions can channel or focus the sound waves resulting in higher noise levels than would result from simple spherical spreading.

Most sounds one hears consist of a broad band of many frequencies differing in sound level. Because of the broad range of audible frequencies, methods have been developed to quantify these values into a single number. The most common method used to quantify environmental sounds uses a weighting system that is reflective of human hearing. Human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This process is termed “A weighting”, and the resulting dB level is termed the “A weighted” decibel (dBA). “A weighting" is widely used in local noise ordinances and state and federal guidelines. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve. Unless specifically noted, the use of A weighting is always assumed with respect to environmental sound and community noise even if the notation does not show the “A”. Sound levels underwater are not weighted and measure the entire frequency range of interest.

A sound level of 0 dBA is approximately the threshold of human hearing and is barely audible by a healthy ear under extremely quiet listening conditions. This threshold is the reference level against which the amplitude of other sounds is compared. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort, progressing to pain at higher levels. An increase (or decrease) in sound level of about 10 dBA is usually perceived by the average person as a doubling (or halving) of the sound’s loudness.

Because of the logarithmic nature of the dB unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in dealing with sound levels. First, if a sound’s intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB. Remember however, that it requires about a 10 dB increase to double the perceived intensity of a sound and it is interesting to note that a doubling of the acoustical energy (a 3 dB increase) is at the lower limit of readily perceived change.

Although dBA may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from nearby and distant sources that creates an ebb and flow of sound including some identifiable sources plus a relatively steady background noise in which no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the “equivalent” constant sound level that would have to be produced by a given constant source to equal the acoustic energy contained in the fluctuating sound level measured during the interval. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators that represent the root-mean-square (RMS) maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe the time-varying character of environmental noise, the statistical or percentile noise descriptors L_{10}, L_{50}, and L_{90} may be used. These are the noise levels equaled or exceeded during 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events. L_{50} represents the median sound level during the measurement interval, while L_{90} levels are typically used to describe background noise conditions.

The Day-Night Average Sound Level (L_{dn} or DNL) represents the average sound level for a 24-hour day and is calculated by adding a 10 dB penalty only to sound levels during the night period (10:00 p.m. to 7:00 a.m.). The L_{dn} is the descriptor of choice used by nearly all federal, state, and local agencies throughout the United States to define acceptable land use compatibility with respect to noise. Within the State of California, the Community Noise Equivalent Level (CNEL) is sometimes used. CNEL is very similar to L_{dn}, except that an additional 5 dB penalty is applied to the evening hours (7:00 p.m. to 10:00 p.m.). Because of the time-of-day penalties associated with the L_{dn} and CNEL descriptors, the L_{dn} or CNEL dBA value for a continuously operating sound source during a 24-hour period will be numerically greater than the dBA value of the 24-hour L_{eq}. Thus, for a continuously operating noise source producing a constant noise level operating for periods of 24 hours or more, the L_{dn} will be 6 dB higher than the 24-hour L_{eq} value. To provide a frame of reference, common sound levels are presented in Table 1, "Sound Levels of Typical Noise Sources and Noise Environments".

Table 1: Sound Levels of Typical Noise Sources and Noise Environments (A-Weighted Sound Levels)

Noise Source (at Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)
Military Jet Take-off with After-burner (50 ft)	140	Carrier Flight Deck	–
Civil Defense Siren (100 ft)	130	–	–
Commercial Jet Take-off (200 ft)	120	–	**Threshold of Pain** *32 times as loud
Pile Driver (50 ft)	110	Rock Music Concert	*16 times as loud
Ambulance Siren (100 ft) Newspaper Press (5 ft) Power Lawn Mower (3 ft)	100		**Very Loud** *8 times as loud
Propeller Plane Flyover (1,000 ft) Diesel Truck, 40 mph (50 ft) Motorcycle (25 ft)	90	Boiler Room Printing Press Plant	*4 times as loud
Garbage Disposal (3 ft)	80	High Urban Ambient Sound	*2 times as loud

Table 1: Sound Levels of Typical Noise Sources and Noise Environments (A-Weighted Sound Levels)

Noise Source (at Given Distance)	Scale of A-Weighted Sound Level in Decibels	Noise Environment	Human Judgment of Noise Loudness (Relative to a Reference Loudness of 70 Decibels*)
Passenger Car, 65 mph (25 ft) Living Room Stereo (15 ft) Vacuum Cleaner (3 ft)	70	–	**Moderately Loud** *70 decibels (Reference Loudness)
Air Conditioning Unit (100 ft) Normal Conversation (5 ft)	60	Data Processing Center Department Store	*1/2 as loud
Light Traffic (100 ft)	50	Private Business Office	*1/4 as loud
Bird Calls (distant)	40	Lower Limit of Urban Ambient Sound	**Quiet** *1/8 as loud
Soft Whisper (5 ft)	30	Quiet Bedroom	**Very Quiet**
	20	Recording Studio	
	10	–	**Extremely Quiet**
	0	–	**Threshold of Hearing**

Source: Compiled by URS Corporation from various published sources and widely-used references such as The Handbook of Acoustical Measurements and Noise Control, Third Edition, edited by C.M. Harris, 1991; Federal Agency Review of Selected Airport Noise Analysis Issues, 1992, Modified by The Louis Berger Group, Inc., 2004 and Noise and Vibration Control, Second Edition, edited by L.L. Beranek, 1988 Institute of Noise Control Engineering.

1.5 Applicable Noise Criteria

Federal and state governments do not provide any specific guidelines for construction noise other than OSHA guidelines for worker protection. The proposed project is located in the vicinity of four convergent jurisdictions: the City of Folsom, Sacramento County, Placer County, and El Dorado County. Construction noise from the project may impact noise sensitive receptors in each of these four jurisdictions. These noise sensitive receptors consist of both human receptors and wildlife receptors. The applicable noise ordinances for each of the four jurisdictions are discussed and summarized in this section.

Each jurisdiction has its own unique standards regarding noise and nuisance. These standards are set out in county or municipal codes and general plans. Each noise ordinance and/or noise element within a municipal/county code or general plan will address noise levels that create a nuisance on surrounding communities. Noise ordinances occasionally classify different districts within these communities based on zoning standards. Such zones can include residential areas (analyzed further based on the density of the population), industrial areas, commercial areas, agricultural areas and rural areas, among many more. The possible adverse effects of construction noise are included in municipal noise ordinances.

Noise sound levels, the ambient noise, the distance to the noise source, the time of day, the length of the noise and the zoning of the areas in question are all considered when considering the adverse effects of noise. All municipal codes categorize noise by decibel levels that are A-weighted (dBA). Most standards use a baseline originating from an L_{50}, which states that the 50^{th} percentile of measured one-second noise levels throughout a given timeframe cannot be exceeded. This 50^{th} percentile means that half of the measured one-second noise levels within the given timeframe will fall below this number and half of the measured one-second noise levels will be above this number. Therefore, if a noise source is generating noise levels over a given timeframe, the 50^{th} percentile of the one-second noise levels that are being generated cannot exceed the L_{50} metric found in the noise standard. Some standards will use an hourly continuous noise equivalent level (L_{eq}) in order to express the sound levels over a given timeframe, which is an hour in this case, as a measurement that would equal the same energy of the fluctuating sound level over the entire time that a measurement was taken. An hourly L_{eq} will be a higher level than an L_{50} because it is taking the top 50^{th} percentile into account while the L_{50} does not.

Noise generated by off-site traffic is related to construction and there are no applicable noise assessment criteria because this type of traffic is temporary in nature and has no operational noise impacts.

1.5.1 City of Folsom

The City of Folsom uses L_{50} as the baseline criterion level. Construction noise is exempt from these regulations during the periods of 7:00 a.m. to 6:00 p.m. on weekdays and 8:00 a.m. to 5:00 p.m. on weekends. If construction were to occur outside of these periods, activities would be required to comply with exterior and interior noise limits at residential receptors, as summarized in Table 2. In the event the measured ambient noise level exceeds the applicable noise level standard in Table 2, the applicable standard shall be adjusted so as to equal the ambient noise level. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA.

Table 2: Noise Ordinance Standards (City of Folsom)*

	Noise Levels Not To

			Be Exceeded In Residential Zone (dBA)**	
Exterior Noise Standards	**Maximum Time of Exposure**	**Noise Metric**	**7 a.m. to 10 p.m. (daytime)**	**10 p.m. to 7 a.m. (nighttime)**
	30 Minutes/Hour	L_{50}	50	45
	15 Minutes/Hour	L_{25}	55	50
	5 Minutes/Hour	$L_{8.3}$	60	55
	1 Minute/Hour	$L_{1.7}$	65	60
	Any period of time	L_{max}	70	65
Interior Noise Standards				
	5 Minutes/Hour	$L_{8.3}$	45	35
	1 Minute/Hour	$L_{1.7}$	50	40
	Any period of time	L_{max}	55	45

*Construction Noise Exemption Times: 7:00 a.m. - 6:00 p.m. Weekdays
8:00 a.m. - 5:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times
SOURCE: City of Folsom, CA Municipal Code. Chapter 8.42, Table 8.42.040

1.5.2 Sacramento County

Like the City of Folsom, the Sacramento County Noise Ordinance specifies noise levels in terms of L_{50}. Construction noise levels are exempt from 6:00 a.m. to 8:00 p.m. on weekdays and 7:00 a.m. to 8:00 p.m. on weekends. If construction were to occur outside of these periods, activities would be required to comply with exterior and interior noise limits at residential receptors, as summarized in Table 3. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA.

Table 3: Noise Ordinance Standards (Sacramento County)*

			Noise Levels Not To Be Exceeded In Residential Zone (dBA)**	
Exterior Noise Standards	**Maximum Time of Exposure**	**Noise Metric**	**7 a.m. to 10 p.m. (daytime)**	**10 p.m. to 7 a.m. (nighttime)**
	30 Minutes/Hour	L_{50}	55	50
	15 Minutes/Hour	L_{25}	60	55
	5 Minutes/Hour	$L_{8.3}$	65	60
	1 Minute/Hour	$L_{1.7}$	70	65

	Any period of time	L_{max}	75	70
Interior Noise Standards				
	5 Minutes/Hour	$L_{8.3}$	-	-
	1 Minute/Hour	$L_{1.7}$	-	-
	Any period of time	L_{max}	-	-

*Construction Noise Exemption Times: 6:00 a.m. - 8:00 p.m. Weekdays
7:00 a.m. - 8:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times
SOURCE: Sacramento County Municipal Code, Chapter 6.68.070.

1.5.3 Placer County

Placer County, unlike Sacramento County and the City of Folsom, prescribes an hourly L_{eq} instead of an L_{50} standard and specifies that noise levels should be measured at the property line. Similar to Sacramento County and Folsom, construction noise is exempt from 6:00 a.m. to 8:00 p.m. on weekdays and 8:00 a.m. to 8:00 p.m. on weekends. If construction were to occur outside of these periods, activities would be required to comply with exterior and interior noise limits at residential receptors, as summarized in Table 4. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA. A variance may be applied for if noise levels are expected to exceed these limits.

Table 4: Noise Ordinance Standards (Placer County)*

	Noise Levels Not To Be Exceeded in Residential Zone (dBA)**	
Sound Level Descriptor	**7 a.m. to 10 p.m. (daytime)**	**10 p.m. to 7 a.m. (nighttime)**
Hourly L_{eq}	55	45
Any Period of Time (L_{max})	70	65

*Construction Noise Exemption Times: 6:00 a.m. – 8:00 p.m. Weekdays
8:00 a.m. – 8:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times
SOURCE: Placer County Code, Chapter 9.36.

1.5.4 El Dorado County

The County of El Dorado Noise Element is contained within Chapter 6.5 of the El Dorado County General Plan. El Dorado County uses hourly L_{eq} in order to categorize noise disturbance, but further regulates noise according to land use zone, and applies different noise standards to each zone. construction noise exempt times include 7:00 a.m. to 7:00 p.m. on weekdays and 8:00 a.m. to 5:00 p.m. on weekends and holidays. If construction were to occur outside of these periods, activities would be required to comply with exterior noise limits at residential receptors, as summarized in Table 5. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA. A variance may be applied for of noise levels are expected to exceed these limits, and would require noise monitoring. El Dorado County adds an hourly evening L_{eq} between 7:00 p.m. to 10:00 p.m. As shown in Table 5, the evening L_{eq} takes the last 3 hours from a daytime L_{eq} and applies a different criterion to it. In addition to adding an evening standard, community and rural districts are split and given distinct criteria. A 5 dBA reduction in all noise level limits will be applied for impulse noise.

Tables 6, 7 and 8 categorize separate zones and the construction noise standards that apply to each of the regions and the planned land use in each region. Table 6 refers to areas that are community regions or adopted plan areas. Table 7 refers to areas that are designated as rural centers. Table 8 refers to areas that are rural regions. According to Policy 6.5.1.12 of the El Dorado County General Plan, at outdoor activity areas of residential use, if the existing or projected future traffic levels are less than 60 dBA L_{dn} and there is going to be more than a 5 dBA L_{dn} increase in level from new traffic, this is considered significant. If the levels are or will be between 60 and 65 dBA L_{dn}, a 3 dBA L_{dn} increase or more is considered significant, and, finally, if the levels are or will be greater than 65 dBA L_{dn}, an increase of 1.5 dBA L_{dn} or more is considered significant. Increases in the L_{dn} that are greater than this will pose a problem and construction will need to be reassessed. Ambient noise level increases of more than 5 dBA will be deemed a nuisance if the ambient noise level is in accordance to Table 5. If the ambient noise level is not in accordance with Table 6, then only a 3 dBA increase is allowed.

Table 5. Noise Level Performance Protection Standards For Noise Sensitive Land Uses Affected by Non-Transportation Sources (El Dorado County)*

Noise Level Descriptor	Noise Levels Not To Be Exceeded in Residential Zones (dBA)**					
	7 a.m. - 7 p.m. (daytime)		7 p.m. - 10 p.m. (evening)		10 p.m. - 7 a.m. (nighttime)	
	Community	Rural	Community	Rural	Community	Rural
Hourly L_{eq}	55	50	50	45	45	40
Any Period of Time (L_{max})	70	60	60	55	55	50

*Construction Noise Exemption Times: 7:00 a.m. – 7:00 p.m. Weekdays
8:00 a.m. – 5:00 p.m. Weekends/Holidays

**5 dBA reduction for impact noise during non-exempt times

SOURCE: El Dorado County General Plan, Chapter 6.5.

Table 6. Maximum Allowable Noise Exposure For Non-Transportation Noise Sources In Community Regions and Adopted Plan Areas - Construction Noise (El Dorado County)**

Land Use Designation	Time Period	Noise Level (dBA)** L_{eq}	Noise Level (dBA)** L_{max}
Higher-Density Residential	7 a.m. - 7 p.m.	55	75
	7 p.m. - 10 p.m.	50	65
	10 p.m. - 7 a.m.	45	60
Commercial and Public Facilities	7 a.m. - 7 p.m.	70	90
	7 p.m. - 7 a.m.	65	75
Industrial	Any Time	80	90

Table 7. Maximum Allowable Noise Exposure For Non-Transportation Noise Sources In Rural Centers - Construction Noise (El Dorado County)*

Land Use Designation	Time Period	Noise Level (dBA)** L_{eq}	Noise Level (dBA)** L_{max}
All Residential	7 a.m. - 7 p.m.	55	75
	7 p.m. - 10 p.m.	50	65
	10 p.m. - 7 a.m.	40	55
Commercial, Recreation, and Public Facilities	7 a.m. - 7 p.m.	65	75
	7 p.m. - 7 a.m.	60	70
Industrial	Any Time	70	80
Open Space	7 a.m. - 7 p.m.	55	75
	7 p.m. - 7 a.m.	50	65

Table 8. Maximum Allowable Noise Exposure For Non-Transportation Noise Sources In Rural Regions - Construction Noise (El Dorado County)*

Land Use Designation	Time Period	Noise Level (dBA)** L_{eq}	Noise Level (dBA)** L_{max}
All Residential	7 a.m. - 7 p.m.	55	75
	7 p.m. - 10 p.m.	50	6
	10 p.m. - 7 a.m.	40	55
Commercial, Recreation, and Public	7 a.m. - 7 p.m.	65	75

Facilities	7 p.m. - 7 a.m.	60	70
Rural Land, Natural Resources, Open Space and Agricultural Land	7 a.m. - 7 p.m.	70	80
	7 p.m. - 7 a.m.	55	75

1.5.5 Wildlife Noise Criteria

Potential noise-sensitive biological receptors were identified by project biologists within a five-mile radius of the project site. Eight potential sites were identified: all are nesting or rookery habitat for four bird species. These include the tri-colored blackbird (*Agelaius tricolor*), great egret (*Casmerodius albus*), great blue heron (*Ardea herodias*), and white-tailed kite (*Elanus leucurus*).

Noise criteria for these species have not been designated. The Draft Comprehensive Species Management Plan for the least Bell's vireo evaluated the potential for masking of least Bell's vireo (*Vireo bellii pusillus*) song by traffic noise and recommended that continuous noise levels above 60 dBA L_{eq} within habitat areas may affect the suitability of habitat use by least Bell's vireo (SANDAG 1988). Since then, many regulatory agencies recommend the use of 60 dBA L_{eq} hourly levels to be considered a significant impact for sensitive bird species at the edge of suitable habitat.

In the absence of species specific criteria, the 60 dBA L_{eq} will be used to determine noise impacts on wildlife.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries and U.S. Fish and Wildlife Service (USFWS) have agreed upon the use of interim criteria for injury to fish from pile driving or blasting. The current thresholds for injury are 206 dB peak, 187 dB cumulative SEL for fish greater than 2 grams, and 183 dB cumulative SEL for fish less than 2 grams. The current threshold for disturbance is 150 dB RMS.

1.5.6 Assessment Criteria

In order to determine the noise effects of the project, the closest jurisdiction with the most restrictive noise level guidelines will be used as the construction noise level criterion threshold for most project-related activities on human sensitive receptors. For the purpose of this project, the City of Folsom's noise standards will be followed because it is the closest jurisdiction with the most restrictive noise ordinance. Project compliance with City of Folsom standards will guarantee project compliance with all relevant ordinances.

Where construction activities would be conducted outside of the City of Folsom construction noise exempt times, then the exterior noise standards limits are used to determine level of effect. In the event the measured ambient noise level exceeds the applicable noise level standard in Table 2, the applicable standard shall be adjusted so as to equal the ambient noise level. If the ambient noise level is above 50 dBA, then this becomes the new standard at each individual noise-sensitive receptor.

The 60 dBA L_{eq} will be used to determine noise impacts on birds and the noise impacts on fish will be addressed qualitatively.

1.6 Existing Noise Environment

The proposed project would be located in City of Folsom on the south side of Folsom Lake. The proposed project area would be located southeast of the Folsom Dam, east of American River and northwest of Folsom Point. There are four proposed staging areas:

- the MIAD disposal area
- the Dike 7 staging area northeast of the intersection of Folsom Lake Crossing and East Natoma Street
- the Overlook Staging Area located directly west of the proposed spur dike
- The Prison Staging Area located southeast of Folsom Lake Crossing and north of Folsom Prison Road and just east of the American River.

Folsom State Prison is located south of the proposed project area. The haul road, which would be used to transport material from the approach channel to disposal areas, runs east from the proposed project area along the edge of Folsom Lake to the MIAD disposal site. The haul road comes within less than 1,000 feet of houses located along Mountain View Drive and Elvie Lane and runs just south of Folsom Point. Several residential areas within the project vicinity may be affected by noise from approach channel excavation, spur dike construction, transload facility construction and removal, staging area operations, blasting and traffic.

1.6.1 Noise-Sensitive Receptors

Noise-sensitive receptors are defined as areas where there is a reasonable degree of sensitivity to noise. These areas include human dwellings, hospitals, schools, churches or libraries. Wildlife may also be sensitive to noise, and certain types of habitat, such as nesting areas for migratory or special status birds, may be considered noise-sensitive receptors.

There are several areas within the City of Folsom that are classified as noise-sensitive receptors. These include:

- Folsom State Prison. The prison is located approximately 2,700 feet south of proposed approach channel excavation activities, 2,300 feet west of the proposed Dike 7 staging area, and is considered a residential area.
- A residential neighborhood located approximately 5,700 feet west of proposed approach channel excavation activities and the Overlook staging area. The residential community is an apartment complex located west of American River and east of the Folsom Auburn Road and Pierpoint Circle intersection.
- A large neighborhood that stretches from the western intersection of Briggs Ranch Drive and East Natoma Street to the intersection of Green Valley Road and East Natoma Street. Residences in this neighborhood are located approximately 3,700 feet south of proposed approach channel excavation activities, 1,000 feet south of the Dike 7 staging area, and approximately 600 feet south of the MIAD disposal and staging areas.

- Several residences scattered throughout the area located immediately west of Folsom Point and Folsom Lake Crossing. These single-family residences are located within 500 feet of the haul road and 400 feet of the Dike 7 Staging Area. The closest residences to the proposed approach channel excavation activities are located at the western end of Mountain View Drive and the western end of Lorena Lane. These residences are located approximately 3,300 feet southeast of proposed approach channel excavation activities.
- Recreationists using Folsom Point. The park is located approximately 4,800 feet southeast of proposed approach channel excavation activities and within 500 feet of the proposed Dike 7 staging area and MIAD disposal area. Folsom Point is a day-use facility that closes at sunset.
- A residential community located approximately 8,000 feet southeast of proposed approach channel excavation activities and across the street from the MIAD disposal and staging areas. This community is located at the northeast corner of Green Valley Road and East Natoma Street.
- Two residences located directly southwest of the boundary of the proposed MIAD staging area. These homes are located at the northeast corner of Briggs Ranch Drive and East Natoma Street. The nearest residence is located approximately 300 feet southwest of the MIAD staging area.

Within Placer County, the Beals Point campground is located about 8,600 feet northwest of proposed approach channel excavation activities. This park is located east of where State Rec Area Road and Beals Point intersect.

The only sensitive receptors in El Dorado County that could be affected by construction noise are located in a community along Agora Way, Shadowfax Lane and Shadowfax Court. This community is approximately 2,500 feet east from the MIAD disposal area and 10,500 feet from proposed approach channel excavation activities.

Wildlife Receptors. As discussed in section 1.5.5, eight potential sensitive sites for wildlife were identified within five miles of proposed approach channel excavation activities; all are protected habitat for nesting birds. Habitats for the tri-colored blackbird are found at three locations, that are over 2 miles from proposed approach channel excavation activities to the south, southeast, and northwest, respectively. The great egret habitat is located over 4 miles southwest of proposed approach channel excavation activities. Habitat for the great blue heron is found approximately 5,000 feet west of proposed approach channel excavation activities and approximately 1,500 feet west of the proposed Prison Staging Area. This is the closest sensitive bio-receptor. White-tailed kite habitats are located over 1.8 miles to the southwest and southeast from proposed approach channel excavation activities.

1.6.2 Construction Noise Levels

Construction noise levels have the ability to affect surrounding communities and residences if proper mitigation procedures are not taken. Table 9 displays the equipment levels found in the Roadway Construction Noise Model's (RCNM) User Guide (FHWA RCNM, Version 1.0 User's Guide). The noise sources descend from highest sound level, which is an impact pile driver, to a refrigerator unit. The column on the right shows the distance at which the piece of equipment will fall to the criterion level. The “Actual Measured L_{max} at 50 feet” is used to calculate this distance unless it reads “N/A”. If the table reads “N/A”, then the specifications (Spec. 721.560) taken from the “Big Dig” in Boston are used. The “Big Dig” was a large Central Artery/Tunnel Project that utilized many types of construction equipment. During the construction of the project, noise measurements were conducted to see how much noise many of the project components were generating.

Table 9. RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Acoustical Usage Factor	Spec. 721.560 Lmax @ 50ft (dBA, slow)	Actual Measured Lmax @ 50ft (dBA, slow) samples avg.	Number of Actual Data Samples (Count)	Distance At Which Level = 50 dBA (45 dBA impact) (in feet)	Distance At Which Level = 45 dBA (40 dBA impact) (in feet)
Impact Pile Driver**	20	95	101	11	31,548	56,101
Vibratory Pile Driver	20	95	101	44	17,741	31,548
Sand Blasting (single nozzle)	20	85	96	9	9,976	17,741
Sheers (on backhoe)	40	85	96	5	9,976	17,741
Hydra Break Ram**	10	90	N/A	0	8,891	15,811
Mounted Impact Hammer (hoe ram)**	20	90	90	212	8,891	15,811
Jackhammer**	20	85	89	133	7,924	14,092
Clam Shovel (dropping)**	20	93	87	4	6,295	11,194
Blasting**	50	85	N/A	0	5,000	8,891
Concrete Saw	20	90	90	55	5,000	8,891
Pavement Scarifier	20	85	90	2	5,000	8,891
Vibrating Hopper	50	85	87	1	3,540	6,295
All Other Equipment > 5 HP	50	85	N/A	0	2,812	5,000
Compressor (air)	50	85	N/A	0	2,812	5,000
Generator(<25KVA, VMS Signs)	50	85	N/A	0	2,812	5,000
Grader	40	85	N/A	0	2,812	5,000
Horizontal Boring Hydraulic Jack	50	85	N/A	0	2,812	5,000
Pneumatic Tools	50	85	85	90	2,812	5,000

Table 9. RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Acoustical Usage Factor	Spec. 721.560 Lmax @ 50ft (dBA, slow)	Actual Measured Lmax @ 50ft (dBA, slow) samples avg.	Number of Actual Data Samples (Count)	Distance At Which Level = 50 dBA (45 dBA impact) (in feet)	Distance At Which Level = 45 dBA (40 dBA impact) (in feet)
Vacuum Excavator (Vac-Truck)	40	85	85	149	2,812	5,000
Auger Drill Rig	20	85	84	36	2,506	4,456
Chain Saw	20	85	84	46	2,506	4,456
Flat Bed Truck	40	84	N/A	0	2,506	4,456
Rivet Buster/Chipping Gun**	20	85	79	19	2,506	4,456
Scraper	40	85	84	12	2,506	4,456
Tractor	40	84	N/A	0	2,506	4,456
Boring Jack Power Unit	50	80	83	1	2,233	3,972
Concrete Batch Plant	15	83	N/A	0	2,233	3,972
Gradall	40	85	83	70	2,233	3,972
Warning Horn	5	85	83	12	2,233	3,972
Dozer	40	85	82	55	1,991	3,540
Grapple (on backhoe)	25	80	82	6	1,991	3,540
Vacuum Street Sweeper	10	80	82	19	1,991	3,540
Concrete Pump Truck	20	82	81	30	1,774	3,155
Crane	16	85	81	405	1,774	3,155
Excavator	40	85	81	170	1,774	3,155
Generator	50	82	81	19	1,774	3,155
Pumps	50	77	81	17	1,774	3,155
Rock Drill	20	85	81	3	1,774	3,155
Bar Bender	20	80	N/A	0	1,581	2,812
Drum Mixer	50	80	80	1	1,581	2,812
Roller	20	85	80	16	1,581	2,812
Slurry Trenching Machine	50	82	80	75	1,581	2,812
Soil Mix Drill Rig	50	80	N/A	0	1,581	2,812

Table 9. RCNM Default Noise Emission Reference Levels and Usage Factors

Equipment Description	Acoustical Usage Factor	Spec. 721.560 Lmax @ 50ft (dBA, slow)	Actual Measured Lmax @ 50ft (dBA, slow) samples avg.	Number of Actual Data Samples (Count)	Distance At Which Level = 50 dBA (45 dBA impact) (in feet)	Distance At Which Level = 45 dBA (40 dBA impact) (in feet)
Vibratory Concrete Mixer	20	80	80	1	1,581	2,812
Concrete Mixer Truck	40	85	79	40	1,409	2,506
Drill Rig Truck	20	84	79	22	1,409	2,506
Front End Loader	40	80	79	96	1,409	2,506
Ventilation Fan	100	85	79	13	1,409	2,506
Backhoe	40	80	78	372	1,256	2,233
Compactor (ground)	40	80	78	18	1,256	2,233
Slurry Plant	100	78	78	1	1,256	2,233
Paver	50	85	77	9	1,119	1,991
Dump Truck	40	84	76	31	998	1,774
Man Lift	20	85	75	23	889	1,581
Pickup Truck	40	55	75	1	889	1,581
Welder/Torch	40	73	74	5	792	1,409
Refrigerator Unit	100	82	73	3	706	1,256

1.6.3 Ambient Noise Survey

An ambient noise level survey was conducted between March 24 and March 26, 2009 in the project area to characterize existing noise conditions. The survey consisted of short-term (l0 minutes) and long-term measurements (24-hours) at noise-sensitive receptors and wildlife habitats. Weather conditions were consistent over the three days of noise monitoring. The temperature ranged from 55 degrees Fahrenheit at night to 75 degrees Fahrenheit during the day. Winds were mild to 6 or 7 miles per hour during noise monitoring. Long-term measurements were conducted using three Larson Davis Model 820 ANSI (American National Standards Institute) Type 1 Integrating Sound Level Meters (Serial Numbers 1527, 1528 and 1598). The sound level meters were bolted to trees, telephone poles or fences approximately five feet above the ground in order to approximate the height of the human ear. Short-term monitoring was conducted using a Bruel and Kjaer Model 2250 ANSI Type 1 Integrating Sound Level Meter (Serial Number 2672071). All sound level meters were calibrated before and after the measurement periods with a Larson Davis Model CAL200 calibrator (Serial Number

2794). All sound level measurements conducted by URS were in accordance with ISO 1996a, b, c.

The long-term and short-term measurement sites for human noise-sensitive receptors are summarized in Table 10 and Table 11, respectively. All long-term and short-term measurement sites are representative of single-family homes or communities near the project site. Table 12 shows measurement sites for wildlife receptors. These modeling locations were necessary for noise modeling purposes due to the residences being near proposed construction activities.

Table 10. Long-Term Measurement Sites

Site ID	Location
LT-2	Tacana Drive and East Natoma Street
LT-3	Mountain View Drive
LT-4	East Natoma Street and Green Valley Road
LT-5	Shadowfax Court
LT-6	East of Folsom Auburn Road and Pierpoint Circle

Table 11. Short-Term Measurement Sites

Site ID	Location
ST-2	Tacana Drive and East Natoma Street
ST-3	Mountain View Drive
ST-4	East Natoma Street and Green Valley Road
ST-5	Shadowfax Court
ST-6	East of Folsom Auburn Road and Pierpoint Circle
ST-7	Beals Point
ST-8	Folsom Point

Table 12. Noise Sensitive Wildlife Receptor Sites

Site ID	Location	Relevant Specie
Bio-1	Main Avenue and Sunset Avenue	Great Egret
Bio-2	5,000 Feet West of Proposed Excavation Site (near American River)	Great Blue Heron
Bio-3	Erwin Avenue and Snipes Boulevard (Snipes-Pershing Park)	White-Tailed Kite
Bio-4	South Lexington Drive and Oak Avenue Parkway	Tri-Colored Blackbird
Bio-5	Willow Bend Road and Grey Fox Court	White-Tailed Kite
Bio-6	Haddington Drive and East Natoma Street	Tri-Colored Blackbird
Bio-7	Sturbridge Drive and Stonemill Drive	White-Tailed Kite
Bio-8	Wellington Way and Grizzly Way	Tri-Colored Blackbird

1.6.4 Long-Term Site Monitoring

Five long-term measurements were conducted. Long-term data was not collected at the Folsom State Prison (LT-1) as prison security did not allow access to Prison property. In place of monitoring data for LT-1, construction noise levels were modeled at the prison on both the north and east sides of the prison in order to account for noise levels due to construction. Table 13 summarizes the long-term measurement site data for all other LT sites. The raw data for each long-term measurement site is provided in Appendix A-Noise.

Table 13. Long-Term Measurement Site Data

Site ID	Location	Start Date	Start Time	Hourly L_{eq} Range (dBA)	CNEL (dBA)
LT-2	Tacana Drive and E. Natoma St.	3/25/2009	17:00:00	51.5 - 69.4	71
LT-3	Mountain View Dr.	3/25/2009	15:00:00	32.8 - 50.9	50
LT-4	E. Natoma St. and Green Valley Rd.	3/24/2009	14:00:00	58.0 - 75.2	76
LT-5	Shadowfax Court	3/24/2009	13:00:00	34.1 - 57.5	51
LT-6	East of Folsom Auburn Rd. and Pierpoint Circle	3/24/2009	15:00:00	31.7 - 56.8	50

Hourly L_{eq}s ranged from 31.7 to 75.2 dBA and from 50 to 76 dBA CNEL depending on the location of the long-term measurement location.

1.6.5 Short-Term Site Monitoring

Eight short-term measurements were conducted during the day, evening and night for all of the corresponding long-term measurement sites except for LT-1, or Folsom State Prison, where no measurements were completed for security reasons. Each measurement lasted a total of 10 minutes. Short-term measurement Site 7 (ST-7) is located at Beals Point Campground. Beals Point Campground is located 8,600 feet northwest of the proposed Project area. Only daytime measurements could be completed here due to campground times. The campground is located on the west side of Lake Folsom. ST-8 is the measurement site located at Folsom Point. The haul road runs just south of Folsom Point. The proposed Dike 7 staging and MIAD disposal areas are located west and south of Folsom Point, respectively. The park is located approximately 4,800 feet southeast of proposed approach channel excavation activities. Daytime and evening measurements could only be completed due to the park being closed after 10:00 p.m. The data for all short-term measurements can be found in Appendix B.

1.6.6 Sensitive Wildlife Receptor Monitoring

Short-term day, evening, and night ambient noise level measurements were completed at eight noise-sensitive wildlife locations. Table 12 identifies the species as well as the location of each wildlife receptor site. The data for these locations can be found in Appendix C.

2.0 IMPACTS

2.1 Noise Prediction Model

Noise impacts for the proposed project are predicted using CadnaA for approach channel excavation, spur dike construction, transload facility construction and removal, and staging area activities. BNoise2 is used to model noise impacts from blasting. CadnaA is a Windows-based computer software modeling program that allows for the input of sound sources and their corresponding noise source output levels. CadnaA takes both topography and attenuation due to sound wave divergence into account in order to produce accurate results. BNoise2 is a computer software program that allows for the user to model blast noise sound levels over a specified range. BNoise2 generates results by taking both the type and amount of charge used when blasting is taking place.

Noise impacts due to proposed construction activities from Alternatives 2 and 3 are analyzed separately. The Microsoft Excel spreadsheet titled “Equipment Estimate Summary” provided by the USACE, dated October 24, 2011, is used in order to estimate the worst-case noise impact scenarios at human and wildlife noise-sensitive receivers during the year in which the noisiest construction activities would presumably occur for both Alternatives 2 and 3. A condensed version of the Equipment Estimate Summary for both Alternatives 2 and 3 can be found in Appendix D. Due to the vast amount of construction equipment and an indefinite construction phasing schedule listed on the Equipment Estimate Summary spreadsheet, if any individual construction activity that is listed to occur at all during any particular year, it is assumed that that particular construction activity could possibly occur at the same time as all other construction activities that may be conducted during that year. This helps provide the annual worst-case noise impact scenario that would occur sometime in between the years 2013 and 2017. Most construction activity is proposed to occur during construction noise exempt times, but since some individual construction activities may occur during nighttime hours, those nighttime activities are analyzed separately for both Alternatives 2 and 3. The noisiest activities for Alternative 2 would occur in 2017 and the noisiest construction activities for Alternative 3 would occur in 2013. The noisiest nighttime construction activities would occur in 2016 for both Alternatives 2 and 3.

Several assumptions are made regarding construction activities, not including blasting, and they include:

- Normal staging area construction operations include 2 dozers, 2 dump trucks and a batch plant at all four proposed staging areas for both Alternatives 2 and 3
- For both Alternatives 2 and 3, rock crushing activities would occur at either the MIAD staging area or at the overlook staging area and would not occur during non-exempt construction noise activities
- Potential non-exempt construction activities for both Alternatives 2 and 3 include the use of the batch plant; use of four 1500 cfm air compressors during “set up and operation of the bubble curtain and/or silt curtain”

construction activities; “dredging activities common to rock”; and “drill and shoot and dredging in-the-wet” activities

- Additional non-exempt construction activities for Alternative 3 only include ”common dredging below cofferdam” activities; and “dewatering behind cofferdam” activities
- For Alternative 2, the worst case annual noise construction level year is 2017, and there would be approximately 13,167 annual truck round-trips along the on-site haul road going to and from the MIAD and Dike 7 areas and spur dike construction area
- For Alternative 3, the worst case annual noise construction level year is 2013, and there would be approximately 8,960 annual truck round-trips along the on-site haul road going to and from the MIAD and the approach channel excavation area; 900 annual truck round-trips going to and from the transload facility and MIAD and Dike 7 areas, and 3,740 annual truck round-trips to move cofferdam cell fill material that would be assumed to be coming from the MIAD. The total annual truck round-trips along the on-site haul road in 2013 is 13,600
- Using the total number of annual truck round-trips along the on-site haul road for both Alternatives 2 and 3, there would be approximately 4.5 truck round-trips per day that will be used for modeling purposes

2.1.1 Construction Schedules and Durations for Alternatives 2 and 3

Construction of both Alternatives 2 and 3 would begin in mid-2013 and end in late 2017. Tables 14 and 15 provide a schedule for all construction activities listed in the Equipment Estimate Summary for Alternatives 2 and 3, respectively. The tables list construction activities and the years in which they may occur. Additional construction activities listed in the table, but not listed on the original provided Equipment Estimate Summary, include all four staging area construction activities; and on-site haul road usage going to and from the MIAD and Project site during approach channel excavation and spur dike construction; and on-site haul road usage going to and from the MIAD and transload facility during construction of the transload facility. There would only be one batch plant located at one of the four proposed staging areas. Batch plant operations have the potential to be conducted during non-exempt construction noise hours. All potential non-exempt construction noise activities are marked with an “asterisk”. Rock crushing activities would be conducted at either the MIAD staging area or Overlook staging area. In Tables 14 and 15, for each year, every construction activity is marked if it would occur at some time during that year.

For both Alternatives 2 and 3, blasting would take place in between February 2014 and August 2017. Blasting activities are not listed in Tables 14 and 15 because blast noise impacts are analyzed separately.

Table 14. Alternative 2 Proposed Construction Activities by Year

Construction Activity	2013	2014	2015	2016	2017
Site Prep / Haul Road Prep	X	X			
Construct Transload Facility	X				
Concrete Secant Pile Wall	X	X	X	X	
Cutoff Wall Concrete Placement	X	X	X	X	
Common Excavation to Waste	X				
MIAD Staging Area w/ Rock Crusher	X	X	X	X	X
MIAD Staging Area Batch Plant*	X	X	X	X	X
Dike 7 Staging Area	X	X	X	X	X
Dike 7 Staging Area Batch Plant*	X	X	X	X	X
Overlook Staging Area w/ Rock Crusher	X	X	X	X	X
Overlook Staging Area Batch Plant*	X	X	X	X	X
Prison Staging Area	X	X	X	X	X
Prison Staging Area Batch Plant*	X	X	X	X	X
On-Site Haul Road Usage to and From Excavation Site and MIAD***	X	X	X	X	X
On-Site Haul Road Usage for Construction of Transload Facility***	X				
Rock Excavation Dry		X			
Site Restoration Teardown		X			
Mobilization for Approach Walls			X		
Intake Approach Walls and Slab			X	X	X
Set up and Operate Bubble Curtain / Silt Curtain**			X		
Dredge Common to Rock*			X	X	
Drill and Shoot / Dredge Rock Wet*				X	X
Haul Road Prep and Spur Dike Stripping				X	
Import Material from Quarry to D1/D2 MIAD				X	X
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill					X
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap					X

Table 14. Alternative 2 Proposed Construction Activities by Year

Construction Activity	2013	2014	2015	2016	2017
Foundation Clean Up					X
Remove Transload Facility					X

*potential nighttime construction activity
**potential nighttime construction activity (four 1500 CFM compressors only)
***total SPL at a distance of 50 feet is 52.6 dBA L_{eq} from 4.5 haul truck round-trips along haul road

Table 15. Alternative 3 Proposed Construction Activities by Year

Construction Activity	2013	2014	2015	2016	2017
Mobilization for Cofferdam	X	X			
Construct Transload Facility	X				
Common Excavation Below Cofferdam	X				
Common Dredge Below Cofferdam*	X				
Construction of Sheet Pile Cells	X	X			
Fill Cells	X	X			
Set up and Operate Bubble Curtain / Silt Curtain**	X				
MIAD Staging Area w/ Rock Crusher	X	X	X	X	X
MIAD Staging Area Batch Plant*	X	X	X	X	X
Dike 7 Staging Area	X	X	X	X	X
Dike 7 Staging Area Batch Plant*	X	X	X	X	X
Overlook Staging Area w/ Rock Crusher	X	X	X	X	X
Overlook Staging Area Batch Plant*	X	X	X	X	X
Prison Staging Area	X	X	X	X	X
Prison Staging Area Batch Plant*	X	X	X	X	X
On-Site Haul Road Usage to and From Excavation Site and MIAD	X	X	X	X	X
On-Site Haul Road Usage for Construction of Transload Facility	X				
Dewater Behind Cofferdam*		X			
Site Restoration / Teardown		X			
Mobilization for Approach Walls			X		
Intake Approach Walls and Slab			X	X	X
Common Excavation to Waste			X	X	X
Rock Excavation Dry			X	X	X
Haul Road Prep and Spur Dike Stripping				X	

Table 15. Alternative 3 Proposed Construction Activities by Year

Construction Activity	2013	2014	2015	2016	2017
Import Material from Quarry to D1/D2 MIAD				X	X
Remove Cell Rubble Fill					X
Remove Sheets					X
Dredge Common to Rock*					X
Drill and Shoot / Dredge Rock Wet*					X
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill					X
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap					X
Foundation Clean Up					X
Remove Transload Facility					X

*potential nighttime construction activity
**potential nighttime construction activity (four 1500 CFM compressors only)

2.1.2 Areas of Construction Activity and Associated Noise Source Levels for Alternatives 2 and 3

Tables 14 and 15 list all of the construction activities that can be found on the Equipment Estimate Summary provided by the USACE for Alternatives 2 and 3. Appendix D provides a detailed breakdown of the equipment required for each activity. In Appendix D, under each construction activity, the quantity; horsepower; hours per day; duty cycle; total sound pressure levels (SPL) at 50 feet and sound power levels (PWL) for the quantity of individual types of equipment; and total SPLs at 50 feet and PWLs for all of the equipment combined for each construction activity are listed. Tables 16 and 17, below, present areas where the individual construction activities occur, along with the total combined SPL (at 50 feet) and PWL for all of the required construction equipment. The areas of designation for the construction activities are significant because these designated areas are where each individual construction activity are modeled. On-site haul road truck usage for both approach channel excavation/spur dike construction activities and transload facility construction activities have been combined into one activity in order to generate a worst case annual haul road round-trip SPL at 50 feet for all trips.

Table 16. Alternative 2 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction							Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
	Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road		
Site Prep / Haul Road Prep	X							93.0	127.6
Construct Transload Facility		X						91.6	126.2
Concrete Secant Pile Wall	X							89.1	123.7
Cutoff Wall Concrete Placement	X							82.1	116.7
Common Excavation to Waste	X							90.5	125.1
MIAD Staging Area w/ Rock Crusher			X					88.0	122.6
MIAD Staging Area Batch Plant*			X					83.0	117.6
Dike 7 Staging Area				X				86.4	121.0
Dike 7 Staging Area Batch Plant*				X				83.0	117.6
Overlook Staging Area w/ Rock Crusher					X			88.0	122.6
Overlook Staging Area Batch Plant*					X			83.0	117.6
Prison Staging Area						X		86.4	121.0
Prison Staging Area Batch Plant*						X		83.0	117.6
All On-Site Haul Road Usage***							X	52.6	n/a
Rock Excavation Dry	X							91.2	125.8

Table 16. Alternative 2 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction							Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
	Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road		
Site Restoration Teardown	X							92.5	127.0
Mobilization for Approach Walls	X							89.7	124.3
Intake Approach Walls and Slab	X							84.9	119.5
Set up and Operate Bubble Curtain / Silt Curtain**	X							93.1	127.7
Dredge Common to Rock*	X							96.0	130.6
Drill and Shoot / Dredge Rock Wet*	X							96.4	131.0
Haul Road Prep and Spur Dike Stripping	X							89.3	123.9
Import Material from Quarry to D1/D2 MIAD	X							90.6	125.2
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill	X							88.7	123.3
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap	X							84.1	118.7

Table 16. Alternative 2 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction: Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road	Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
Foundation Clean Up	X							96.0	130.6
Remove Transload Facility		X						91.6	126.2

*potential nighttime activity
**potential nighttime activity (four 1500 CFM compressors only)
***total SPL @ 50 feet is 52.6 dBA Leq from 4.5 haul truck round-trips along haul road (calculated using FHWA model)

Table 17. Alternative 3 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction: Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road	Total SPL @ 50 Feet per Constructio n Activity (dBA L_{eq})	Total PWL per Constructio n Activity (dBA L_{eq})
Mobilization for Cofferdam	X							93.2	127.8
Construct Transload Facility		X						91.6	126.2
Common Excavation Below Cofferdam	X							90.4	124.9
Common Dredge Below Cofferdam*	X							96.8	131.4
Construction of Sheet Pile Cells	X							101.7	136.3
Fill Cells	X							102.2	136.8

Table 17. Alternative 3 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction							Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
	Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road		
Set up and Operate Bubble Curtain / Silt Curtain**	X							92.8	127.4
MIAD Staging Area w/ Rock Crusher			X					88.0	122.6
MIAD Staging Area Batch Plant*			X					83.0	117.6
Dike 7 Staging Area				X				86.4	121.0
Dike 7 Staging Area Batch Plant*				X				83.0	117.6
Overlook Staging Area w/ Rock Crusher					X			88.0	122.6
Overlook Staging Area Batch Plant*					X			83.0	117.6
Prison Staging Area						X		86.4	121.0
Prison Staging Area Batch Plant*						X		83.0	117.6
All On-Site Haul Road Usage***							X	52.6	n/a
Dewater Behind Cofferdam*	X							95.9	130.4
Site Restoration / Teardown	X							92.5	127.0
Mobilization for Approach Walls	X							89.7	124.3
Intake Approach Walls and Slab	X							84.9	119.5

Table 17. Alternative 3 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction							Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
	Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road		
Common Excavation to Waste	X							92.7	127.3
Rock Excavation Dry	X							91.1	125.7
Haul Road Prep and Spur Dike Stripping	X							89.3	123.9
Import Material from Quarry to D1/D2 MIAD	X							90.6	125.2
Remove Cell Rubble Fill	X							87.7	122.3
Remove Sheets	X							94.4	128.9
Dredge Common to Rock*	X							96.0	130.6
Drill and Shoot / Dredge Rock Wet*	X							96.3	130.9
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill	X							89.0	123.6
Rehandle All Imported Material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap	X							84.1	118.7

Table 17. Alternative 3 Areas of Construction Activity and Associated Noise Source Levels

Construction Activity	Area of Construction							Total SPL @ 50 Feet per Construction Activity (dBA L_{eq})	Total PWL per Construction Activity (dBA L_{eq})
	Approach Channel / Spur Dike	Transload Facility	MIAD Staging Area	Dike 7 Staging Area	Overlook Staging Area	Prison Staging Area	Haul Road		
Foundation Clean Up	X							96.0	130.6
Remove Transload Facility		X						91.2	125.8

*potential nighttime construction activity
**potential nighttime construction activity (four 1500 CFM compressors only)
***total SPL @ 50 feet is 52.6 dBA L_{eq} from 4.5 haul truck round-trips along haul road (calculated using FHWA model)

For both alternatives, the most, and noisiest, construction activities are being conducted at the approach channel excavation and spur dike construction areas. Noise generated by haul road trips is the construction activity that generates the least amount of noise because the trucks are going at a relatively low speed and they only briefly pass by noise-sensitive receptors.

2.2 Noise Prediction model Method for construction activities

Tables 14 through 17 are used to calculate total combined sound power levels for all of the construction activities that are taking place in distinct areas of the overall proposed Project area. These total combined sound power levels for distinct areas are used for the CadnaA model as a worst case year construction noise level scenario. For example, Table 14 identifies the years in which all construction activities would be conducted for Alternative 2. Table 15 identifies the specific areas where the construction activities for Alternative 2 would be conducted along with the combined total sound pressure levels (SPLs) at 50 feet and sound power levels (PWLs) for each construction activity. Referring to Table 14, there are a total of 16 total construction activities that would be conducted during 2017. By cross-referencing Tables 14 and 16, it is found that six of those construction activities would be conducted near the approach channel excavation and spur dike construction area in 2017. The PWLs found in Table 16 for those six construction activities are then summed up to generate a total PWL for the approach channel excavation and spur dike construction area. In 2017, and for Alternative 2, the acoustic power level for all construction activities being conducted at the approach channel excavation and spur dike construction area is 134.9 dBA PWL. This process is carried out for both Alternatives 2 and 3 for the following designated construction areas in order find the year with the worst-case noise generating scenario due to construction:

- Approach Channel Excavation and Spur Dike Construction Area
- Transload Facility Construction and Removal Area
- MIAD Staging Area
- Dike 7 Staging Area
- Overlook Staging Area
- Prison Staging Area
- Haul Road

Blast noise and off-site traffic noise due to construction is analyzed separately from the rest of on-site construction activities listed in Tables 14 through 17.

2.2.1 Noise Prediction Model Inputs for Construction Activities Conducted During Construction Noise Exempt Hours for Alternatives 2 and 3

Tables 18 and 19 list the combined PWLs for all of the construction equipment for activities being conducted during daytime hours at each respective construction area by year. Construction activities would be conducted from year 2013 through 2017 at the approach channel excavation and spur dike construction area. Transload facility construction occurs in 2013 and removal of the transload facility occurs in 2017. Rock crushing would only occur at either the MIAD or overlook staging area, but not at both.

Haul road round-trips cannot be assigned a PWL because traffic noise is measured by the sound pressure level (SPL) at 50 feet.

Table 18. Alternative 2 Total Combined PWL for Each Area of Construction by Year (dBA)

Area of Construction	2013	2014	2015	2016	2017
Approach Channel / Spur Dike	130.7	132.4	133.7	134.8	134.9
Transload Facility	126.2	0.0	0.0	0.0	126.2
MIAD Staging Area w/ Rock Crusher	122.6	122.6	122.6	122.6	122.6
Dike 7 Staging Area	121.0	121.0	121.0	121.0	121.0
Overlook Staging Area w/ Rock Crusher	122.6	122.6	122.6	122.6	122.6
Prison Staging Area	121.0	121.0	121.0	121.0	121.0
Haul Road*	n/a	n/a	n/a	n/a	n/a

*noise due to on-site haul road round-trips is analyzed using FHWA Model that generated SPLs

Table 19. Alternative 3 Total Combined PWL for Each Area of Construction by Year (dBA)

Area of Construction	2013	2014	2015	2016	2017
Approach Channel / Spur Dike	140.7	140.3	131.0	132.0	137.9
Transload Facility	126.2	0.0	0.0	0.0	126.2
MIAD Staging Area w/ Rock Crusher	122.6	122.6	122.6	122.6	122.6
Dike 7 Staging Area	121.0	121.0	121.0	121.0	121.0
Overlook Staging Area w/ Rock Crusher	122.6	122.6	122.6	122.6	122.6
Prison Staging Area	121.0	121.0	121.0	121.0	121.0
Haul Road*	n/a	n/a	n/a	n/a	n/a

*noise due to on-site haul road round-trips is analyzed using FHWA Model that generated SPLs

Table 18 confirms that construction activities during year 2017 would generate the highest levels of noise associated with Alternative 2, and Table 19 confirms that construction activities during year 2013 would generate the highest levels of noise associated with Alternative 3. Construction activities conducted outside of construction noise exempt hours are analyzed and modeled separately from the rest of construction activities because most of them will be limited in scope and size compared to the rest of the construction activities.

In the CadnaA model, “area sources” are input near the general vicinity of where the proposed area of construction would be conducted. The area sources are input into the CadnaA model with the overall PWL found under the year 2017 column for each respective construction activity in order to generate a worst-case scenario from noise due to construction. Using Alternative 2, for example, in the vicinity of the approach channel excavation and spur dike construction area, an area source is input into the CadnaA model that has a PWL of 134.9 dBA and an area source with a PWL of 126.2 dBA is input into the model where the transload facility would be located. The same goes for the four staging areas and their respective PWLs. Table 20 displays the general octave band spectrum for diesel engines that is used to input area sources in the CadnaA model. This octave band spectrum originates from the octave band spectrum for an articulated 40 ton truck found in the 2009 Early Approach Channel Excavation EA/IS (Corps, 2009). Each octave band level is increased in order to reflect the overall PWL for each area of construction in the CadnaA model. For example, each octave band level is increased 29.9 dBA for approach channel excavation and spur dike construction (134.9 – 105 = 29.9) using the numbers in Table 19 in order to make up for the difference in overall PWLs. Then, those respective octave band levels are input into the CadnaA model for each respective area source.

Table 20. PWL for Area Sources Input into the CadnaA Model (dBA)

Noise Source	Sound Power Levels (dB)								
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Overall Level (dBA)
40 TN Articulated Trucks*	102	108	106	101	100	97	91	82	105

*octave band levels are increased for area sources in order to make up for differences in overall PWLs

There is also a haul road that runs from the approach channel excavation and spur dike construction area to the MIAD staging and disposal areas. Inputs for roadways into the CadnaA model are different than area sources. A road source is input into the CadnaA model using nine trucks going at a speed of 10 mph; and then the road source is calibrated to match the output of the FHWA which calculated out to an SPL of 52.6 dBA L_{eq} at a distance of 50 feet.

2.2.2 Noise Prediction Model Inputs for Construction Activities Conducted During Non-Exempt Hours for Alternative 2

There are several construction activities that have the potential to be conducted during non-exempt hours. Batch plant operations; “dredging activities common to rock”; “drill and shoot and dredging in-the-wet” activities, and the operation of four 1500 cfm compressors during set up and operation of the bubble curtain or silt curtain are all potential activities that may be conducted during non-exempt construction noise hours. Table 21 lists the calculated area source PWLs for all potential nighttime activities for Alternative 2. As stated in the previously mentioned assumptions, there would be only one batch plant used during construction of the Project, but the location of the batch plant has not been determined. For the purpose of analysis of noise impacts for the noise model, the batch plant was modeled at each individual staging area during non-exempt hours in order to see which locations provided the lowest and highest levels of noise exposure during non-exempt construction noise hours. For Alternative 2, a worst-case scenario for activity during non-exempt hours would occur in year 2016 when nighttime batch plant operations and “drill and shoot and dredging of rock in-the-wet” activities are being conducted. “Dredging activities common to rock” could also occur in 2016, but according to the dates listed in the Equipment Estimate Summary that was provided by the USACE, “dredging activities common to rock” and “drill and shoot and dredging rock in-the-wet” activities would occur consecutively; and the noise models assumed that they would not occur simultaneously during non-exempt construction hours.

Table 21. Alternative 2 Proposed Construction Areas and PWLs for Potential Non-Exempt Construction Hour Activities by Year (dBA)

Construction Activity	Area of Construction	2013	2014	2015	2016	2017
Batch Plant	MIAD Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Dike 7 Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Overlook Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Prison Staging Area	117.6	117.6	117.6	117.6	117.6
Dredge Common to Rock	Approach Channel / Spur Dike	n/a	n/a	130.6	130.6	n/a
Drill and Shoot / Dredge Rock Wet	Approach Channel / Spur Dike	n/a	n/a	n/a	131.0	131.0
Set up and Operate Bubble Curtain / Silt Curtain (four 1500 CFM Compressors Only)	Approach Channel / Spur Dike	n/a	n/a	110.4	n/a	n/a

For Alternative 2, in reference to Table 21, the noisiest construction activity that would be conducted outside of construction noise exempt hours would be “drill and shoot and dredging rock in-the-wet” activities in 2016.

2.2.3 Noise Prediction Model Inputs for Construction Activities Conducted During Non-Exempt Hours for Alternatives 3

Table 22 lists the calculated area source PWLs for all potential non-exempt construction hour activities for Alternative 3. For Alternative 3, a worst-case scenario for noise generated by construction activities conducted outside of construction noise exempt hours occurs in year 2013 when batch plant operations and “common dredging below cofferdam" activities are being conducted. This is the highest noise generating construction activity for Alternative 3. Both "dredging common to rock" and "drill and shoot/dredging rock in-the-wet" activities occur in 2017, but it is assumed that these two activities would occur consecutively. Therefore, for Alternative 3, the worst-case year for non-exempt construction noise levels generated by construction activities would occur when batch plant operations and "common dredging below cofferdam" activities are conducted simultaneously in year 2013.

Table 22. Alternative 3 Proposed Construction Areas and PWLs for Potential Non-Exempt Construction Hour Activities by Year (dBA)

Construction Activity	Area of Construction	2013	2014	2015	2016	2017
Batch Plant	MIAD Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Dike 7 Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Overlook Staging Area	117.6	117.6	117.6	117.6	117.6
Batch Plant	Prison Staging Area	117.6	117.6	117.6	117.6	117.6
Dewater Behind Cofferdam	Approach Channel / Spur Dike	n/a	130.4	n/a	n/a	n/a
Dredge Common to Rock	Approach Channel / Spur Dike	n/a	n/a	n/a	n/a	130.6
Drill and Shoot / Dredge Rock Wet	Approach Channel / Spur Dike	n/a	n/a	n/a	n/a	130.9
Common Dredge Below Cofferdam	Approach Channel / Spur Dike	131.4	n/a	n/a	n/a	n/a
Set up and Operate Bubble Curtain / Silt Curtain (four 1500 CFM Compressors Only)	Approach Channel / Spur Dike	110.4	n/a	n/a	n/a	n/a

For Alternative 3, in reference to Table 22, the noisiest construction activity that would be conducted outside of construction noise exempt hours would be "common dredging below the cofferdam" activities in 2013. This is the worst-case scenario for construction activities conducted during non-exempt construction noise hours.

2.3 Noise Prediction Model Results

For both Alternatives 2 and 3, worst-case scenarios due to construction activities during construction noise exempt hours were input into the noise model in order to obtain noise levels at long-term (LT-X), short-term (ST-X), modeled (MR-X), and wildlife receivers (Bio-X). MR-1a, MR1b, MR-9 and MR-10 are modeled noise-sensitive receivers. MR-1a is a modeled noise-sensitive receiver located on the north end of Folsom Prison and MR-1b is a modeled noise-sensitive receiver located on the east end of Folsom Prison. MR-9 is located at the eastern-most single-family residence that is located immediately southwest of the MIAD staging area and north of the intersection of Briggs Ranch Drive and East Natoma Street. MR-10 is located at the western end of Lorena Lane and immediately southeast of the Dike 7 staging area. These noise modeling locations are utilized because ambient noise level measurements were not conducted at these locations and, due to the activities at the Dike 7 and MIAD staging areas, it is important to know what type of noise would be generated by construction equipment at the noise modeling locations. The noise levels at the noise-sensitive receivers have been compared to the measured ambient noise levels to see if there would be noise impacts. The same process was also conducted for blasting and construction activities conducted outside of construction noise exempt hours for both Alternatives 2 and 3.

2.3.1 Noise Prediction Model Results for Alternative 2 during Construction Noise Exempt Hours

Under Alternative 2, the worst-case scenario is 2017 as the result of noise levels generated by construction activities during exempt hours. The area sources, and their respective PWLs, found in Table 18, are input into the CadnaA model to generate noise levels at ST, LT, MR, and Bio noise-sensitive sites. The noise contours generated by CadnaA for construction activities conducted during 2017 for Alternative 2 can be found in the DEIS/EIR. Table 23 displays the resulting L_{eq} values at each noise-sensitive receiver. The City of Folsom uses the L_{50} metric as its baseline noise criterion, but comparing the L_{eq} with the L_{50} results is a conservative model because L_{eq} values are always higher than L_{50} values.

Table 23. Measured Ambient Noise Levels and Noise Levels Due to Construction Activities for Alternative 2 in 2017

Site ID	Modeled Noise Level Due to Construction Activities (dBA L_{eq})	L_{50} (ambient noise level in dBA from 7:00 to 18:00 for LTs and daytime L_{50} for Bio and ST)
MR-1a	49	n/a
MR-1b	47	n/a
LT-2	55	66

Table 23. Measured Ambient Noise Levels and Noise Levels Due to Construction Activities for Alternative 2 in 2017

Site ID	Modeled Noise Level Due to Construction Activities (dBA	L_{50} (ambient noise level in dBA from 7:00 to 18:00 for LTs and daytime L_{50} for Bio
LT-3	64	46
LT-4	52	73
LT-5	45	45
LT-6	48	47
ST-7	49	43
ST-8	58	40
MR-9	57	n/a
MR-10	61	n/a
Bio-1	30	42
Bio-2	46	49
Bio-3	34	42
Bio-4	40	51
Bio-5	44	49
Bio-6	46	51
Bio-7	36	41
Bio-8	31	57

2.3.2 Noise Prediction Model Analysis for Alternative 2 during Construction Noise Exempt Hours

Construction activities that would be conducted during construction noise exempt hours in the year 2017 for Alternative 2 of the Project will generate exterior noise levels which exceed significance criteria established by the City of Folsom at several noise-sensitive receivers. The 50 dBA daytime L_{50} noise standard is exceeded at LT-2, LT-3, LT-4, ST-8, MR-9 and MR-10. At LT-2 and LT-4, the modeled L_{eq} is below the measured daytime L_{50} and therefore, there would be no noise impacts at these noise-sensitive receivers. Although the modeled noise levels due to daytime construction activities for Alternative 2 would exceed the L_{50} noise standard and existing ambient daytime L_{50}s at LT-3, ST-8, MR-9, and MR-10, construction noise is exempt from local standards from 7:00 a.m. to 6:00 p.m. during weekdays and from 8:00 a.m. to 5:00 p.m. on weekends. The will be no significant noise impacts if construction activities are conducted within these construction noise exempt times.

If construction activities are conducted in between 6:00 p.m. and 10:00 p.m., then mitigation would be necessary in order to meet the daytime noise standard of 50 dBA L_{50} at all respective noise-sensitive receivers where the modeled L_{eq} is above 50 dBA L_{eq}. If construction activities are conducted in between 10:00 p.m. and 7:00 a.m., then mitigation would be necessary in order to meet the nighttime noise standard of 45 dBA L_{50} at all respective noise-sensitive receivers where the modeled L_{eq} is above 45 dBA L_{eq}.

Noise levels would not exceed 60 dBA L_{eq} at any wildlife receptor site, therefore there are no expected impacts to wildlife habitat.

2.3.3 Noise Prediction Model Results for Alternative 3 during Construction Noise Exempt Hours

Under Alternative 3, the worst-case scenario is 2013 as the result of noise levels generated by construction activities during exempt hours. The area sources, and their respective PWLs, found in Table 19, are input into the CadnaA model to generate noise levels at ST, LT, MR, and Bio noise-sensitive sites. The noise contours generated by CadnaA for construction activities conducted during 2013 for Alternative 3 can be found in the DEIS/EIR. Table 24 displays the resulting L_{eq} values at each noise-sensitive receiver.

Table 24. Measured Ambient Noise Levels and Noise Levels Due to Construction Activities for Alternative 3 in 2013

Site ID	Modeled Noise Level Due to Construction Activities (dBA L_{eq})	L_{50} (ambient noise level in dBA from 7:00 to 18:00 for LTs and daytime L_{50} for Bio and ST)
MR-1a	54	n/a
MR-1b	52	n/a
LT-2	58	66
LT-3	67	46
LT-4	54	73
LT-5	48	45
LT-6	53	47
ST-7	55	43
ST-8	62	40
MR-9	58	n/a
MR-10	63	n/a
Bio-1	35	42
Bio-2	51	49
Bio-3	38	42

Site ID	Modeled Noise Level Due to Construction Activities (dBA	L_{50} (ambient noise level in dBA from 7:00 to 18:00 for LTs and daytime L_{50} for Bio
Bio-4	44	51
Bio-5	48	49
Bio-6	48	51
Bio-7	41	41
Bio-8	36	57

2.3.4 Noise Prediction Model Analysis for Alternative 3 Activities during Construction Noise Exempt Hours

Construction activities that are proposed to be conducted during construction noise exempt hours in the year 2013 for Alternative 3 of the Project would generate exterior noise levels which exceed significance criteria established by the City of Folsom at several noise-sensitive receivers. The 50 dBA daytime L_{50} noise standard is exceeded at MR-1, LT-2, LT-3, LT-4, LT-6, ST-7, ST-8, MR-9, and MR-10. At LT-2 and LT-4, the modeled L_{eq} is below the measured daytime L_{50} and therefore, there would be no noise impacts at these noise-sensitive receivers. Although the modeled noise levels due to daytime construction activities for Alternative 3 would exceed the L_{50} noise standard and existing ambient daytime L_{50}s at MR-1, LT-3, LT-6, ST-7, ST-8, MR-9, and MR-10, construction noise is exempt from local standards from 7:00 a.m. to 6:00 p.m. during weekdays and from 8:00 a.m. to 5:00 p.m. on weekends. There would be no significant noise impacts if construction activities are conducted within these construction noise exempt times.

If construction activities are conducted in between 6:00 p.m. and 10:00 p.m., then mitigation will be necessary in order to meet the daytime noise standard of 50 dBA L_{50} at all respective noise-sensitive receivers where the modeled L_{eq} is above 50 dBA L_{eq}. If construction activities are conducted in between 10:00 p.m. and 7:00 a.m., then mitigation would be necessary in order to meet the nighttime noise standard of 45 dBA L_{50} at all respective noise-sensitive receivers where the modeled L_{eq} is above 45 dBA L_{eq}.

Noise levels would not exceed 60 dBA L_{eq} at any wildlife receptor site, therefore there are no expected impacts to wildlife habitat.

2.3.5 Noise Prediction Model Results and Analysis for Alternative 2 during Non-Exempt Construction Noise Hours

There are several potential construction activities planned for Alternative 2 that may be conducted outside of construction noise exempt times. Batch plant activities would be conducted during non-exempt hours at one of the staging areas, but the location of the batch plant has yet to be determined. Non-exempt batch plant activities may be conducted at any time throughout the construction of the project. For Alternative

2, a worst-case scenario for construction activities conducted outside of construction noise exempt hours occurs in year 2016 when nighttime batch plant operations and “drill and shoot and dredging of rock in-the-wet” activities are conducted simultaneously. Table 25 displays the modeled noise levels at each noise-sensitive receiver due to only batch plant activities being conducted at each individual staging area, “drill and shoot and dredging of rock in-the-wet” activities, and batch plant activities being conducted simultaneously with “drill and shoot and dredging of rock in-the-wet” activities as a worst-case scenario for non-exempt generated construction noise in 2016.

At Folsom Prison (MR-1a and MR-1b), LT-5, and LT-6, the 50 or 45 dBA L_{50} exterior noise standards would not be exceeded due to any of the potential construction activities that may be conducted during non-exempt construction noise hours.

At LT-2, if the batch plant is located at the Dike 7 staging area, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded if “drill and shoot and dredging in-the-wet” activities are conducted outside of construction noise exempt hours simultaneously with batch plant activities. Batch plant activities alone, at the Dike 7 staging area, would generate noise levels that exceed the 45 dBA L_{50} nighttime exterior noise standard. The 45 dBA L_{50} nighttime exterior noise standard would also be exceeded during non-exempt hours if “drill and shoot and dredging in-the-wet” activities are conducted without any batch plant activities being conducted simultaneously. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at LT-2 as the result of construction activities being conducted outside of construction noise exempt hours.

At LT-3, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if “drill and shoot and dredging in-the-wet” activities are conducted. If batch plant activities are conducted during non-exempt hours at the Dike 7 staging area without any other construction activities taking place, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at LT-3 as the result of construction activities being conducted outside of construction noise exempt hours.

At LT-4, the 45 dBA L_{50} nighttime exterior noise standard would be exceeded during non-exempt construction hours if batch plant activities are being conducted at the MIAD staging area. Mitigation would be necessary in order to prevent noise impacts at LT-4 if batch plant activities are conducted outside of construction noise exempt hours and occur from 10:00 p.m. and 7:00 a.m.

Table 25. Alternative 2 Modeled Noise Levels Due to Construction Activities Being Conducted during Non-Exempt Construction Noise Hours (dBA L_{eq})

Site ID	MIAD Batch Plant	Dike 7 Batch Plant	Overlook Batch Plant	Prison Batch Plant	Drill and Shoot and Dredging In-the-Wet	MIAD Batch Plant w/ Drill and Shoot / Dredging In-the-Wet	Dike 7 Batch Plant w/ Drill and Shoot / Dredging In-the-Wet	Overlook Batch Plant w/ Drill and Shoot / Dredging In-the-Wet	Prison Batch Plant w/ Drill and Shoot / Dredging In-the-Wet
MR-1a	22	33	34	33	44	44	44	44	44
MR-1b	17	31	32	28	41	41	42	42	42
LT-2	31	48	30	26	47	47	50	47	47
LT-3	33	59	40	29	55	55	60	55	55
LT-4	46	21	26	16	41	47	41	41	41
LT-5	36	24	23	17	37	39	37	37	37
LT-6	21	26	32	37	43	43	43	43	44
ST-7	19	22	35	27	45	45	45	45	45
ST-8	42	33	36	24	51	51	51	51	51
MR-9	51	32	29	22	44	52	44	44	44
MR-10	25	57	34	27	49	49	58	49	49
Bio-1	10	12	13	13	25	25	25	25	25
Bio-2	11	22	29	35	41	41	41	41	42
Bio-3	13	15	16	15	28	29	29	29	29
Bio-4	24	24	20	17	34	34	34	34	34
Bio-5	32	27	23	17	37	38	37	37	37
Bio-6	38	26	23	18	37	40	37	37	37
Bio-7	24	19	16	14	30	31	30	30	30
Bio-8	9	11	14	13	27	27	27	27	27

At ST-7, the 45 dBA L_{50} nighttime exterior noise standard would be exceeded during non-exempt construction hours if “drill and shoot and dredging in-the-wet” activities are conducted. Mitigation would be necessary in order to prevent noise impacts at ST-7 as the result of construction activities being conducted outside of construction noise exempt hours.

At ST-8 (Folsom Point), the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if “drill and shoot and dredging in-the-wet” activities are conducted. ST-8 is modeled near the north end of the parking lot and, although Table 25 indicates a modeled 42 dBA L_{eq} from batch plant activities at the MIAD staging area, there may be higher levels of noise at other areas of the Folsom Point that may exceed the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards if batch plant activities are conducted outside of construction noise exempt times. However, since Folsom Point is a day-use facility, it is assumed that recreationists would not be present during non-exempt hours, and this effect is consisted less than significant.

At MR-9, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if batch plant activities are conducted at the MIAD staging area. Mitigation would be necessary in order to prevent noise impacts at MR-9 as the result of batch plant activities being conducted outside of construction noise exempt hours.

At MR-10, if the batch plant is located at the Dike 7 staging area, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours. If “drill and shoot and dredging in-the-wet” activities are conducted outside of construction noise exempt hours, the 45 dBA L_{50} nighttime noise standard would be exceeded. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at MR-10 as the result of construction activities being conducted outside of construction noise exempt hours.

Noise levels would not exceed 60 dBA L_{eq} at any wildlife receptor site, therefore there are no expected impacts to wildlife habitat during non-exempt construction noise hours.

2.3.6 Noise Prediction Model Results and Analysis for Alternative 3 Non-Exempt Construction Noise Hours Activities

There are several potential construction activities planned for Alternative 3 that may be conducted outside of construction noise exempt times. Batch plant activities would be conducted during non-exempt hours at one of the staging areas, but the location of the batch plant has yet to be determined. Non-exempt batch plant activities may potentially be conducted at any time throughout the construction of the project. For Alternative 3, a worst-case scenario for construction activities being conducted outside of construction noise exempt hours would occur in year 2013 when nighttime batch plant operations and common dredging below cofferdam activities are conducted simultaneously. Table 26 displays the modeled noise levels at each noise-sensitive receiver due to only batch plant activities being conducted at each individual staging area, “common dredging below cofferdam” activities, and batch plant activities being conducted simultaneously with “common dredging below cofferdam” activities as a worst-case scenario for non-exempt generated construction noise in 2013.

At Folsom Prison (MR-1a and MR-1b), LT-5, and LT-6, the 50 or 45 dBA L_{50} exterior noise standards would not be exceeded due to any of the potential construction activities that may be conducted during non-exempt construction noise hours.

Table 26. Alternative 3 Modeled Noise Levels Due to Construction Activities Being Conducted during Non-Exempt Construction Noise Hours (dBA L_{eq})

Site ID	MIAD Batch Plant	Dike 7 Batch Plant	Overlook Batch Plant	Prison Batch Plant	Common Dredge Below Cofferdam	MIAD Batch Plant w/ Common Dredge Below Cofferdam	Dike 7 Batch Plant w/ Common Dredge Below Cofferdam	Overlook Batch Plant w/ Common Dredge Below Cofferdam	Prison Batch Plant w/ Common Dredge Below Cofferdam
MR-1a	22	33	34	33	44	44	44	44	44
MR-1b	17	31	32	28	42	42	42	42	42
LT-2	31	48	30	26	47	47	50	47	47
LT-3	33	59	40	29	56	56	60	56	56
LT-4	46	21	26	16	41	47	41	41	41
LT-5	36	24	23	17	37	40	38	37	37
LT-6	21	26	32	37	43	43	43	44	44
ST-7	19	22	35	27	45	45	45	45	45
ST-8	42	33	36	24	51	52	51	51	51
MR-9	51	32	29	22	44	52	45	44	44
MR-10	25	57	34	27	49	49	58	49	49
Bio-1	10	12	13	13	26	26	26	26	26
Bio-2	11	22	29	35	41	41	41	41	42
Bio-3	13	15	16	15	29	29	29	29	29
Bio-4	24	24	20	17	34	35	35	34	34
Bio-5	32	27	23	17	37	38	38	37	37
Bio-6	38	26	23	18	37	41	37	37	37
Bio-7	24	19	16	14	31	31	31	31	31
io-8	9	11	14	13	27	27	27	27	27

At LT-2, if the batch plant is located at the Dike 7 staging area, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded if “common dredging below cofferdam” activities are conducted outside of construction noise exempt hours simultaneously with batch plant activities. Batch plant activities alone, at the Dike 7 staging area, will generate noise levels that exceed the 45 dBA L_{50} nighttime exterior noise standard. The 45 dBA L_{50} nighttime exterior noise standard would also be exceeded during non-exempt hours if “common dredging below cofferdam” activities are conducted without any batch plant activities being conducted simultaneously. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at LT-2 as the result of construction activities being conducted outside of construction noise exempt hours.

At LT-3, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if “common dredging below cofferdam” activities are conducted. If batch plant activities are conducted during non-exempt hours at the Dike 7 staging area without any other construction activities taking place, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at LT-3 as the result of construction activities being conducted outside of construction noise exempt hours.

At LT-4, the 45 dBA L_{50} nighttime exterior noise standard would be exceeded during non-exempt construction hours if batch plant activities are conducted at the MIAD staging area. Mitigation would be necessary in order to prevent noise impacts at LT-4 if batch plant activities are conducted outside of construction noise exempt hours and occur from 10:00 p.m. and 7:00 a.m.

At ST-7, the 45 dBA L_{50} nighttime exterior noise standard would be exceeded during non-exempt construction hours if “common dredging below cofferdam” activities are conducted. Mitigation would be necessary in order to prevent noise impacts at ST-7 as the result of construction activities being conducted outside of construction noise exempt hours.

At ST-8 (Folsom Point), the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if “common dredging below cofferdam” activities are conducted. ST-8 is modeled near the north end of the parking lot and, although Table 26 indicates a modeled 42 dBA L_{eq} generated by batch plant activities at the MIAD staging area, there may be higher levels of noise at other areas of the Folsom Point that may exceed the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards if batch plant activities are conducted outside of construction noise exempt times. However, since Folsom Point is a day-use facility, it is assumed that recreationists would not be present during non-exempt hours. As a result, this effect is considered less than significant.

At MR-9, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours if batch plant activities are conducted at the MIAD staging area and if “common dredging below cofferdam” activities are conducted simultaneously with batch plant activities at the

MIAD staging area, then the 45 dBA L_{50} nighttime exterior noise standard will be exceeded. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at MR-9 as the result of construction activities being conducted outside of construction noise exempt hours.

At MR-10, if the batch plant is located at the Dike 7 staging area, the 50 dBA L_{50} daytime and 45 dBA L_{50} nighttime exterior noise standards would be exceeded during non-exempt construction noise hours. If "common dredging below cofferdam" activities are conducted outside of construction noise exempt hours, the 45 dBA L_{50} nighttime noise standard would be exceeded. For all of these potential noise impacts, mitigation would be necessary in order to prevent noise impacts at MR-10 as the result of construction activities being conducted outside of construction noise exempt hours.

Noise levels would not exceed 60 dBA L_{eq} at any wildlife receptor site, therefore there are no expected impacts to wildlife habitat during non-exempt construction noise hours.

2.3.7 Noise Prediction Model Results and Analysis for Blasting Activities

A noise modeling program known as BNoise2 is used in order to determine the sound power level of an individual blast. Assumptions are made based on data provided by the USACE and information in Appendix E (Technical Noise Report) of the 2010 EA/IS for the Joint Federal Project for the Construction of the Control Structure and Lining of the Spillway Chute and Stilling Basin. The following assumptions are:

- There would be approximately 400 blasts in-the-wet and 200 blasts in-the-dry from February 2014 to August 2017 (approximately 1,100 days of work) for Alternative 2. This results in an approximately one blast every other day
- There would be approximately 200 blasts in-the-wet and 280 blasts in-the-dry from February 2014 to August 2017 (approximately 1,100 days of work) for Alternative 3. This results in approximately one blast every other day
- Ammonium nitrate and fuel oil (ANFO) charges would be used
- A charge weight of 44 pounds would be packed in 20-foot deep borings
- The borings would be spaced 5 feet apart in a 20-foot-wide bench
- The most charges that would be used during any blast is 75 charges

Using the assumptions above, BNoise2 calculated a SPL of 84.5 dBC SEL at 328 feet for one charge. If 75 charges are used, the PWL would be 141.2 dBA at 328 feet. This PWL is input into the CadnaA model at the approach channel excavation area in order to account for changes in topography. Table 27 shows the resulting SELs at each noise-sensitive receiver.

Table 27. Noise Levels at Noise-Sensitive Receivers due to Individual Blasts

Site ID	Noise Level due to Individual Blast (dBA SEL)
MR-1a	54
MR-1b	50
LT-2	48
LT-3	60
LT-4	45
LT-5	51
LT-6	57
ST-7	60
ST-8	59
MR-9	54
MR-10	51
Bio-1	40
Bio-2	55
Bio-3	43
Bio-4	41
Bio-5	45
Bio-6	50
Bio-7	44
Bio-8	44

Blasting would be conducted during construction noise exempt hours and would only be at the noise levels listed in Table 27 for no more than a few seconds. This would not significantly increase any of the modeled L_{eq}s for other construction noise exempt hour activities. There would be no noise impacts at human or wildlife noise-sensitive receivers due to blasting.

2.3.8 Noise Impacts on Fish

Potential Impacts on Fish. As identified previously, underwater sound from blasting and pile driving has the potential to impact fish inhabiting Folsom Lake. Noise potentially causes both auditory and non-auditory effects on fish. The non-auditory effects of noise may be obvious, for instance when an underwater detonation of explosives results in floating dead fish. Other injuries, such as swim bladder rupture in fish, may be shown only by dissection of exposed individuals. These adverse impacts only occur at high levels of sound, typically within tens, or at most a few hundred meters of underwater blasts, and hence affect relatively small areas and numbers of individuals (Nedwell and Edwards 2004).

The auditory effects of sound include temporary or permanent noise-induced deafness. Behavioral effects elicited by underwater noise can include a startle reaction or a species avoiding an area of high noise. Such responses are poorly understood or documented, yet behavioral effects may have an influence over great ranges, often kilometers, reaching much larger numbers of individuals. Fish response to sound can also be varied, ranging from the classic fright response that results in a startle behavior and sudden burst of short duration and distance swimming, to other responses such as packing or balling, polarizing, increasing swimming speed, diving, or avoidance (Olsen 1969).

Extremely loud sound levels can have very negative effects on fish including temporary or permanent deafness, tissue damage, and even acute mortality. The most severe instances, often associated with explosive sources, result from a high amplitude shock wave caused by the initial impulse and the negative pressure wave reflected by the water surface (Turnpenny and Nedwell 1994; Houghton and Munday 1987). Tissue damage arises when the wave passes through tissues of different densities. A wave passed through the tissues at different speeds can result in a shear environment, and in extreme cases the tissues can be torn apart. This is most severe where tissue density differences are the greatest, which in the case of demersal fish, is at the muscle - swim bladder interface (Turnpenny and Nedwell 1994).

This physical trauma, often termed barotrauma, has a direct impact on the fish and health of the fish. The degree of this impact has been characterized as a numerical scale (O'Keefe and Young 1984; based on an earlier scale developed by Hubbs et al. 1960). These numerical explosion damage criteria for fish cover the range of gross visible effects from exposure to large high amplitude shockwaves:

1. No damage (fish survives)
2. Light hemorrhaging (fish survives)
3. Light hemorrhaging and some kidney damage (impaired escape response and possible increased vulnerability to predation)
4. Swimbladder bursts and gross kidney damage (fish killed)
5. Incomplete body wall break and gross internal damage (fish killed)
6. Complete rupture of body cavity and organ destruction (fish killed)

While this range is diagnostic for direct trauma due to high amplitude shockwaves, it also applies for high intensity sound waves generated by other sources such as impact pile driving.

This definition of direct effects also implies indirect effects to fish due to noise impacts. These indirect effects usually manifest themselves as a reduction in the ability to evade predation (stunning, or reduced swimming ability), a change in behavior that leads to increased exposure to predation (inability to access a refuge habitat), or an inability to detect predators or prey effectively (temporary or permanent deafness).

The underwater sound levels associated with blasting depends on the size of the charge.

Blasting In-the-Wet. Wet blasting will generate very little airborne noise, but has the potential to kill fish in Folsom Lake. It is likely that some fish will be killed during wet blasting. Recommended mitigation procedures are described in the mitigation section.

Drilling In-the-Wet. Drilling generates noise from both the drill bit striking the rock near the collar of the holes, as well as from mechanical equipment and compressors used on the drills. If the drilling occurs with three or more feet of water, noise made from drill bit striking the rock will be almost immeasurable in air. Drilling from platforms will not occur in less than 35 feet of water, and thus is not expected to generate measurable noise in air. It is likely that some fish will be disturbed during drilling, but underwater sound levels are not expected to result in injury or death to fish.

2.4 Mitigation

The following measures would be implemented in order to reduce noise effects in the vicinity of construction for the project and in order to attempt to meet the respective daytime and nighttime exterior noise standards of 50 and 45 dBA L_{50}. Mitigation measures would be implemented to reduce noise from the following activities outside of noise exempt hours: batch plant operations, “dredging activities common to rock”, “drill and shoot and dredging in-the-wet” activities, activities relating to four 1,500 cfm compressors running during “set up and operation of the bubble and/or silt curtain”, “common dredging below cofferdam” activities, and “dewatering” activities behind the cofferdam. , Mitigation measures would include:

- Conduct construction activities during construction noise exempt hours
- For construction activities being conducted outside of construction noise exempt hours, the Contractor will obtain a permit from the City and County
- Contractor will be responsible for maintaining equipment in best possible working condition
- Each piece of construction equipment should be fitted with efficient, well-maintained mufflers that reduce equipment noise emissions in order to reduce noise emission levels from equipment and vehicles at the project site
- Schedule truck loading, unloading, and hauling operations so as to reduce noise levels due to construction during non-exempt construction hours
- Locate construction equipment as far as possible from nearby noise-sensitive receptors
- Situate construction equipment so that natural berms or aggregate stockpiles are located in between the equipment and noise-sensitive receptors
- Enclose pumps that are not submerged and enclose above-ground conveyor systems in acoustically treated enclosures

- Lining or covering hoppers, conveyor transfer points, storage bins and chutes with sound-deadening material
- Acoustically attenuating shielding (barriers) and shrouds should be used when possible
- Using blast mats to cover blasts in order to minimize the possibility of fly rock
- Use of bubble curtains around under water blasting activities

If all of these mitigation procedures are put into practice for Alternatives 2 and 3, there is still the potential for construction activities that are conducted during non-exempt hours to exceed the daytime and nighttime noise standards at noise-sensitive receptors.

Specific mitigation measures should be utilized in order to reduce noise levels from blasting. The BMPs listed below assume use of the standard practice of linear (rather than spherical) charges, and standard timing separation of 8 milliseconds to reduce cumulative effects between adjacent charges. BMPs include:

- Designing efficient detonations ("blast design") that fracture the rock with minimal energy released to surrounding water.[1] Efficient detonations are achieved by:
    - Establishing a not-to-exceed peak pressure-change (over-pressure) limit of 100kPa (14.5 psi).
    - Controlling maximum pressure thresholds by establishing cautious charge confinement rules regarding the type and amount of stemming[2] (material placed in the upper portions of blast holes), and the amount of confining rock burden between charges and the free or open face to which they break.
    - Monitoring peak blast-induced pressure and impulse;
    - Requiring the use of multiple time-sequenced charges that will reduce the cumulative impacts on the water environment;
    - Timing blasting when fish tend to be in streams in northern tributaries far from the blast site, e.g., February through June for rainbow trout; the timing of spawning of Chinook salmon in Folsom Lake is not well characterized.
    - Setting off small charges ("scare charges") or firing air-cannons into the water before blasting to chase fish from the blast area;

[1] The use of stemming to confine blasts, results in several typically listed BMPs becoming less necessary to minimize the impact of the underwater blast on fish. Stemming is used to control extreme peak pressures spikes released in the water. Another method of removing steep peak pressure spikes is to specify the burn rate of the exploding charge or Velocity of Detonation (VOD) which impacts the relative amounts of gas versus shock energy. Specifying the explosive properties, therefore, is not necessary as a BMP when proper stemming is utilized.

[2] Stemming is the practice of placing inert material on the top of the charge to help confine the energy released by the charge to the material to be demolished, and reduce the energy released to the water or air.

  - Grouping continuous periods of noisy work or simultaneous noisy work (e.g., multiple drill barges) to prevent the fish from re-entering the area during short quiet periods);
  - Using air curtains or bubble curtains to attenuate pressure waves. Air supply to bubble pipes would be provided by clean-air compressors that contain no oil or other contaminants.
  - Not using ammonium nitrate-fuel oil mixtures (ANFO) in or near water because they will not function as desired and if released into water they will dissolve and release toxic by-products (ammonia and nitrates)
- For drilling activities in the water, BMP's include the use of down-the-hole-hammers, which produce much less noise than top-hammer drills from the striking bar.

2.5 Cumulative

There is the potential for future construction activities that are conducted concurrently throughout the life of the Folsom Dam JFP and involved with other projects in the vicinity of the Project to temporarily increase noise levels in the surrounding areas. The projects include:

- Johnny Cash Folsom Prison Blues Trail: Historic Truss Bridge to Green Valley Road Segment
- Raw Water Bypass Pipeline Project
- Central California Area Office Building Replacement Project
- Lower American River Salmonid Spawning Gravel Augmentation and Side-channel Habitat Establishment Program
- Folsom Dam Safety and Flood Damage Reduction Project Ongoing Construction Activities
- Widening of Green Valley Road
- Folsom Dam Raise

Simultaneous construction of these projects would increase noise levels, from onsite construction and transport of materials. The worst case assumption indicates that simultaneous construction could potentially increase source noise emissions by 3 dBA. If these construction projects are implemented concurrently, the combined cumulative effects could be above significance thresholds. If this were the case, each project would need to mitigate individual noise effects which could decrease overall cumulative effects. However, without consideration of scheduling and sequence of activities, determination of whether concurrent construction projects within and adjacent to Folsom Lake could have significant cumulative noise effects is not possible. Construction involved with both the Folsom Dam JFP and the projects listed above are temporary in nature and, therefore, there would be no cumulative noise effects other than increases in noise levels during simultaneous construction activities.

2.6 Summary/Conclusion

The largest noise impacts from the proposed Project are due to construction activities being conducted outside of construction noise exempt hours. The only construction activities that would potentially be conducted during non-exempt construction noise hours that would not exceed noise significance criteria would be if batch plants activities were conducted at either the Overlook or Prison staging areas with no other construction taking place at the approach channel excavation and spur dike construction areas. Most construction activities that would potentially be conducted during non-exempt construction noise hours for Alternatives 2 and 3 would exceed the City of Folsom's daytime and nighttime exterior noise standards of 50 and 45 dBA L_{50} at some of the noise-sensitive receivers. If the batch plant is located at the MIAD or Dike 7 staging areas and they are the only activities being conducted outside of construction noise exempt hours, then there would still be noise impacts at noise-sensitive receivers. Other activities conducted outside of construction noise exempt hours at the approach channel excavation and spur dike construction areas would generate noise impacts at some noise-sensitive receivers with or without batch plant activities being conducted simultaneously. Mitigation would be necessary in order to reduce noise impacts, but even with mitigation, there is the potential for noise impacts outside of construction noise exempt hours.

Noise levels would not exceed the 60 dBA L_{eq} at wildlife receptor sites. There are no expected noise impacts.

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LT-2 (Tacana Drive and E. Natoma St.)

Date	Start Time	End Time	Hourly L_{eq} (dBA)
3/25/2009	17:00:00	18:00:00	68.9
3/25/2009	18:00:00	19:00:00	68.4
3/25/2009	19:00:00	20:00:00	67.8
3/25/2009	20:00:00	21:00:00	65.9
3/25/2009	21:00:00	22:00:00	65.7
3/25/2009	22:00:00	23:00:00	62.9
3/25/2009	23:00:00	0:00:00	60.0
3/26/2009	0:00:00	1:00:00	56.6
3/26/2009	1:00:00	2:00:00	56.9
3/26/2009	2:00:00	3:00:00	51.5
3/26/2009	3:00:00	4:00:00	58.8
3/26/2009	4:00:00	5:00:00	57.1
3/26/2009	5:00:00	6:00:00	63.8
3/26/2009	6:00:00	7:00:00	67.6
3/26/2009	7:00:00	8:00:00	68.3
3/26/2009	8:00:00	9:00:00	69.4
3/26/2009	9:00:00	10:00:00	68.4
3/26/2009	10:00:00	11:00:00	67.8
3/26/2009	11:00:00	12:00:00	69.0
3/26/2009	12:00:00	13:00:00	68.1
3/26/2009	13:00:00	14:00:00	68.6
3/26/2009	14:00:00	15:00:00	69.1
3/26/2009	15:00:00	16:00:00	68.8
3/26/2009	16:00:00	17:00:00	69.4

LT-3 (Mountain View Dr.)

Date	Start Time	End Time	Hourly L_{eq} (dBA)
3/24/2009	15:00:00	16:00:00	47.5
3/24/2009	16:00:00	17:00:00	46.3
3/24/2009	17:00:00	18:00:00	48.7
3/24/2009	18:00:00	19:00:00	45.7
3/24/2009	19:00:00	20:00:00	43.1
3/24/2009	20:00:00	21:00:00	42.2
3/24/2009	21:00:00	22:00:00	42.1
3/24/2009	22:00:00	23:00:00	41.1
3/24/2009	23:00:00	0:00:00	40.7
3/25/2009	0:00:00	1:00:00	35.9
3/25/2009	1:00:00	2:00:00	34.7
3/25/2009	2:00:00	3:00:00	32.8
3/25/2009	3:00:00	4:00:00	34.3
3/25/2009	4:00:00	5:00:00	37.6
3/25/2009	5:00:00	6:00:00	42.0
3/25/2009	6:00:00	7:00:00	46.4
3/25/2009	7:00:00	8:00:00	49.9
3/25/2009	8:00:00	9:00:00	50.6
3/25/2009	9:00:00	10:00:00	47.6
3/25/2009	10:00:00	11:00:00	47.9
3/25/2009	11:00:00	12:00:00	49.5
3/25/2009	12:00:00	13:00:00	50.5
3/25/2009	13:00:00	14:00:00	50.9
3/25/2009	14:00:00	15:00:00	50.7

LT-4 (E. Natoma St. and Green Valley Rd.)

Date	Start Time	End Time	Hourly L_{eq} (dBA)
3/24/2009	14:00:00	15:00:00	73.8
3/24/2009	15:00:00	16:00:00	73.9
3/24/2009	16:00:00	17:00:00	74.1
3/24/2009	17:00:00	18:00:00	74.1
3/24/2009	18:00:00	19:00:00	73.8
3/24/2009	19:00:00	20:00:00	72.2
3/24/2009	20:00:00	21:00:00	71.2
3/24/2009	21:00:00	22:00:00	71.2
3/24/2009	22:00:00	23:00:00	68.1
3/24/2009	23:00:00	0:00:00	65.4
3/25/2009	0:00:00	1:00:00	62.5
3/25/2009	1:00:00	2:00:00	61.0
3/25/2009	2:00:00	3:00:00	58.0
3/25/2009	3:00:00	4:00:00	60.1
3/25/2009	4:00:00	5:00:00	65.1
3/25/2009	5:00:00	6:00:00	70.1
3/25/2009	6:00:00	7:00:00	73.2
3/25/2009	7:00:00	8:00:00	75.2
3/25/2009	8:00:00	9:00:00	75.0
3/25/2009	9:00:00	10:00:00	73.3
3/25/2009	10:00:00	11:00:00	73.5
3/25/2009	11:00:00	12:00:00	73.1
3/25/2009	12:00:00	13:00:00	72.9
3/25/2009	13:00:00	14:00:00	74.1

LT-5 (Shadowfax Court)

Date	Start Time	End Time	Hourly L_{eq} (dBA)
3/24/2009	13:00:00	14:00:00	50.9
3/24/2009	14:00:00	15:00:00	46.0
3/24/2009	15:00:00	16:00:00	49.0
3/24/2009	16:00:00	17:00:00	48.9
3/24/2009	17:00:00	18:00:00	50.8
3/24/2009	18:00:00	19:00:00	57.5
3/24/2009	19:00:00	20:00:00	48.5
3/24/2009	20:00:00	21:00:00	47.9
3/24/2009	21:00:00	22:00:00	49.0
3/24/2009	22:00:00	23:00:00	41.4
3/24/2009	23:00:00	0:00:00	39.8
3/25/2009	0:00:00	1:00:00	39.5
3/25/2009	1:00:00	2:00:00	34.1
3/25/2009	2:00:00	3:00:00	36.4
3/25/2009	3:00:00	4:00:00	33.1
3/25/2009	4:00:00	5:00:00	37.1
3/25/2009	5:00:00	6:00:00	44.1
3/25/2009	6:00:00	7:00:00	50.2
3/25/2009	7:00:00	8:00:00	50.1
3/25/2009	8:00:00	9:00:00	49.3
3/25/2009	9:00:00	10:00:00	44.9
3/25/2009	10:00:00	11:00:00	44.0
3/25/2009	11:00:00	12:00:00	43.3
3/25/2009	12:00:00	13:00:00	45.7

LT-6 (East of Folsom Auburn Rd. and Pierpoint Circle)

Date	Start Time	End Time	Hourly L_{eq} (dBA)
3/24/2009	15:00:00	16:00:00	56.8
3/24/2009	16:00:00	17:00:00	54.5
3/24/2009	17:00:00	18:00:00	49.6
3/24/2009	18:00:00	19:00:00	40.8
3/24/2009	19:00:00	20:00:00	47.1
3/24/2009	20:00:00	21:00:00	45.9
3/24/2009	21:00:00	22:00:00	41.6
3/24/2009	22:00:00	23:00:00	38.2
3/24/2009	23:00:00	0:00:00	35.7
3/25/2009	0:00:00	1:00:00	34.4
3/25/2009	1:00:00	2:00:00	35.4
3/25/2009	2:00:00	3:00:00	31.7
3/25/2009	3:00:00	4:00:00	36.4
3/25/2009	4:00:00	5:00:00	33.5
3/25/2009	5:00:00	6:00:00	38.2
3/25/2009	6:00:00	7:00:00	41.5
3/25/2009	7:00:00	8:00:00	45.9
3/25/2009	8:00:00	9:00:00	49.0
3/25/2009	9:00:00	10:00:00	45.4
3/25/2009	10:00:00	11:00:00	51.1
3/25/2009	11:00:00	12:00:00	49.1
3/25/2009	12:00:00	13:00:00	48.8
3/25/2009	13:00:00	14:00:00	51.0
3/25/2009	14:00:00	15:00:00	52.7

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
ST-2	Tacana Dr. and E. Natoma St.	3/25/2009	16:40:00	66.2	79.5	39.6	47.4	63.8	69.9
ST-2	Tacana Dr. and E. Natoma St.	3/25/2009	16:50:00	67.7	86.8	40.7	52.2	64.7	71.1
ST-2	Tacana Dr. and E. Natoma St.	3/25/2009	20:28:00	63.0	79.7	39.2	45.3	53.3	67.2
ST-2	Tacana Dr. and E. Natoma St.	3/25/2009	20:39:00	62.4	78.5	41.9	45.5	55.1	66.7
ST-2	Tacana Dr. and E. Natoma St.	3/26/2009	0:11:00	53.0	71.3	31.9	34.7	38.3	53.0
ST-2	Tacana Dr. and E. Natoma St.	3/26/2009	0:21:00	53.6	72.4	32.6	35.1	38.7	53.0
ST-3	Mountain View Dr.	3/24/2009	17:25:00	45.1	61.0	36.1	39.6	42.9	47.6
ST-3	Mountain View Dr.	3/24/2009	17:35:00	46.1	60.7	39.2	41.7	44.5	48.7
ST-3	Mountain View Dr.	3/24/2009	20:40:00	41.1	53.7	35.5	37.9	40.5	43.3
ST-3	Mountain View Dr.	3/24/2009	20:51:00	40.1	57.6	34.5	36.6	39.3	42.1
ST-3	Mountain View Dr.	3/24/2009	22:49:00	40.7	55.8	33.3	35.9	39.5	43.7
ST-3	Mountain View Dr.	3/24/2009	22:59:00	39.0	54.3	33.2	35.4	37.5	41.4
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	17:52:00	70.5	87.3	44.9	55.6	69.2	73.8
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	18:02:00	70.8	79.8	51.6	60.1	69.6	74.1
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	21:08:00	69.4	83.4	47.2	57.8	67.2	73.0

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	21:18:00	69.6	84.4	46.7	57.2	67.0	73.6
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	23:46:00	60.4	75.2	31.8	36.0	46.5	65.4
ST-4	E. Natoma St. and Green Valley Rd.	3/24/2009	23:56:00	62.8	81.4	31.4	36.3	47.6	66.5
ST-5	Shadowfax Ct.	3/24/2009	18:18:00	60.9	78.4	43.3	47.3	50.9	59.8
ST-5	Shadowfax Ct.	3/24/2009	18:28:00	52.4	71.3	43.2	45.6	48.4	51.3
ST-5	Shadowfax Ct.	3/24/2009	21:34:00	47.4	62.7	40.9	44.2	46.9	49.4
ST-5	Shadowfax Ct.	3/24/2009	21:45:00	50.7	62.8	40.7	44.0	46.8	53.0
ST-5	Shadowfax Ct.	3/24/2009	23:18:00	41.7	70.6	30.7	34.9	38.7	42.7
ST-5	Shadowfax Ct.	3/24/2009	23:29:00	41.3	60.5	31.5	35.8	39.6	44.2
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	15:19:00	50.2	64.8	36.6	40.1	44.3	55.0
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	15:29:00	50.9	72.9	41.1	45.4	48.8	53.6
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	19:52:00	40.6	60.6	32.3	34.7	36.9	42.1
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	20:02:00	42.6	59.9	35.0	38.3	40.7	45.4
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	23:31:00	35.4	51.7	31.2	32.6	34.2	37.1
ST-6	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	23:41:00	34.9	47.6	29.6	31.1	32.8	36.1
ST-7	Beals Point (Campground)	3/24/2009	15:11:00	48.9	71.1	38.0	40.8	43.2	51.1
ST-7	Beals Point (Campground)	3/24/2009	15:22:00	49.0	79.2	35.9	39.1	42.2	46.4
ST-8	Folsom Point	3/24/2009	16:57:00	43.7	57.7	34.8	37.1	39.6	47.7
ST-8	Folsom Point	3/24/2009	17:07:00	41.3	52.8	35.6	37.5	39.1	44.7
ST-8	Folsom Point	3/24/2009	20:12:00	41.3	61.8	31.3	35.5	37.6	40.1

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
ST-8	Folsom Point	3/24/2009	20:22:00	40.9	54.1	31.7	34.0	36.7	45.7

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
BIO-1	Main St.	3/25/2009	10:51:00	44.1	62.6	35.4	38.3	41.6	46.8
BIO-1	Main St.	3/25/2009	19:26:00	48.8	65.4	31.9	37.8	44.3	52.3
BIO-1	Main St.	3/25/2009	22:53:00	44.2	59.6	34.0	36.9	40.4	48.2
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	15:19:00	50.2	64.8	36.6	40.1	44.3	55.0
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	15:29:00	50.9	72.9	41.1	45.4	48.8	53.6
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	19:52:00	40.6	60.6	32.3	34.7	36.9	42.1
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	20:02:00	42.6	59.9	35.0	38.3	40.7	45.4
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	23:31:00	35.4	51.7	31.2	32.6	34.2	37.1
BIO-2	East of Folsom Auburn Rd. and Robin Ln.	3/25/2009	23:41:00	34.9	47.6	29.6	31.1	32.8	36.1
BIO-3	Erwin Ave. and Snipes Blvd.	3/25/2009	10:30:00	43.4	59.5	36.8	39.1	42.2	45.8
BIO-3	Erwin Ave. and Snipes Blvd.	3/25/2009	19:08:00	44.8	65.4	34.0	36.1	37.9	45.1
BIO-3	Erwin Ave. and Snipes Blvd.	3/25/2009	23:09:00	36.9	47.9	32.1	34.2	35.8	39.1
BIO-4	S. Lexington Dr. and Oak Avenue Parkway	3/26/2009	15:57:00	51.0	68.4	45.0	47.2	50.4	53.2

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
BIO-4	S. Lexington Dr. and Oak Avenue Parkway	3/26/2009	20:58:00	49.6	61.0	44.0	46.4	48.5	51.3
BIO-4	S. Lexington Dr. and Oak Avenue Parkway	3/26/2009	23:48:00	43.1	63.1	34.4	36.4	40.1	45.1
BIO-5	Willow Bend Rd. and Grey Fox Ct.	3/26/2009	14:21:00	49.8	60.5	43.2	45.8	49.0	52.0
BIO-5	Willow Bend Rd. and Grey Fox Ct.	3/26/2009	20:13:00	46.4	56.8	37.7	40.6	43.8	50.1
BIO-5	Willow Bend Rd. and Grey Fox Ct.	3/26/2009	23:07:00	37.1	51.1	27.5	30.5	34.6	40.2
BIO-6	Haddington Dr. and E. Natoma St.	3/26/2009	13:45:00	51.9	63.5	45.3	48.1	50.9	54.1
BIO-6	Haddington Dr. and E. Natoma St.	3/26/2009	19:53:00	52.0	64.7	40.9	45.5	49.4	55.8
BIO-6	Haddington Dr. and E. Natoma St.	3/26/2009	22:49:00	47.9	66.5	31.4	36.0	42.3	48.5
BIO-7	Sturbridge Dr. and Stonemill Dr.	3/26/2009	14:54:00	42.7	59.5	34.5	36.8	40.6	45.5
BIO-7	Sturbridge Dr. and Stonemill Dr.	3/26/2009	20:34:00	38.5	52.6	32.6	35.5	37.6	40.5
BIO-7	Sturbridge Dr. and Stonemill Dr.	3/26/2009	23:27:00	31.4	43.8	26.7	29.1	30.6	32.8
BIO-8	Wellington Way and Grizzly Way	3/24/2009	15:53:00	58.0	67.5	42.9	48.3	56.5	61.7

Site ID	Location	Start Date	Start Time (10 min. Meas.)	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
BIO-8	Wellington Way and Grizzly Way	3/24/2009	19:38:00	59.9	71.4	44.5	49.9	56.7	63.7
BIO-8	Wellington Way and Grizzly Way	3/24/2009	22:18:00	51.2	68.7	39.5	42.9	45.0	53.6

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Site Prep / Haul Rd Prep						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	80%	79.0	113.6
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
Generator	2	200	10	65%	82.1	116.7
Welding Machines	4	30	10	50%	77.0	111.6
Outboard powered workskiffs	2	40	10	40%	78.2	112.8
Rock Import Trucks	10	350	10	90%	85.5	120.1
Small Tug	1	250	10	80%	86.2	120.7
Super 30 carrylift	1	350	10	70%	83.5	118.0
Construct Transload Facility						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	30%	74.8	109.4
225T Crane	1	400	10	80%	80.0	114.6
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
8 Mgal Water WAGON	1	450	10	80%	75.0	109.6

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Off HWY 50 TN Trucks	2	650	10	80%	78.0	112.6
Rock Import Trucks	3	350	10	70%	79.2	113.8
Large Excavator	1	550	10	90%	80.5	115.1
Rub Tire Backhoe	1	125	10	70%	76.5	111.0
Loader 980 size	1	350	10	70%	77.5	112.0
Super 30 carrylift	1	350	10	70%	83.5	118.0
Loader 966 size	1	300	10	80%	78.0	112.6
Concrete Secant Pile Wall						
Large Dozer	1	570	10	80%	81.0	115.6
1200 CFM Compressor	4	575	10	15%	75.8	110.4
Large Roller	1	250	10	10%	70.0	104.6
Drill Rig	2	670	10	30%	81.8	116.4
100 Ton Crane	2	643	10	30%	78.8	113.4
8 Mgal Water WAGON	1	450	10	20%	69.0	103.6
20 CY Dump Trucks	4	350	10	30%	76.8	111.4
Rub Tire Backhoe	2	125	10	80%	80.0	114.6
Loader 360 Wheel Loader	2	100	10	80%	81.0	115.6
Loader 966 size	2	300	10	80%	81.0	115.6
Cutoff Wall Concrete Placement						
Cement Mixer	1	25	10	80%	77.0	111.6
Large Excavator	1	700	10	90%	80.5	115.1

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Common Excavation to Waste						
Large Dozer-Ripper	2	570	10	90%	84.6	119.1
Large Excavator	1	428	10	90%	80.5	115.1
Off HWY 50 TN Trucks	7	650	10	80%	83.5	118.1
8 MG Water Pull	1	450	10	90%	75.5	110.1
Large Motor Grader	1	400	10	90%	84.5	119.1
Dozer	1	185	10	90%	81.5	116.1
Roller	1	250	10	50%	77.0	111.6
Rock Excavation Dry						
Rock Drills	4	250	12	100%	87.0	121.6
Large Excavator	1	428	12	90%	80.5	115.1
Off HWY 50 TN Trucks	6	650	12	80%	82.8	117.4
8 MG Water Pull	1	450	12	90%	75.5	110.1
Large Dozer-Ripper	1	550	12	90%	81.5	116.1
Large Motor Grader	1	400	12	40%	81.0	115.6
8 MG Water Pull	1	450	12	90%	75.5	110.1
Dozer	1	185	12	90%	81.5	116.1
Powder Truck	1	350	12	90%	75.5	110.1
Mobilization for Approach Walls (Road, Crane Pads)						
Cat D-8 Dozer -Ripper	1	305	10	80%	81.0	115.6
Cat 980 Loader	1	318	10	80%	78.0	112.6
Cat 730 Articulated trucks	3	317	10	80%	79.8	114.4

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Highway 10-wheeler dump truck	1	330	10	80%	75.0	109.6
Graders 140H	1	165	10	80%	84.0	118.6
Water Truck 4000gal	1	330	10	80%	75.0	109.6
Highway tractor - trailer	1	330	10	60%	73.8	108.4
Electric - Line Man Truck	1	200	10	70%	74.5	109.0
Mech trucks	2	200	10	70%	77.5	112.0
Fuel trucks	2	250	10	70%	77.5	112.0
Pipe Fitters Truck	1	200	10	70%	74.5	109.0
Flatbed trucks	2	200	10	60%	75.8	110.4
Pickup's standard F-150 (gas)	5	380	10	50%	79.0	113.6
Pickup's Ford 150 4X4 (gas)	2	411	10	50%	75.0	109.6
Intake Approach Walls & Slab						
Manitowoc 555 - 150 ton Crawler	1	340	9	70%	79.5	114.0
50 ton Hydraulic Crane	1	174	9	70%	79.5	114.0
Concrete Boom Pump	1	330	10	70%	79.5	114.0
Highway tractor - trailer	1	330	9	70%	74.5	109.0
Pickup's Ford 150 4X4 (gas)	1	411	9	50%	72.0	106.6
Set up/Operate Bubble Curtain/Silt Curtain*						
Tendors	2	200	10	70%	87.6	122.2
Dozer	1	250	10	80%	81.0	115.6

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Mid size Excavator	1	200	10	80%	80.0	114.6
Small Tug	1	250	10	80%	86.2	120.7
Large Tug	1	400	10	60%	86.9	121.5
1500 CFM Compressors	4	600	24	15%	75.8	110.4
80 TN crane	1	250	10	80%	80.0	114.6
Super 20 Carrylift	1	200	10	60%	82.8	117.4
Dredge Common to Rock*						
Large long reach Excavator/cutter	1	1100	20	90%	93.1	127.7
250 Ton Clam Derrick Barge	2	450	20	50%	81.0	115.6
Large Tug	2	500	20	50%	90.1	124.7
85 TN Rock Trucks	3	650	20	70%	79.2	113.8
Light plants	3	40	20	100%	83.9	118.5
Dozer	1	450	20	70%	80.5	115.0
Large Loader	1	500	20	10%	69.0	103.6
Barge Winches	1	400	20	40%	85.2	119.8
Drill and Shoot/Dredge Rock Wet*						
Rock Drills	3	350	20	80%	84.8	119.4
Large long reach Excavator/cutter	1	1100	20	80%	92.6	127.2
250 Ton Clam Derrick Barge	2	450	20	50%	81.0	115.6
Small Tug	1	250	20	40%	83.1	117.7

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Large Tug	1	500	20	60%	87.9	122.5
50 TN Rock Trucks	5	600	20	75%	81.7	116.3
Light plants	4	40	20	60%	83.0	117.5
Large Dozer	1	450	20	50%	79.0	113.6
Large Loader	1	500	20	20%	72.0	106.6
Barge Winches	8	250	20	20%	89.2	123.7
Powder Truck	1	350	12	80%	75.0	109.6
Haul Road Prep, Spur Dike Stripping						
Large Dozer	1	570	10.43	80%	81.0	115.6
Large Motor Grader	1	275	10.43	80%	84.0	118.6
Large Excavator	1	532	10.43	60%	78.8	113.4
8 Mgal water truck	1	490	10.43	90%	75.5	110.1
40 TN Articulated Trucks	2	405	10.43	90%	78.6	113.1
80 Ton Crane	1	350	10.43	80%	80.0	114.6
Super 20 Carrylift	1	225	10.43	60%	82.8	117.4
Import Material from Quarry to D1/D2 MIAD						
On Hwy Transport Truck and Trailers	25	350	10.43	100%	90.0	124.6
Large Dozer	1	570	10.43	100%	82.0	116.6
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill						
Large Dozer-Ripper	1	570	10.43	90%	81.5	116.1
Large Excavator	1	532	10.43	90%	80.5	115.1

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
40 TN articulated Trucks	6	405	10.43	95%	83.6	118.1
8 Mgal Water Truck	1	490	10.43	90%	75.5	110.1
Large Motor Grader	1	275	10.43	20%	78.0	112.6
Dozer	1	305	10.43	90%	81.5	116.1
Self Propelled Vibratory Roller	1	153	10.43	25%	74.0	108.6
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap						
Large Excavator	1	532	10.43	80%	80.0	114.6
Large Dozer	1	570	10.43	50%	79.0	113.6
Large Front End Loader	1	490	10.43	100%	79.0	113.6
Foundation Clean up						
Large Tug	1	500	10	60%	87.9	122.5
Large long reach Excavator/cutter	1	1100	10	60%	91.3	125.9
1500 CFM Compressors	2	600	10	90%	80.6	115.1
Small Tug	1	250	10	80%	86.2	120.7
250 Ton Clam Derrick Barge	2	450	10	80%	83.0	117.6
Large Loader	1	500	10	40%	75.0	109.6
Barge Winches	4	250	10	40%	89.2	123.7
50 TN Rock Trucks	2	600	10	50%	76.0	110.6
Large Dozer	1	450	10	50%	79.0	113.6
Tendors	1	200	10	70%	84.6	119.2

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Remove Transload Facility						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	30%	74.8	109.4
225T Crane	1	400	10	80%	80.0	114.6
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
8 Mgal Water WAGON	1	450	10	80%	75.0	109.6
Off HWY 50 TN Trucks	2	650	10	80%	78.0	112.6
Rock Import Trucks	3	350	10	70%	79.2	113.8
Large Excavator	1	550	10	90%	80.5	115.1
Rub Tire Backhoe	1	125	10	70%	76.5	111.0
Loader 980 size	1	350	10	70%	77.5	112.0
Super 30 carrylift	1	350	10	70%	83.5	118.0
Loader 966 size	1	300	10	80%	78.0	112.6
Site Restoration/Teardown						
Pick up Trucks	6	200	10	30%	77.6	112.1
Large Motor Grader	1	400	10	80%	84.0	118.6
Generator	2	200	10	65%	82.1	116.7
Outboard powered workskiffs	2	40	10	65%	80.3	114.9
Shop Trucks	2	250	10	40%	75.0	109.6

Alternative 2 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Large Tug	1	400	10	70%	87.6	122.2
Small Tug	1	250	10	70%	85.6	120.2
Dozer	1	185	10	60%	79.8	114.4
Medium Size Excavator	1	200	8	90%	80.5	115.1
Staging Area w/ Rock Crusher						
Rock Crusher	1	n/a	12	100%**	83.0	117.6
Batch Plant	1	n/a	12/24	100%**	83.0	117.6
Large Dozer	2	570	12	100%**	82.0	116.6
Belly dump truck	2	300	12	100%**	79.0	113.6
Staging Area w/out Rock Crusher						
Batch Plant	1	n/a	12/24	100%**	83.0	117.6
Large Dozer	2	570	12	100%**	82.0	116.6
Belly dump truck	2	300	12	100%**	79.0	113.6
Batch Plant Activities at Staging Area*						
Batch Plant	1	n/a	12/24	100%**	83.0	117.6

*potential nighttime activity
**assumed 100% duty cycle

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Mobilization for Cofferdam (Haul Road)						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	80%	79.0	113.6
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
Generator	2	200	10	65%	82.1	116.7
Welding Machines	4	30	10	50%	77.0	111.6
Outboard powered workskiffs	2	40	10	40%	78.2	112.8
Rock Import Trucks	10	350	10	90%	85.5	120.1
Small Tug	1	250	10	80%	86.2	120.7
Super 30 carrylift	1	350	10	70%	79.5	114.0
Mid size Excavator	1	200	10	80%	84.0	118.6
Construct Transload Facility						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	30%	74.8	109.4
225T Crane	1	400	10	80%	80.0	114.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
8 Mgal Water WAGON	1	450	10	80%	75.0	109.6
Off HWY 50 TN Trucks	2	650	10	80%	78.0	112.6
Rock Import Trucks	3	350	10	70%	79.2	113.8
Large Excavator	1	550	10	90%	80.5	115.1
Rub Tire Backhoe	1	125	10	70%	76.5	111.0
Loader 980 size	1	350	10	70%	77.5	112.0
Super 30 carrylift	1	350	10	70%	83.5	118.0
Loader 966 size	1	300	10	80%	78.0	112.6
Common Excavation Below Cofferdam						
Large Dozer-Ripper	2	570	10	90%	84.6	119.1
Large Excavator	1	428	10	90%	80.5	115.1
Off HWY 50 TN Trucks	7	650	10	80%	83.5	118.1
8 MG Water Pull	1	450	10	90%	75.5	110.1
Large Motor Grader	1	400	10	90%	84.5	119.1
Dozer	1	250	10	90%	81.5	116.1
Common Dredge Below Cofferdam*						
Large Long Reach Excavator/ Cutter	1	1100	20	90%	93.1	127.7
250 Ton Clam Derrick Barge	2	450	20	50%	89.7	124.3
Large Tug	2	500	20	50%	90.1	124.7
85 TN Rock Trucks	3	650	20	70%	79.2	113.8

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Light Plants	3	40	20	100%	83.9	118.5
Dozer	1	450	20	70%	80.5	115.0
Large Loader	1	500	20	10%	69.0	103.6
Barge Winches	1	400	20	40%	85.2	119.8
Construction of Sheet Pile Cells						
4100 Manitowoc Crane	1	364	10	100%	81.0	115.6
Barge Winches	2	400	10	50%	89.2	123.7
Vibro Hammer	1	250	10	80%	100.0	134.6
Pile Hammer	1	250	10	20%	94.0	128.6
Generator	1	250	10	50%	78.0	112.6
250 CFM Compressor	1	150	10	50%	75.0	109.6
Welding Machine	1	30	10	20%	67.0	101.6
Pump	1	200	10	5%	68.0	102.6
Yard crane	1	350	10	20%	74.0	108.6
Outboard powered workskiffs	1	40	10	25%	73.1	107.7
Material Transport Tugboat	1	500	10	100%	90.1	124.7
Fill Cells						
20 CY bottom dump trucks	6	300	10	75%	82.5	117.1
Front end loader	1	200	10	75%	77.8	112.3
4100 Manitowoc Crane	1	364	10	100%	81.0	115.6
Barge Winches	2	800	10	50%	92.2	126.8
Vibro Hammer	1	250	10	80%	100.0	134.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Pile Hammer	1	250	10	20%	94.0	128.6
Generator	1	250	10	50%	78.0	112.6
250 CFM Compressor	1	150	10	50%	75.0	109.6
Welding Machine	1	30	10	20%	67.0	101.6
Pump	1	200	10	5%	68.0	102.6
Fill Processing Plant	1	1100	10	90%	93.1	127.7
Mobilization for Approach Walls (Roads, Crane Pads)						
Cat D-8 Dozer -Ripper	1	305	10	80%	81.0	115.6
Cat 980 Loader	1	318	10	80%	78.0	112.6
Cat 730 Articulated trucks	3	317	10	80%	79.8	114.4
Highway 10-wheeler dump truck	1	330	10	80%	75.0	109.6
Graders 140H	1	165	10	80%	84.0	118.6
Water Truck 4000gal	1	330	10	80%	75.0	109.6
Highway tractor - trailer	1	330	10	60%	73.8	108.4
Electric - Line Man Truck	1	200	10	70%	74.5	109.0
Mech trucks	2	200	10	70%	77.5	112.0
Fuel trucks	2	250	10	70%	77.5	112.0
Pipe Fitters Truck	1	200	10	70%	74.5	109.0
Flatbed trucks	2	200	10	60%	74.8	109.4
Pickup's standard F-150 (gas)	5	380	10	50%	79.0	113.6
Pickup's Ford 150 4X4 (gas)	2	411	10	50%	75.0	109.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Intake Approach Walls & Slab						
Manitowoc 555 - 150 ton Crawler	1	340	9	70%	79.5	114.0
50 ton Hydraulic Crane	1	174	9	70%	79.5	114.0
Concrete Boom Pump	1	330	10	70%	79.5	114.0
Highway tractor - trailer	1	330	9	70%	74.5	109.0
Pickup's Ford 150 4X4 (gas)	1	411	9	50%	72.0	106.6
Remove cell rubble fill						
3900 Manitowoc Crane	1	300	10	80%	80.0	114.6
20 CY bottom dump trucks	6	300	10	100%	83.8	118.4
Dozer	2	180	10	80%	84.0	118.6
Remove sheets						
4100 Manitowoc Crane	1	364	10	100%	81.0	115.6
Barge Winches	2	400	10	50%	89.2	123.7
Vibro Hammer	1	250	10	80%	86.2	120.7
Pile Hammer	1	250	10	20%	80.1	114.7
Generator	1	250	10	50%	78.0	112.6
250 CFM Compressor	1	150	10	50%	75.0	109.6
Welding Machine	1	30	10	20%	67.0	101.6
Pump	1	200	10	5%	68.0	102.6
Material Transport Tugboat	1	500	10	100%	90.1	124.7
Yard crane	1	350	10	100%	81.0	115.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Common Excavation						
Large Dozer-Ripper	2	570	10	90%	84.6	119.1
Large Excavator	1	428	10	90%	80.5	115.1
Off HWY 50 TN Trucks	7	650	10	80%	83.5	118.1
8 MG Water Pull	1	450	10	90%	75.5	110.1
Large Motor Grader	1	400	10	90%	84.5	119.1
Dozer	1	250	10	90%	81.5	116.1
Rock Excavation Dry						
Rock Drills	4	250	12	100%	87.0	121.6
Large Excavator	1	428	12	90%	80.5	115.1
Off HWY 50 TN Trucks	5	650	12	80%	82.0	116.6
8 MG Water Pull	1	450	12	90%	75.5	110.1
Large Dozer-Ripper	1	550	12	90%	81.5	116.1
Large Motor Grader	1	400	12	40%	81.0	115.6
8 MG Water Pull	1	450	12	90%	75.5	110.1
Dozer	1	185	12	90%	81.5	116.1
Powder Truck	1	350	12	90%	75.5	110.1
Dewater Behind Cofferdam*						
Pump	1	2200	24	85%	95.9	130.4
Set up/operate Bubble Curtain/Silt Curtain						
Tendors	2	200	10	70%	87.6	122.2
Dozer	1	250	10	80%	81.0	115.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Mid size Excavator	1	200	10	80%	80.0	114.6
Small Tug	1	250	10	80%	86.2	120.7
Large Tug	1	400	10	60%	86.9	121.5
1500 CFM Compressors	4	600	24	15%	75.8	110.4
80 TN crane	1	250	10	80%	80.0	114.6
Super 20 Carrylift	1	200	10	60%	78.8	113.4
Dredge Common to Rock*						
Large long reach Excavator/cutter	1	1100	20	90%	93.1	127.7
250 Ton Clam Derrick Barge	2	450	20	50%	81.0	115.6
Large Tug	2	500	20	50%	90.1	124.7
85 TN Rock Trucks	3	650	20	70%	79.2	113.8
Light plants	3	40	20	100%	83.9	118.5
Dozer	1	450	20	70%	80.5	115.0
Large Loader	1	500	20	10%	69.0	103.6
Barge Winches	1	400	20	40%	85.2	119.8
Drill and Shoot/Dredge Rock Wet*						
Rock Drills	3	350	20	80%	84.8	119.4
Large long reach Excavator/cutter	1	1100	20	80%	92.6	127.2
250 Ton Crane/Derrick	2	450	20	50%	81.0	115.6
Small Tug	1	250	20	40%	83.1	117.7
Large Tug	1	500	20	60%	87.9	122.5

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
50 TN Rock Trucks	3	600	20	60%	78.6	113.1
Light plants	4	40	20	60%	83.0	117.5
Large Dozer	1	450	20	50%	79.0	113.6
Large Loader	1	500	20	20%	72.0	106.6
Barge Winches	8	250	20	20%	89.2	123.7
Powder Truck	1	350	12	80%	75.0	109.6
Haul Road Prep, Spur Dike Stripping						
Large Dozer	1	570	10.43	80%	81.0	115.6
Large Motor Grader	1	275	10.43	80%	84.0	118.6
Large Excavator	1	532	10.43	60%	78.8	113.4
8 Mgal water truck	1	490	10.43	90%	75.5	110.1
40 TN Articulated Trucks	2	405	10.43	90%	78.6	113.1
80 Ton Crane	1	350	10.43	80%	80.0	114.6
Super 20 Carrylift	1	225	10.43	60%	82.8	117.4
Import Material from Quarry to D1/D2 MIAD						
On Hwy Transport Truck and Trailers	25	350	10.43	100%	90.0	124.6
Large Dozer	1	570	10.43	100%	82.0	116.6
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Emb Core and Rock Fill						
Large Dozer-Ripper	1	570	10.43	90%	81.5	116.1
Large Excavator	1	532	10.43	90%	80.5	115.1
40 TN articulated Trucks	6	405	10.43	95%	83.6	118.1
8 Mgal Water Truck	1	490	10.43	90%	75.5	110.1

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Large Motor Grader	1	275	10.43	20%	78.0	112.6
Dozer	1	305	10.43	90%	81.5	116.1
Self Propelled Vibratory Roller	1	153	10.43	25%	79.0	113.6
Rehandle all imported material to Spur Dike from D1/D2 MIAD, Rip Rap Bedding and Rip Rap						
Large Excavator	1	532	10.43	80%	80.0	114.6
Large Dozer	1	570	10.43	50%	79.0	113.6
Large Front End Loader	1	490	10.43	100%	79.0	113.6
Foundation Clean Up						
Large Tug	1	500	10	60%	87.9	122.5
Large long reach Excavator/cutter	1	1100	10	60%	91.3	125.9
1500 CFM Compressors	2	600	10	90%	80.6	115.1
Small Tug	1	250	10	80%	86.2	120.7
250 Ton Clam Derrick Barge	2	450	10	80%	83.0	117.6
Large Loader	1	500	10	40%	75.0	109.6
Barge Winches	4	250	10	40%	89.2	123.7
50 TN Rock Trucks	2	600	10	50%	76.0	110.6
Large Dozer	1	450	10	50%	79.0	113.6
Tendors	1	200	10	70%	84.6	119.2
Remove Transload Facility						
Large Dozer	1	570	10	80%	81.0	115.6
Small Dozer	1	185	10	80%	81.0	115.6

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
Large Motor Grader	1	275	10	80%	84.0	118.6
Large Roller	1	250	10	30%	74.8	109.4
225T Crane	1	400	10	80%	80.0	114.6
80 Ton Crane	1	200	10	80%	80.0	114.6
4 Mgal Water Truck	1	350	10	80%	75.0	109.6
8 Mgal Water WAGON	1	450	10	80%	75.0	109.6
Off HWY 50 TN Trucks	2	650	10	80%	78.0	112.6
Rock Import Trucks	3	350	10	70%	79.2	113.8
Large Excavator	1	550	10	90%	80.5	115.1
Rub Tire Backhoe	1	125	10	70%	76.5	111.0
Loader 980 size	1	350	10	70%	77.5	112.0
Super 30 carrylift	1	350	10	70%	79.5	114.0
Loader 966 size	1	300	10	80%	78.0	112.6
Site Restoration/Teardown						
Pick up Trucks	6	200	10	30%	77.6	112.1
Large Motor Grader	1	400	10	80%	84.0	118.6
Generator	2	200	10	65%	82.1	116.7
Outboard powered workskiffs	2	40	10	65%	80.3	114.9
Shop Trucks	2	250	10	40%	75.0	109.6
Large Tug	1	400	10	70%	87.6	122.2
Small Tug	1	250	10	70%	85.6	120.2
dozer	1	185	10	60%	79.8	114.4

Alternative 3 Equipment Estimate Summary

Equipment	Quantity	Horsepower (HP)	Hours per Day	Duty Cycle	Total SPL of Equipment at 50 Feet (dBA L_{eq})	Total PWL of Equipment (dBA)
medium size excavator	1	200	8	90%	80.5	115.1
Staging Area w/ Rock Crusher						
Rock Crusher	1	n/a	12	100%**	83.0	117.6
Batch Plant	1	n/a	12/24	100%**	83.0	117.6
Large Dozer	2	570	12	100%**	82.0	116.6
Belly dump truck	2	300	12	100%**	79.0	113.6
Staging Area w/out Rock Crusher						
Batch Plant	1	n/a	12/24	100%**	83.0	117.6
Large Dozer	2	570	12	100%**	82.0	116.6
Belly dump truck	2	300	12	100%**	79.0	113.6
Batch Plant Activities at Staging Area*						
Batch Plant	1	n/a	12/24	100%**	83.0	117.6

*potential nighttime activity
**assumed 100% duty cycle

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Nicholas Fonseca
Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

OCT 13 2011

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel project near Folsom, California. The California Department of Water Resources (DWR) and the U.S. Army Corps of Engineers (Corps) are constructing the Project as a component of the Folsom Dam Joint Federal Project (JFP). The Bureau of Reclamation (BUR) has previously consulted on the Dam Safety component of the JFP in 2006 and 2007. The Corps is responsible for completion of the Flood Risk Management (FRM) components of the JFP, to include construction of an auxiliary spillway. The Corps has consulted with potentially interested Native American tribes on previous phases of the overall JFP in 2008 and 2010. At this time we are beginning identification efforts for a supplemental environmental impact statement/environmental impact report (EIS/EIR) for the JFP and more specifically, on the Folsom Dam Modifications, Approach Channel project (Project).

The area of potential effects (APE) for the Project is located near the left and right abutments of Folsom Dam and near Dikes 7 and 8 and the Morman Island Auxiliary Dam in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, and R8E in portions of Section 19, 20, 21, 24, 28, 29, and 30 (enclosure 1). The EIS/EIR will address construction alternatives that are intended to improve dam safety and provide FRM within the APE. Alternatives analyzed for the EIS/EIR may include one or more of the following design measures: installation of a temporary cofferdam or cutoff walls, construction of a spur dike, blasting to remove bedrock material, dredging, terrestrial deposition of dredge material, and temporary modification of existing terrestrial sites for haul routes and staging areas.

We have completed a records and literature search at the North Central Information Center at California State University, Sacramento. Other than Folsom Dam, there are no known historic properties located within the APE for the Project. We also plan to conduct a pedestrian survey of the APE not previously consulted on during the BUR's consultation. If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

A public scoping meeting for the Project will be held to present an overview of the Project and the EIS/EIR process, and to afford all interested parties with an opportunity to comment on the scope of the analysis and potential alternatives. The public scoping meeting will be held at the Folsom Community Center at 52 Natoma Street in Folsom, California on October 20, 2011. Presentation on the Project will begin at 6 p.m. and we invite you to attend as an interested party.

We have contacted the Native American Heritage Commission, who provided your name as being potentially interested in our proposed project. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the Project APE. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Gregory S. Baker, Tribal Administrator
United Auburn Indian Community
Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

OCT 13 2011

Dear Mr. Baker:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel project near Folsom, California. The California Department of Water Resources (DWR) and the U.S. Army Corps of Engineers (Corps) are constructing the Project as a component of the Folsom Dam Joint Federal Project (JFP). The Bureau of Reclamation (BUR) has previously consulted on the Dam Safety component of the JFP in 2006 and 2007. The Corps is responsible for completion of the Flood Risk Management (FRM) components of the JFP, to include construction of an auxiliary spillway. The Corps has consulted with potentially interested Native American tribes on previous phases of the overall JFP in 2008 and 2010. At this time we are beginning identification efforts for a supplemental environmental impact statement/environmental impact report (EIS/EIR) for the JFP and more specifically, on the Folsom Dam Modifications, Approach Channel project (Project).

The area of potential effects (APE) for the Project is located near the left and right abutments of Folsom Dam and near Dikes 7 and 8 and the Morman Island Auxiliary Dam in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, and R8E in portions of Section 19, 20, 21, 24, 28, 29, and 30 (enclosure 1). The EIS/EIR will address construction alternatives that are intended to improve dam safety and provide FRM within the APE. Alternatives analyzed for the EIS/EIR may include one or more of the following design measures: installation of a temporary cofferdam or cutoff walls, construction of a spur dike, blasting to remove bedrock material, dredging, terrestrial deposition of dredge material, and temporary modification of existing terrestrial sites for haul routes and staging areas.

We have completed a records and literature search at the North Central Information Center at California State University, Sacramento. Other than Folsom Dam, there are no known historic properties located within the APE for the Project. We also plan to conduct a pedestrian survey of the APE not previously consulted on during the BUR's consultation. If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

A public scoping meeting for the Project will be held to present an overview of the Project and the EIS/EIR process, and to afford all interested parties with an opportunity to comment on the scope of the analysis and potential alternatives. The public scoping meeting will be held at the Folsom Community Center at 52 Natoma Street in Folsom, California on October 20, 2011. Presentation on the Project will begin at 6 p.m. and we invite you to attend as an interested party.

We have contacted the Native American Heritage Commission, who provided your name as being potentially interested in our proposed project. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the Project APE. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. David Keyser, Chairperson
United Auburn Indian Community
Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

OCT 13 2011

Dear Mr. Keyser:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel project near Folsom, California. The California Department of Water Resources (DWR) and the U.S. Army Corps of Engineers (Corps) are constructing the Project as a component of the Folsom Dam Joint Federal Project (JFP). The Bureau of Reclamation (BUR) has previously consulted on the Dam Safety component of the JFP in 2006 and 2007. The Corps is responsible for completion of the Flood Risk Management (FRM) components of the JFP, to include construction of an auxiliary spillway. The Corps has consulted with potentially interested Native American tribes on previous phases of the overall JFP in 2008 and 2010. At this time we are beginning identification efforts for a supplemental environmental impact statement/environmental impact report (EIS/EIR) for the JFP and more specifically, on the Folsom Dam Modifications, Approach Channel project (Project).

The area of potential effects (APE) for the Project is located near the left and right abutments of Folsom Dam and near Dikes 7 and 8 and the Morman Island Auxiliary Dam in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, and R8E in portions of Section 19, 20, 21, 24, 28, 29, and 30 (enclosure 1). The EIS/EIR will address construction alternatives that are intended to improve dam safety and provide FRM within the APE. Alternatives analyzed for the EIS/EIR may include one or more of the following design measures: installation of a temporary cofferdam or cutoff walls, construction of a spur dike, blasting to remove bedrock material, dredging, terrestrial deposition of dredge material, and temporary modification of existing terrestrial sites for haul routes and staging areas.

We have completed a records and literature search at the North Central Information Center at California State University, Sacramento. Other than Folsom Dam, there are no known historic properties located within the APE for the Project. We also plan to conduct a pedestrian survey of the APE not previously consulted on during the BUR's consultation. If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

A public scoping meeting for the Project will be held to present an overview of the Project and the EIS/EIR process, and to afford all interested parties with an opportunity to comment on the scope of the analysis and potential alternatives. The public scoping meeting will be held at the Folsom Community Center at 52 Natoma Street in Folsom, California on October 20, 2011. Presentation on the Project will begin at 6 p.m. and we invite you to attend as an interested party.

We have contacted the Native American Heritage Commission, who provided your name as being potentially interested in our proposed project. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the Project APE. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Ms. Eileen Moon
Vice Chairperson
Tsi-Akim Maidu
1239 East Main Street
Grass Valley, California 95945

OCT 13 2011

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel project near Folsom, California. The California Department of Water Resources (DWR) and the U.S. Army Corps of Engineers (Corps) are constructing the Project as a component of the Folsom Dam Joint Federal Project (JFP). The Bureau of Reclamation (BUR) has previously consulted on the Dam Safety component of the JFP in 2006 and 2007. The Corps is responsible for completion of the Flood Risk Management (FRM) components of the JFP, to include construction of an auxiliary spillway. The Corps has consulted with potentially interested Native American tribes on previous phases of the overall JFP in 2008 and 2010. At this time we are beginning identification efforts for a supplemental environmental impact statement/environmental impact report (EIS/EIR) for the JFP and more specifically, on the Folsom Dam Modifications, Approach Channel project (Project).

The area of potential effects (APE) for the Project is located near the left and right abutments of Folsom Dam and near Dikes 7 and 8 and the Morman Island Auxiliary Dam in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, and R8E in portions of Section 19, 20, 21, 24, 28, 29, and 30 (enclosure 1). The EIS/EIR will address construction alternatives that are intended to improve dam safety and provide FRM within the APE. Alternatives analyzed for the EIS/EIR may include one or more of the following design measures: installation of a temporary cofferdam or cutoff walls, construction of a spur dike, blasting to remove bedrock material, dredging, terrestrial deposition of dredge material, and temporary modification of existing terrestrial sites for haul routes and staging areas.

We have completed a records and literature search at the North Central Information Center at California State University, Sacramento. Other than Folsom Dam, there are no known historic properties located within the APE for the Project. We also plan to conduct a pedestrian survey of the APE not previously consulted on during the BUR's consultation. If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

A public scoping meeting for the Project will be held to present an overview of the Project and the EIS/EIR process, and to afford all interested parties with an opportunity to comment on the scope of the analysis and potential alternatives. The public scoping meeting will be held at the Folsom Community Center at 52 Natoma Street in Folsom, California on October 20, 2011. Presentation on the Project will begin at 6 p.m. and we invite you to attend as an interested party.

We have contacted the Native American Heritage Commission, who provided your name as being potentially interested in our proposed project. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the Project APE. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

SHINGLE SPRINGS RANCHERIA

Shingle Springs Band of Miwok Indians,
Shingle Springs Rancheria
(Verona Tract), California
5281 Honpie Road, Placerville, CA 95667
P.O. Box 1340, Shingle Springs, CA 95682
(530) 676-8010 Office (530)676-8033 Fax

October 24, 2011

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

RE: The Proposed Folsom Dam Modifications, Approach Channel Project near Folsom California

Dear Ms. Melissa Montag

The Most likely Descendant, Daniel Fonseca would like to initiate consultation process with the Department of the Army for Folsom Dam Modifications Approach Channel Project located in Sacramento County. Among other things, we would like this consultation to address the cultural and historic resource issues, pursuant to the regulations implementing Section 106 of the National Historic Preservation Act.

Prior to meeting we would like to request any and all completed record searches and or surveys that were done in or around the project area up to and including environmental, archaeological and cultural reports.

Please let this letter serve as a formal request for the Shingle Springs Band of Miwok Indians to be added as a consulting party in identifying any Traditional Cultural Properties (TCPs) that may exist within the project's Area of Potential Effects (APE).

Please contact Crystal Dilworth, Cultural Resource Office Manager at 530-698-1471 to schedule a consultation meeting pursuant to Section 106 of the NHPA.

Sincerely,

Daniel Fonseca
Cultural Resources Director

Montag, Melissa L SPK

From: Montag, Melissa L SPK
Sent: Monday, November 07, 2011 1:54 PM
To: Marcos Guerrero
Cc: Tribal Preservation; Melodi McAdams; Greg Baker
Subject: RE: Folsom Dam Modifications (UNCLASSIFIED)
Attachments: Project_Map_2.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Hello Marcos,

We would be happy to meet with you at your convenience to discuss the project. I'm attaching and sending some links to information on previous environmental and cultural resources compliance done in the project area for your information and review. The current proposed work is a part of the larger Joint Federal Project, a combined venture between the Corps of Engineers and the Bureau of Reclamation that was included in an Environmental Impact Statement in 2007. We are presently working towards NEPA and Section 106 compliance in a supplemental EIS to that 2007 document.

I'm also included an aerial map that shows some of the project features in a little more detail. Although the area was almost entirely included within the Bureau's NEPA and Section 106 compliance efforts there are some areas and activities not previously included. As a result I have requested an updated records and literature search from the North Central Information Center. Once I have received those results I would be happy to share with you the information on previous surveys and known sites in the area.

The Corps has a website where we are posting information on the current project as it becomes available:
http://www.spk.usace.army.mil/projects/civil/americanriver/jfp/docs.html

The Corps has posted several NEPA compliance related documents at an ftp site here:
ftp://ftp.usace.army.mil/pub/spk/Folsom_JFP/

And the Bureau has a fairly exhaustive list of documents they completed as part of the Joint Federal Project here:
http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=1808

I would like to propose that we meet sometime in early December. I would like to plan to have a few Corps technical team members present in order to be able to describe the project and answer any questions you may have. We would be able to host the meeting in our offices at 1325 J Street in Sacramento or we would be happy to come to wherever is convenient for you. We could follow up that meeting with a site visit later, if needed. If you have some dates and times in early December that would work best for you please let me know, we will work around your schedule.

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922
(916) 557-7907
e-mail: Melissa.L.Montag@usace.army.mil Please note that due to security requirements our out of the office notification has been disabled. If I do not respond to your message in a few days, I may be out of the office. I will respond as soon as I am able. Thank you.

-----Original Message-----
From: Marcos Guerrero [mailto:mguerrero@auburnrancheria.com]
Sent: Monday, November 07, 2011 12:43 PM
To: Montag, Melissa L SPK

Cc: Tribal Preservation; Melodi McAdams; Greg Baker
Subject: Folsom Dam Modifications

Hello Melissa,

You will be receiving a letter in the mail from Greg Baker, Tribal Administrator, regarding this project. In the mean time I would like to set up a meeting/site visit and go over some of the tribes concerns. We are currently reviewing our inventory or any resources in your project area, but consider it sensitive for cultural and environmental resources. We also have qualified UAIC tribal members that would also like to participate in the survey.

Please let me know when we could discuss your project.

Thank you and we look forward to your response,

Marcos Guerrero, RPA, THPO

Tribal Historic Preservation Committee

United Auburn Indian Community of the Auburn Rancheria

10720 Indian Hill Road

Auburn, CA 95603

Office: (530) 883-2364

Cell: (916) 420-0213

Fax: (530) 885-5476

Classification: UNCLASSIFIED
Caveats: NONE

MIWOK MAIDU
United Auburn Indian Community
of the Auburn Rancheria

November 16, 2011

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922

Subject: Folsom Dam Modifications, Approach Channel Project

Dear Ms. Montag,

Thank you for requesting information regarding the above referenced project. The United Auburn Indian Community (UAIC) of the Auburn Rancheria is comprised of Miwok and Southern Maidu (Nisenan) people whose tribal lands are within Placer County and ancestral territory spans into El Dorado, Nevada, Sacramento, Sutter, and Yuba counties. The UAIC is concerned about development within its aboriginal territory that has potential to impact the lifeways, cultural sites, and landscapes that may be of sacred or ceremonial significance. We appreciate the opportunity to comment on this and other projects in your jurisdiction.

In order to ascertain whether or not the project could affect cultural resources that may be of importance to the UAIC, we would like to receive copies of any archaeological reports that have been, or will be, completed for the project. We also request copies of future environmental documents for the proposed project so that we have the opportunity to comment on potential impacts and proposed mitigation measures related to cultural resources. The UAIC would also like the opportunity to have our tribal monitors accompany you during the field survey and ground disturbing activities. The information gathered will provide us with a better understanding of the project and cultural resources on site and is invaluable for consultation purposes.

The UAIC's preservation committee has identified cultural resources within your project area and in close proximity, and would like to request a site visit to confirm their locations and meet with you regarding this project. Thank you again for taking these matters into consideration, and for involving the UAIC early in the planning process. We look forward to reviewing the aforementioned documents as requested. Please contact Marcos Guerrero, Tribal Historic Preservation Officer, at (530) 883-2364 or email at mguerrero@auburnrancheria.com if you have any questions.

Sincerely,

Gregory S. Baker,
Tribal Administrator

CC: Marcos Guerrero, UAIC

Montag, Melissa L SPK

From: Montag, Melissa L SPK
Sent: Thursday, December 15, 2011 2:51 PM
To: Marcos Guerrero
Cc: Montag, Melissa L SPK
Subject: Joint Federal Project - Folsom Dam Modifications - Phase III Project (UNCLASSIFIED)
Attachments: USACE Records Search Reports List JFP Phase III Dec2011.xlsx; USACE Records Search Reports B JFP Phase III Dec2011.pdf; USACE Records Search Reports A JFP Phase III Dec2011.pdf; USACE Records Search Resources JFP Phase III Dec2011.pdf

Classification: UNCLASSIFIED
Caveats: NONE

Hi Marcos,

As you requested, I am providing you with scanned copies of the just completed records and literature search for the Joint Federal Project Folsom Dam Modifications, Phase III Project that we met with you on last week. The files are a little large but I'm hoping they come through okay, I didn't want to reduce the file size and lose image quality. I'm reluctant to post them on our public ftp site since this is considered confidential information so if you have any issues getting the files let me know and I will reproduce and send you hard copies.

I'm also including a brief bibliography of the report numbers referenced on the map. As you know, the records and information are considered privileged and confidential and should not be shared publically. Let me know if you have any questions about the information. You mentioned that you would like to conduct a site visit of the project, which we would be happy to coordinate. Perhaps if you have some available dates and times in January I can work on coordinating that on my end?

And I will be sending a letter with some additional information, maps, and summarization of communication in the near future as part of our continuing consultation process. Please let me know if you have any questions.

Sincerely,

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922
(916) 557-7907
e-mail: Melissa.L.Montag@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Montag, Melissa L SPK

From:	Montag, Melissa L SPK
Sent:	Thursday, December 15, 2011 2:58 PM
To:	Crystal Dilworth
Cc:	dfonseca@ssband.org; Montag, Melissa L SPK
Subject:	RE: Follow up on Corps Folsom Dam Modifications Project (UNCLASSIFIED)
Attachments:	USACE Records Search Reports List JFP Phase III Dec2011.xlsx; USACE Records Search Reports B JFP Phase III Dec2011.pdf; USACE Records Search Reports A JFP Phase III Dec2011.pdf; USACE Records Search Reports List JFP Phase III Dec2011.xlsx

Classification: UNCLASSIFIED
Caveats: NONE

Hello Crystal,

As you requested in your October 24, 2011 letter to the Corps of Engineers, I am providing you with scanned copies of the just completed records and literature search for the Joint Federal Project Folsom Dam Modifications, Phase III Project. The files are a little large but I'm hoping they come through okay, I didn't want to reduce the file size and lose image quality. I'm reluctant to post them on our public ftp site since this is considered confidential information so if you have any issues getting the files let me know and I will reproduce and send you hard copies.

I'm also including a brief bibliography of the report numbers referenced on the map. As you know, the records and information are considered privileged and confidential and should not be shared publically. Let me know if you have any questions about the information.

If you would like to meet to discuss the project or would like additional information please let me know. I would like to plan to have a few Corps technical team members present in order to be able to describe the project and answer any questions you may have. We would be able to host the meeting in our offices at 1325 J Street in Sacramento or we would be happy to come to wherever is convenient for you. We could follow up that meeting with a site visit later, if needed.

Thank you for your interest in our project.

Sincerely,

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922
(916) 557-7907
e-mail: Melissa.L.Montag@usace.army.mil
Please note that due to security requirements our out of the office notification has been disabled. If I do not respond to your message in a few days, I may be out of the office. I will respond as soon as I am able. Thank you.

-----Original Message-----
From: Montag, Melissa L SPK
Sent: Wednesday, December 07, 2011 8:53 AM
To: 'Crystal Dilworth'
Cc: 'dfonseca@ssband.org'
Subject: FW: Follow up on Corps Folsom Dam Modifications Project (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hello Crystal,

I wanted to follow up with you in reference to my email below. I received the October 24, 2011 letter from Mr. Fonseca requesting information on the project, and environmental and cultural reports on the Folsom Dam Modifications, Approach Channel Project, an aspect of the overall Join Federal Project. I replied with links to information in my email below but wanted to see if you had any additional information requests at this time. I am awaiting the results of an updated records and literature search and once I have received that I will send you a scan of the map depicting surveys and sites in the project area.

Additionally, as mentioned in my November 7, 2011 email below, please let me know if you would like to meet. I would like to plan to have a few Corps technical team members present in order to be able to describe the project and answer any questions you may have. We would be able to host the meeting in our offices at 1325 J Street in Sacramento or we would be happy to come to wherever is convenient for you. We could follow up that meeting with a site visit later, if needed.

Thank you for your interest in our project.

Sincerely,

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922
(916) 557-7907
e-mail: Melissa.L.Montag@usace.army.mil Please note that due to security requirements our out of the office notification has been disabled. If I do not respond to your message in a few days, I may be out of the office. I will respond as soon as I am able. Thank you.

-----Original Message-----
From: Montag, Melissa L SPK
Sent: Monday, November 07, 2011 2:00 PM
To: Crystal Dilworth
Subject: Follow up on Corps Folsom Dam Modifications Project (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hello Crystal,

I received the letter dated October 24, 2011 from Daniel Fonseca that requested additional information on the Folsom Dam Modifications, Approach Channel Project and that requested to meet with the Corps in reference to the project.

We would be happy to meet with you at your convenience to discuss the project. As was requested in the letter, I'm attaching and sending some links to information on previous environmental and cultural resources compliance done in the project area for your information and review. The current proposed work is a part of the larger Joint Federal Project, a combined venture between the Corps of Engineers and the Bureau of Reclamation that was included in an Environmental Impact Statement in 2007. We are presently working towards NEPA and Section 106 compliance in a supplemental EIS to that 2007 document.

I'm also included an aerial map that shows some of the project features in a little more detail. Although the area was almost entirely included within the Bureau's NEPA and Section 106 compliance efforts there are some areas and activities not previously included. As a result I have requested an updated records and literature search from the North Central Information Center. Once I have received those results I would be happy to share with you the information on previous surveys and known sites in the area.

The Corps has a website where we are posting information on the current project as it becomes available:
http://www.spk.usace.army.mil/projects/civil/americanriver/jfp/docs.html

The Corps has posted several NEPA compliance related documents at an ftp site here:
ftp://ftp.usace.army.mil/pub/spk/Folsom_JFP/

And the Bureau has a fairly exhaustive list of documents they completed as part of the Joint Federal Project here:
http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=1808

I would like to propose that we meet sometime in early December. I would like to plan to have a few Corps technical team members present in order to be able to describe the project and answer any questions you may have. We would be able to host the meeting in our offices at 1325 J Street in Sacramento or we would be happy to come to wherever is convenient for you. We could follow up that meeting with a site visit later, if needed. If you have some dates and times in early December that would work best for you please let me know, we will work around your schedule.

Thank you for your interest in our project.

Sincerely,

Melissa Montag
Senior Environmental Manager/Historian
U.S. Army Corps of Engineers
Cultural, Recreation & Social Assessment Section (CESPK-PD-RC)
1325 J Street
Sacramento, CA 95814-2922
(916) 557-7907
e-mail: Melissa.L.Montag@usace.army.mil

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

DEC 22 2011

Mr. Marcos Guerrero
Tribal Historic Preservation Officer
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Mr. Guerrero:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel Phase III (Phase III) Project near Folsom, California. The Phase III Project is a component of the Folsom Dam Joint Federal Project (JFP), which includes Flood Damage Reduction (FDR) measures to Folsom Dam, its dikes, and associated features. The U.S. Bureau of Reclamation (USBR) is responsible for construction of Dam Safety features for the JFP while the U.S. Army Corps of Engineers (Corps) is in the process of constructing the FDR features of the overall JFP. The Corps has consulted with potentially interested Native American tribes and individuals on previous phases of the overall JFP in 2008 and 2010. We contacted you in a letter dated October 13, 2011 to inform you of the Phase III Project, provide you with general project information, invite you to the public scoping meeting, and ask for any interest you may have on the Phase III Project.

We received your letter dated November 16, 2011, requesting information on the Phase III Project, as well as all record searches, surveys, environmental, archaeological and cultural reports completed in or around the APE. As you requested in an email to Ms. Melissa Montag, Corps Historian, on November 7, 2011, Ms. Montag provided links to the available requested reports and Phase III Project background on the USBR website and our project and ftp websites. We met with you on December 6, 2011, to discuss the Phase III Project further and in an email on December 15, 2011 Ms. Montag provided you with copies of the recently completed records and literature search for the Phase III Project.

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing you now to further define the area of potential effects (APE), provide additional information, describe our efforts to identify historic properties, and further request if you have any information or if you have interest in the Phase III Project. We are in the process of completing a supplemental environmental impact statement/environmental impact report for the JFP and more specifically, on the Phase III Project.

The Corps, in coordination with the Central Valley Flood Protection Board and the Sacramento Area Flood Control Agency, is implementing the JFP FDR features in order to significantly decrease the flood risk in the Sacramento area. Pursuant to 36 CFR Part 800.2(c)(2)(ii)(A) we are offering you the opportunity to identify any concerns you may have about the project, and advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, within the APE.

The APE for the Phase III Project is located near the left abutment of Folsom Dam and near Dikes 7 and 8 and the Mormon Island Auxiliary Dam (MIAD) in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, in portions of Section 19, 29, and 30 (Enclosure 1). This is an expanded APE from our 2010 correspondence and includes all the currently known FDR features of the JFP. The revised APE is almost entirely within the APE that the USBR included in their consultation during the completion of the 2007 JFP Environmental Impact Statement/Environmental Impact Report and Section 106 compliance.

Phase III of the Project includes the completion of the approach channel and spur dike for the auxiliary spillway at Folsom Dam. Components for construction of these features include:

- Construction of a transload facility adjacent to Dike 7.
- Construction of a concrete batch plant.
- Installation of a 1,000 foot long concrete secant pile cutoff wall between the rock plug and the control structure.
- Placement of fill material along the east side of the rock plug to maintain the 80 foot wide haul road connection to the spillway.
- Excavation of material from the rock plug between the control structure and the cutoff wall.
- Installation of the approach channel slab and concrete walls.
- Excavation of the remaining rock plug to flood the approach channel.
- Dredging of the remaining material to complete the approach channel.
- Disposal of material at MIAD and temporary stockpile of material at Dike 7.
- Construction of a spur dike on the north side of the approach channel.

We have determined that the APE includes those areas highlighted and outlined in Enclosure 1. Most of the APE for the Phase III Project was included in the Section 106 consultation conducted by the USBR for excavation of the spillway under the JFP in 2006 and 2007 and during our previous Section 106 consultation for the Phase I and II of the Corps' JFP FDR measures. The only portion of the APE not included in the previous consultation efforts is the section of the transload facility that extends into Folsom Reservoir.

We have completed an updated records and literature search at the North Central Information Center at California State University, Sacramento. The only known cultural resources within the APE for the Phase III Project are Folsom Dam, Dike 7, Dike 8, and MIAD. Folsom Dam and its associated features are eligible for listing in the National Register of Historic Places. The known cultural resources within the APE will not be adversely affected by the Phase III Project. Other than the portions of the Phase III Project that extend into Folsom Reservoir (the transload facility, the spillway approach channel, and the spur dike) all of the APE has been previously surveyed or heavily disturbed by construction of the dam in the 1950s; follow on modification, maintenance, and repair of Folsom Dam, dikes and MIAD; or construction of roads and other development around Folsom Reservoir.

If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

Pursuant to 36 CFR Part 800.3(f)(2), we request that you notify us if you have interest in the Phase III Project or if you may attach religious and cultural significance to historic properties in the APE. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, traditional cultural properties, or areas of traditional cultural value or concern in or near the Phase III Project APE.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Ms. Pamela Arnie, Project Manager, at (916) 557-7811 with any specific project questions.

Sincerely,

For Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc (w/enclosures):
Mr. Gregory S. Baker, Tribal Administrator, United Auburn Indian Community of the Auburn Rancheria, 10720 Indian Hill Road, Auburn, California 95603
Ms. Anastasia Leigh, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Daniel Fonseca
Tribal Historic Preservation Officer
Shingle Springs Rancheria
P.O. Box 1340
Shingle Springs, California 95682

DEC 22 2011

Dear Mr. Fonseca:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel Phase III (Phase III) Project near Folsom, California. The Phase III Project is a component of the Folsom Dam Joint Federal Project (JFP), which includes Flood Damage Reduction (FDR) measures to Folsom Dam, its dikes, and associated features. The U.S. Bureau of Reclamation (USBR) is responsible for construction of Dam Safety features for the JFP while the U.S. Army Corps of Engineers (Corps) is in the process of constructing the FDR features of the overall JFP. The Corps has consulted with potentially interested Native American tribes and individuals on previous phases of the overall JFP in 2008 and 2010. We contacted you in a letter dated October 13, 2011 to inform you of the Phase III Project, provide you with general project information, invite you to the public scoping meeting, and ask for any interest you may have on the Phase III Project.

We received your letter dated October 24, 2011, requesting initiation of the consultation process on the Phase III Project, as well as all record searches, surveys, environmental, archaeological and cultural reports completed in or around the APE. In your letter you also formally requested that the Shingle Springs Band of Miwok Indians be added as a consulting party in identifying any traditional cultural properties that may exist within the area of potential effects (APE). As requested, Ms. Melissa Montag, Corps Historian, contacted Ms. Crystal Dilworth, leaving a phone message on October 28, 2011 to discuss the project further. Ms. Montag followed that phone message with an email on November 7, 2011 providing links to the available requested reports and Phase III Project background. On December 7, 2011, Ms. Montag sent an email to arrange for a meeting with the Shingle Springs Band of Miwok Indians as requested and in an email on December 15, 2011, Ms. Montag provided you with copies of the recently completed records and literature search for the Phase III Project. We ask that you notify us if you would like to meet to discuss the project, arrange for a site visit, or would like additional information.

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing you now to further define the APE, provide additional information, describe our efforts to identify historic properties, and further request if you have any information or if you have interest in the Phase III Project. We are in the process of completing a supplemental environmental impact statement/environmental impact report for the JFP and more specifically, on the Phase III Project.

The Corps, in coordination with the Central Valley Flood Protection Board and the Sacramento Area Flood Control Agency, is implementing the JFP FDR features in order to significantly decrease the flood risk in the Sacramento area. Pursuant to 36 CFR Part 800.2(c)(2)(ii)(A) we are offering you the opportunity to identify any concerns you may have about the project, and advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, within the APE.

The APE for the Phase III Project is located near the left abutment of Folsom Dam and near Dikes 7 and 8 and the Mormon Island Auxiliary Dam (MIAD) in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, in portions of Section 19, 29, and 30 (Enclosure 1). This is an expanded APE from our 2010 correspondence and includes all the currently known FDR features of the JFP. The revised APE is almost entirely within the APE that the USBR included in their consultation during the completion of the 2007 JFP Environmental Impact Statement/Environmental Impact Report and Section 106 compliance.

Phase III of the Project includes the completion of the approach channel and spur dike for the auxiliary spillway at Folsom Dam. Components for construction of these features include:

- Construction of a transload facility adjacent to Dike 7.
- Construction of a concrete batch plant.
- Installation of a 1,000 foot long concrete secant pile cutoff wall between the rock plug and the control structure.
- Placement of fill material along the east side of the rock plug to maintain the 80 foot wide haul road connection to the spillway.
- Excavation of material from the rock plug between the control structure and the cutoff wall.
- Installation of the approach channel slab and concrete walls.
- Excavation of the remaining rock plug to flood the approach channel.
- Dredging of the remaining material to complete the approach channel.
- Disposal of material at MIAD and temporary stockpile of material at Dike 7.
- Construction of a spur dike on the north side of the approach channel.

We have determined that the APE includes those areas highlighted and outlined in Enclosure 1. Most of the APE for the Phase III Project was included in the Section 106 consultation conducted by the USBR for excavation of the spillway under the JFP in 2006 and 2007 and during our previous Section 106 consultation for the Phase I and II of the Corps' JFP

FDR measures. The only portion of the APE not included in the previous consultation efforts is the section of the transload facility that extends into Folsom Reservoir.

We have completed an updated records and literature search at the North Central Information Center at California State University, Sacramento. The only known cultural resources within the APE for the Phase III Project are Folsom Dam, Dike 7, Dike 8, and MIAD. Folsom Dam and its associated features are eligible for listing in the National Register of Historic Places. The known cultural resources within the APE will not be adversely affected by the Phase III Project. Other than the portions of the Phase III Project that extend into Folsom Reservoir (the transload facility, the spillway approach channel, and the spur dike) all of the APE has been previously surveyed or heavily disturbed by construction of the dam in the 1950s; follow on modification, maintenance, and repair of Folsom Dam, dikes and MIAD; or construction of roads and other development around Folsom Reservoir.

If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

Pursuant to 36 CFR Part 800.3(f)(2), we request that you notify us if you have interest in the Phase III Project or if you may attach religious and cultural significance to historic properties in the APE. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, traditional cultural properties, or areas of traditional cultural value or concern in or near the Phase III Project APE.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Ms. Pamela Arnie, Project Manager, at (916) 557-7811 with any specific project questions.

Sincerely,

For Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc (w/enclosures):
Ms. Crystal Dilworth, Cultural Resource Office Manager, Shingle Springs Rancheria, P.O. Box 1340, Shingle Springs, California 95682
Ms. Anastasia Leigh, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

DEC 22 2011

Ms. Eileen Moon
Vice Chairperson
Tsi-Akim Maidu
1239 East Main Street
Grass Valley, California 95945

Dear Ms. Moon:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel Phase III (Phase III) Project near Folsom, California. The Phase III Project is a component of the Folsom Dam Joint Federal Project (JFP), which includes Flood Damage Reduction (FDR) measures to Folsom Dam, its dikes, and associated features. The U.S. Bureau of Reclamation (USBR) is responsible for construction of Dam Safety features for the JFP while the U.S. Army Corps of Engineers (Corps) is in the process of constructing the FDR features of the overall JFP. The Corps has consulted with potentially interested Native American tribes and individuals on previous phases of the overall JFP in 2008 and 2010. We contacted you in a letter dated October 13, 2011 to inform you of the Phase III Project, provide you with general project information, invite you to the public scoping meeting, and ask for any interest you may have on the Phase III Project.

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing you now to further define the area of potential effects (APE), provide additional information, describe our efforts to identify historic properties, and further request if you have any information or if you have interest in the Phase III Project. We are in the process of completing a supplemental environmental impact statement/environmental impact report for the JFP and more specifically, on the Phase III Project.

The Corps, in coordination with the Central Valley Flood Protection Board and the Sacramento Area Flood Control Agency, is implementing the JFP FDR features in order to significantly decrease the flood risk in the Sacramento area. Pursuant to 36 CFR Part 800.2(c)(2)(ii)(A) we are offering you the opportunity to identify any concerns you may have about the project, and advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, within the APE.

The APE for the Phase III Project is located near the left abutment of Folsom Dam and near Dikes 7 and 8 and the Mormon Island Auxiliary Dam (MIAD) in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, in portions of Section 19, 29, and 30 (Enclosure 1). This is an expanded APE from our 2010 correspondence and includes all the currently known FDR features of the JFP. The revised APE is almost entirely within the APE that the USBR included in their consultation during the completion of the 2007 JFP Environmental Impact Statement/Environmental Impact Report and Section 106 compliance.

Phase III of the Project includes the completion of the approach channel and spur dike for the auxiliary spillway at Folsom Dam. Components for construction of these features include:

- Construction of a transload facility adjacent to Dike 7.
- Construction of a concrete batch plant.
- Installation of a 1,000 foot long concrete secant pile cutoff wall between the rock plug and the control structure.
- Placement of fill material along the east side of the rock plug to maintain the 80 foot wide haul road connection to the spillway.
- Excavation of material from the rock plug between the control structure and the cutoff wall.
- Installation of the approach channel slab and concrete walls.
- Excavation of the remaining rock plug to flood the approach channel.
- Dredging of the remaining material to complete the approach channel.
- Disposal of material at MIAD and temporary stockpile of material at Dike 7.
- Construction of a spur dike on the north side of the approach channel.

We have determined that the APE includes those areas highlighted and outlined in Enclosure 1. Most of the APE for the Phase III Project was included in the Section 106 consultation conducted by the USBR for excavation of the spillway under the JFP in 2006 and 2007 and during our previous Section 106 consultation for the Phase I and II of the Corps' JFP FDR measures. The only portion of the APE not included in the previous consultation efforts is the section of the transload facility that extends into Folsom Reservoir.

We have completed an updated records and literature search at the North Central Information Center at California State University, Sacramento. The only known cultural resources within the APE for the Phase III Project are Folsom Dam, Dike 7, Dike 8, and MIAD. Folsom Dam and its associated features are eligible for listing in the National Register of Historic Places. The known cultural resources within the APE will not be adversely affected by the Phase III Project. Other than the portions of the Phase III Project that extend into Folsom Reservoir (the transload facility, the spillway approach channel, and the spur dike) all of the APE has been previously surveyed or heavily disturbed by construction of the dam in the 1950s; follow on modification, maintenance, and repair of Folsom Dam, dikes and MIAD; or construction of roads and other development around Folsom Reservoir.

If buried or previously unidentified resources are located during project activities, all work in the vicinity of the find would cease, and the California State Historic Preservation Office would be contacted for additional consultation per 36 CFR 800.13, Post Review Discoveries, and interested Native American representatives would be consulted.

Pursuant to 36 CFR Part 800.3(f)(2), we request that you notify us if you have interest in the Phase III Project or if you may attach religious and cultural significance to historic properties in the APE. We are sensitive to traditional cultural properties and sacred sites, and make every effort to avoid them. Please let us know if you have knowledge of locations of archeological sites, traditional cultural properties, or areas of traditional cultural value or concern in or near the Phase III Project APE.

Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information about the Section 106 compliance and consultation, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil. Please contact Ms. Pamela Amie, Project Manager, at (916) 557-7811 with any specific project questions.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

Cc (w/enclosures):
Ms. Anastasia Leigh, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825

MIWOK United Auburn Indian Community
MAIDU of the Auburn Rancheria

David Keyser	Kimberly DuBach	Gene Whitehouse	Brenda Conway	Calvin Moman
Chairman	Vice Chair	Secretary	Treasurer	Council Member

January 12, 2012

Melissa Montag
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, California 95814-2922

Subject: Folsom Dam Modifications, Approach Channel Phase III (Phase III) Project near Folsom, California, component of the Folsom Dam Joint Federal Project (JFP)

Dear Ms. Montag,

Thank you for the opportunity to consult on the above referenced project. The United Auburn Indian Community (UAIC) of the Auburn Rancheria is comprised of Miwok and Southern Maidu (Nisenan) people whose tribal lands are within Placer County and ancestral territory spans into El Dorado, Nevada, Sacramento, Sutter, and Yuba counties. The UAIC is concerned about development within its aboriginal territory that has potential to impact the lifeways, cultural sites, and landscapes that may be of sacred or ceremonial significance. We appreciate the opportunity to comment on this and other projects in your jurisdiction.

The UAIC has reviewed relevant project information and all requests and recommendations have been addressed. Based on the negative finding the Tribe concludes that the UAIC does not have any further archaeological concerns for this project. It is reasonable to conclude that the project should not result in the alteration of or adverse physical or aesthetic effect to any significant archaeological or historical burials, sites, structures, objects, or buildings; nor should the project have the potential to cause a physical change that would affect unique cultural values or restrict pre-historic religious or sacred uses of the project area. However, when a mitigation bank is chosen, the UAIC would like for Native plants and resources to be considered in the restoration effort. The UAIC also welcomes restoration and mitigation bank opportunities and programs on Tribal lands.

Thank you again for the opportunity to consult on this project. Please contact Marcos Guerrero, Tribal Historic Preservation Officer, at (530) 883-2364 or email at mguerrero@auburnrancheria.com if you have any questions.

Sincerely,

Gregory S. Baker,
Tribal Administrator

CC: Marcos Guerrero, THPO

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA, 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

DEC 22 2011

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are writing to inform you of the proposed Folsom Dam Modifications, Approach Channel Phase III (Phase III) Project near Folsom, California. The Phase III Project is a component of the Folsom Dam Joint Federal Project (JFP), which includes Flood Damage Reduction (FDR) measures to Folsom Dam, its dikes, and associated features. The U.S. Bureau of Reclamation (USBR) is responsible for construction of Dam Safety features for the JFP while the U.S. Army Corps of Engineers (Corps) is in the process of constructing the FDR features of the overall JFP. The USBR has previously consulted on the Dam Safety component of the JFP with your office under reference number BUR061114A.

The Corps, in coordination with the Central Valley Flood Protection Board and the Sacramento Area Flood Control Agency, is implementing the JFP FDR features in order to significantly decrease the flood risk in the Sacramento area. Pursuant to 36 CFR Part 800.3 we are initiating the Section 106 process for the Phase III Project and we are asking for your comments on our proposed efforts to identify historic properties under 36 CFR Part 800.4. We are also asking for your concurrence with our determination of the area of potential effects (APE) for the Phase III Project in accordance with 36 CFR Part 800.4(a)(1).

Previous consultation with your office occurred under reference number COE081120C for Phases I and II of the Corps' JFP FDR measures (Enclosure 1). In a letter dated May 5, 2009, Mr. William Soule of your office concurred with our finding of No Adverse Effect, in accordance with 36 CFR 800.5(b), for the Phase I Project. In a letter dated July 26, 2010, Mr. Soule concurred with our finding of No Adverse Effect, in accordance with 36 CFR 800.5(b), for the Phase II Project.

As described in our previous consultation, the overall FDR measures that we will be constructing for the JFP consist of a continuing series of construction projects with separate environmental compliance efforts for each project (Enclosure 2). Due to the nature of these iterative phases, because descriptive information on what each construction effort will include will not be available until plans are developed in the months leading up to the estimated construction schedule, and in consultation with your office, we determined that the Section 106 compliance for each phase would be handled separately and as information becomes available.

As a result, we are defining the APE for the Phase III Project and we are providing you with information on the current proposed construction effort for the Corps' JFP FDR measures.

The APE for the Phase III Project is located near the left abutment of Folsom Dam and near Dikes 7 and 8 and the Mormon Island Auxiliary Dam (MIAD) in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, in portions of Section 19, 29, and 30 (Enclosure 3). This is an expanded APE from our 2010 correspondence and includes all the currently known FDR features of the JFP. The Phase III Project revised APE is similar to the APE consulted on for the Phase II Project (Enclosure 4), with an additional area identified for the proposed location of a temporary transload facility near Dike 7. The revised APE is almost entirely within the APE that the USBR included in their consultation during the completion of the 2007 JFP Environmental Impact Statement/Environmental Impact Report and Section 106 compliance.

Phase III of the Project includes the completion of the approach channel and spur dike for the auxiliary spillway at Folsom Dam. Components for construction of these features include:

- Construction of a transload facility adjacent to Dike 7.
- Construction of a concrete batch plant.
- Installation of a 1,000 foot long concrete secant pile cutoff wall between the rock plug and the control structure.
- Placement of fill material along the east side of the rock plug to maintain the 80 foot wide haul road connection to the spillway.
- Excavation of material from the rock plug between the control structure and the cutoff wall.
- Installation of the approach channel slab and concrete walls.
- Excavation of the remaining rock plug to flood the approach channel.
- Dredging of the remaining material to complete the approach channel.
- Disposal of material at the MIAD and temporary stockpile of material at Dike 7.
- Construction of a spur dike on the north side of the approach channel.

We have preliminarily determined that the APE includes those areas highlighted and outlined in Enclosure 3. We invite any comments you may have on our preliminary determination of the APE. Most of the APE for the Phase III Project was included in the consultation conducted by the USBR for excavation of the spillway under the JFP in 2006 and 2007 and during our previous consultation for the Phase I and II of the Corps' JFP FDR measures. The only portion of the APE not included in the previous consultation efforts is the section of the transload facility that extends into Folsom Reservoir. We would also like to ask for your comments on our proposed efforts to identify historic properties as outlined below.

We have completed an updated records and literature search at the North Central Information Center at California State University, Sacramento. The only known cultural resources within the APE for the Phase III Project are Folsom Dam, Dike 7, Dike 8, and MIAD. If there are areas not previously included in the USBR's or our previous survey and consultation we plan to conduct a pedestrian survey of those portions of the APE.

We obtained a list of potentially interested Native Americans from the Native American Heritage Commission and contacted them in letters dated October 13, 2011 to inquire if they have knowledge of locations of archeological sites, or areas of traditional cultural value or concern in or near the Phase III Project APE. Both the United Auburn Indian Community of the Auburn Rancheria (UAIC) and the Shingle Springs Rancheria (SSR) have contacted us in reference to the Phase III Project and have asked to meet with us. We met with representatives of the UAIC on December 6, 2011 and plan to continue communicating with the UAIC on the Phase III Project. We have contacted the SSR by phone and email to coordinate a time to meet, but they have not responded to our inquiries. We plan to continue to try to coordinate with the SSR to determine if they have interest in the Phase III Project.

Pursuant to 36 CFR Part 800.4(a)(1), we request your comments on our preliminary determination of the APE for the Phase III Project. We also request any comments your office may have of our proposed efforts to identify historic properties under 36 CFR Part 800.4. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or would like additional information, please contact Ms. Montag at (916) 557-7907 or by email at: Melissa.L.Montag@usace.army.mil.

Sincerely,

for Alicia E. Kirchner
Chief, Planning Division

Enclosures

Cc (w/enclosures):
Anastasia Leigh, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

January 25, 2012

Reply to: COE081120C

Alicia E. Kirchner
Army Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

RE: Folsom Dam Modification Approach Channel Phase III, Sacramento County, California

Dear Ms. Kirchner:

Thank you for requesting my comments on the above cited undertaking. You have requested my comments in accordance with Section 106 of the National Historic Preservation Act as amended. My staff has reviewed the documentation you provided and I would like to offer the following comments.

The current undertaking is the next phase of the Folsom Dam Joint Federal Project which is being undertaken by the Bureau of Reclamation and the Army Corps of Engineers. In your letter of December 22, 2011 you identify an area of potential effect (APE) for this phase of the undertaking. I do not object to how you have drawn the APE for this undertaking. In addition, I find your efforts to date and those proposed reasonable and sufficient to identify historic properties within the undertaking's APE.

If my staff can be of any further assistance, please contact Dwight Dutschke at 916-445-7010.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

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:
81420-2011-CPA-0170-1

MAR 1 2012

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

Dear Ms. Kirchner:

The Corps of Engineers (Corps) has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the American River Watershed Investigation: Folsom Dam Modification Project, Approach Channel. The proposed project would occur within Folsom Reservoir, Sacramento County, California, and is intended to function in conjunction with the new spillway and control structure, as well as spillway releases from the main dam, to pass the Probable Maximum Flood event. The enclosed report constitutes the Fish and Wildlife Service's draft FWCA report for the proposed project.

By copy of this letter we are circulating this draft report to the agencies listed below for review and comment with a request for comments by March 30, 2012, so that we can provide the Corps with a revised draft report for inclusion in the draft environmental documents being prepared for public review.

If you have any questions regarding this report on the proposed project, please contact Doug Weinrich at (916) 414-6563.

Sincerely,

Daniel Welsh
Assistant Field Supervisor

Enclosure

cc:
Jaime LeFevre, COE, Sacramento, CA
Nancy Sandburg, COE, Sacramento, CA
Mike Hendrick, NOAA Fisheries, Sacramento, CA
Kevin Thomas, CDFG, Rancho Cordova, CA
Jay Rowan, CDFG, Rancho Cordova, CA
Kenneth Kundargi, CDFG, Rancho Cordova, CA

**FISH AND WILDLIFE COORDINATION ACT REPORT
AMERICAN RIVER WATERSHED INVESTIGATION
FOLSOM DAM MODIFICATION PROJECT, APPROACH CHANNEL
CALIFORNIA
March 2012**

This is the Fish and Wildlife Service's (Service) draft Fish and Wildlife Coordination Act report on the effects that proposed excavation of the proposed Folsom Dam Modification Project, Approach Channel (Project) would have on fish and wildlife resources within Folsom Reservoir, lands adjacent the left wing dam of Folsom Dam, and the lower American River in Folsom, California. This report has been prepared under the authority of, and in accordance with, the provisions of the Fish and Wildlife Coordination Act (48 stat. 401, as amended: 16 U.S.C. 661 et seq).

BACKGROUND

The Corps of Engineers (Corps), Bureau of Reclamation (Reclamation), Central Valley Flood Protection Board, and Sacramento Area Flood Control Agency are seeking 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 Energy and Water Appropriations Act of 2006 directed the Secretary of the Army and 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 (Folsom Facility) as one Joint Federal Project.

The current spillway and outlets at the Folsom Facility do not have sufficient discharge capacity for managing the predicted Probable Maximum Flood (PMF) and lesser event flood inflows above a 1 in 100 year event (an event that has a 1% chance of occurring in any given year). Currently, the Folsom Facility can safely release flood flows between 115,000 cubic feet per second (cfs) and 160,000 cfs for a duration which provides a level of protection provided by downstream levees associated with a 1 in 100 year event. Structural modifications associated with the Joint Federal Project are proposed to address increasing discharge capability and/or increasing storage during extreme flood events above the 1 in 200 year event (an event that has a 0.5% chance of occurring an any given year) up to the PMF. Combined, the modifications would be able to safely release flood flows between 115,000 cfs and 160,000 cfs for a longer duration equivalent to a 1 in 200 year event level. A new auxiliary spillway is a major feature that would address the need to safely pass part or the entire PMF event. Increasing discharge capability and increasing storage would potentially achieve the goal of a greater than 1 in 200 year flood protection objective (USBR et al. 2006).

An auxiliary spillway consisting of a 1,100-foot-long approach channel on the waterside of a control structure, a spur dike, a gated control structure, and a 3,000-foot-long discharge chute on the downstream side of the control structure is being constructed (Figure 1).

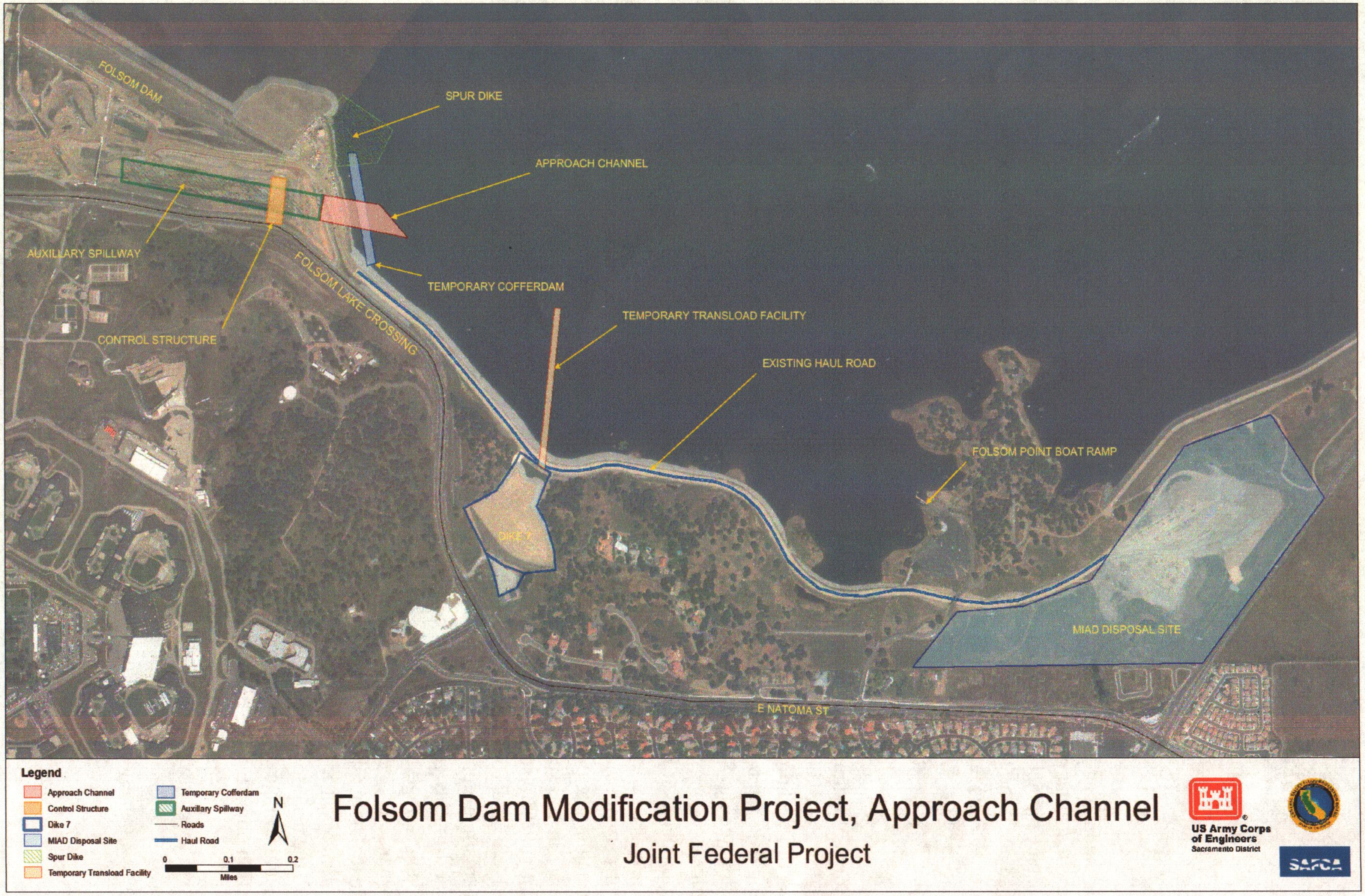

Figure 1. Folsom Dam Modification Project, Approach Channel.

Flows from the auxiliary spillway would enter the American River about 1,500 feet downstream of Folsom Dam. This Fish and Wildlife Coordination Act report only addresses Phase 4 of the new auxiliary spillway consisting of the excavation of the proposed spillway approach channel and construction of the spur dike. The other features of the spillway (control structure, discharge chute, etc) were covered in earlier coordination with the Service (USFWS 2007, 2009, 2010).

PROJECT DESCRIPTION

The project is being phased such that the excavation and construction of the gated control structure is being conducted using the existing topography and natural rock formation (paved overlook/parking area to the east of the Left Wing Dam) as a natural dam or plug. The Corps is evaluating two alternatives in addition to the No Action Alternative (Alternative 1). These are Alternative 2: Approach Channel Excavation with Cutoff Wall and Alternative 3: Approach Channel with Cofferdam.

Alternative 2 was selected as the preferred alternative. In addition to construction of the approach channel and cutoff wall, a spur dike, transload facility, and concrete batch plant are necessary. After the control structure becomes operational, the approach channel and rock plug will be excavated and a cutoff wall will be installed. Construction is slated to begin in the summer/fall of 2013 and would be completed in about 4 years. Construction features and other project details are summarized below.

Reclamation completed the excavation of the spillway chute and stilling basin and a partial excavation for the control structure. The Corps is responsible for the final excavation for the gated control structure and the approach channel, as well as for the construction of concrete structures. The approach channel for the auxiliary spillway is expected to extend about 1,100 feet into the reservoir from the concrete control structure. The invert of the approach channel would be at elevation 362.34 (NAVD 88 datum) and the approach channel excavation would narrow towards the control structure. The approach channel slopes would be 2H:1V in overburden, decomposed and highly weathered rock, and 0.5H:1V in less weathered rock. There would be a 30-foot-wide by 10-foot-deep rock trap at the upstream end of the approach channel apron to block debris from entering the spillway. A spur dike on the north side of the approach channel will be required based on the results of hydraulic model tests (refer to Figure 1).

The first step in the excavation effort for the approach channel would consist of removal of rock plug material between the constructed control structure and the cutoff wall. A combination of ripping and blasting would be required to facilitate rock excavation. Once enough material is removed from this area, the approach channel slab and concrete walls would be installed over an 18 month period. During this timeframe the control structure's bulkhead gates would be completed and operational. Excavation of the rock plug would continue in-the-dry until the approach channel is ready for flooding.

The remaining material from the rock plug would be excavated in-the-wet. Blasting and dredging would be required for this operation. Dredging of soft material and silts on the lake bottom would be conducted first to reduce turbidity during the blasting phase. Large silt containing curtains would be utilized for all operations conducted in- the- wet in order to minimize turbidity. Preferably, this dredging would occur at the lowest lake level available. After fine materials are removed, the underlying rock would be blasted. Blasted material would be dredged using a barge-mounted clam shell or hydraulic excavator dredge, down to an elevation of 350 feet. The dredging would be performed from barges and would require marine equipment to be mobilized and the transload facility to be operational.

The proposed cutoff wall would be located adjacent to Folsom Reservoir southeast of the left wing dam and east of the auxiliary spillway chute excavation. The cutoff wall would consist of a reinforced concrete secant pile wall socketed into the underlying highly weathered granitic in situ rock. Potential disposal sites for dredged material include Dike 7 and Reclamation's D2 site at Mormon Island Auxiliary Dam (MIAD).

Land-based rock excavation would consist of conventional drilling and blasting methods. Drilling would be performed in lifts and patterns to facilitate thorough pulverization of the granite material. In dry holes, ammonium nitrate-fuel oil (ANFO) would be used and primed with cast boosters. Water-resistant emulsified slurry would be required since water intrusion is anticipated. Explosives would be stored off-site. The explosives storage facility is assumed to be located in Jamestown, California, about 80 miles from the site. Explosives would be trucked to the site on a daily basis.

Blasting would typically consist of 15,000 cubic yards (cys) rock shots. Blasted rock would be excavated with shovels or loaders, placed in haul trucks, and hauled to the MIAD disposal area, located about 1.5 to 2 miles from the excavation area.

Underwater rock excavation would be accomplished by drill and blast methods. Barge platforms would be transported and assembled on-site to accommodate drilling and excavation equipment. Down-the-hole hammer drills would bore 5-inch holes and the holes would be charged with emulsified slurry explosives. Prior to detonations, the drill and fleeting barge would move 300 to 500 feet from the blast area. Each blast would produce about 2,000 cys of rock. The removal of material would be completed in two lifts when the rock depth exceeds 30 to 40 feet.

Explosives would be stored off-site. The explosives storage facility is assumed again to be located in Jamestown, California. Explosives would be trucked to the site on a daily basis. After verification all charges have been detonated, a long stick excavator or crane supported clam shell would dredge the shot rock into material barges for tow to the temporary transload facility.

All charges at least 20-charge diameters would be confined by rock burden and crushed stone stemming to limit the blast over-pressures. A bubble curtain would reduce the blast-induced dynamic water pressure that could otherwise be transmitted to the lake.

The dredging equipment that could be utilized for this project includes barges and excavators:

- A barge-mounted large long reach excavator, with an effective excavating depth of 90 to 95 feet. Different size buckets exist and they can be changed out for the various soil and rock materials to be encountered during construction. The excavator method is limited by its effective digging depth. Accordingly, the 3½ month (mid-November to end of February) low lake level window would need to be used to effectively dredge to the final grades.

- A 225-ton class barge-mounted crawler crane clam shell unit would supplement the hydraulic excavator to dredge shot rock and common material to grade in periods where the lake level is too high for the hydraulic excavator to dredge to final grade.

The long reach excavator, conventional clam shell, and other overwater equipment would be mounted on portable *"Flexifloat"* units, sized and assembled to maintain stability and manage the excavation sets. The size of the *"Flexifloat"* barges would be about 180 to 200 feet by 40 to 50 feet by 7 feet deep. The barges would be held in position by large winch controlled spuds, or in water over 50 feet deep, by a four-point mooring system using bottom founded anchors.

The proposed spur dike is an embankment designed to direct water into the approach channel. The spur dike would be located directly to the northwest of the approach channel. The core of the spur dike would be constructed of decomposed granite. This would be followed by a compacted random rock fill followed by a stone riprap cap. The quantity of material estimated to complete the spur dike is 395,000 cys. Material for the spur dike construction would come from the excavation of the approach channel excavation, or MIAD. The construction equipment needed to build the spur dike consists of normal scrapers, bulldozers, and sheep-foot rollers for the body of the spur dike, and backhoes, bulldozers, and smooth rollers for the bedding, riprap, and surfacing materials. The construction would take place over 9 months in 2016 and 2017.

A transload facility would be needed for mobilization and demobilization of marine equipment (e.g., sectional barges and heavy cranes), dredged spoil off-loading from barges to trucks, marine equipment fuel and explosives transfer to support barges, equipment maintenance, and marine crew deployment. The proposed transload facility would be comprised of a ramp, crane and crane pad, and a fuel transfer station. The transload facility would be located adjacent to Dike 7. The ramp structure would need to accommodate seasonal and variable lake levels between the elevations of 355 to 475 feet (NAVD 88).

The ramp dimensions are roughly 50 feet wide and 1,500 feet long, with a maximum slope of 10 percent. The width allows large haul trucks the ability to turnaround and two-way passage along the ramp. At about 1,000 feet from the haul road, the ramp would intersect the existing lake bottom. From this point, steel planks would lie on the existing bottom to control mud and minimize siltation and turbidity within the lake.

The ramp would be constructed from about 250,000 cys of compacted 3-inch maximum graded fill with little or no fines. About 20,000 cys of ¼ ton riprap would be placed on top of the main fill for protection from wave action. Aggregate material would be imported from offsite locations. Dredging out an average of 3 feet of material under the footprint of the ramp (about 18,000 cys) may be required depending on the soils at the lake bottom.

Depending on lake levels, the ramp material may be placed directly into the water. The fines content of the ramp material would be reduced as much as possible to limit water turbidity during placement of material. Full depth silt curtains would surround the ramp installation to control turbidity and silt movement into the greater lake body.

The ramp would incur progressive construction, with each stage of horizontal extension dependent upon existing lake level, and depth needed to accommodate the reach to barges. Ramp construction would begin at the shoreline junction with the haul road and extend into the lake. The ramp would be extended as needed in response to fluctuating lake levels during approach channel and cofferdam construction activities. The estimate for complete ramp extension is 4 months.

To off-load the dredged material from barges, a crane would be placed on a level crushed rock pad located near the bottom of the ramp just above lake level. Timber mats would form a work platform for the crane. The pad would need to be relocated to accommodate fluctuating lake levels.

A fuel transfer station would be located on the ramp. The transfer station would include a flexible hose from the ramp, which would be supported intermittently by a small float anchored offshore. The float would be used to service a utility barge with a storage tank, and then recalled to the ramp to prevent severage by boat traffic. The tank would hold one day's supply of fuel for the floating equipment at the project site. Fuel would be delivered by trucks and pumped from the trucks through the fuel transfer facility to the tank on the utility barge.

The transload facility is potentially permanent or may be removed after the completion of the approach channel project in 2017. If the ramp is removed, ramp material would be removed with excavators and hauled for disposal at MIAD.

The construction of the approach channel and cutoff wall would require large quantities of temperature controlled concrete. This would necessitate the use of a contractor-provided, on-site concrete batch plant and deliveries of large quantities of concrete aggregate, concrete sand, and cement. The batch plant would be powered by electricity from overhead Sacramento Municipal Utility District (SMUD) lines. The batch plant would be located either at the Dike 7 staging area, MIAD, the overlook, chute, or the Folsom Prison sites.

About 13,000 cys of concrete would be needed for the approach channel and about 11,200 cys of concrete would be needed for the cutoff wall. The batch plant would produce concrete for the approach channel's 18 month construction period.

The concrete batch plant area would consist of the aggregate storage system, aggregate rescreen system (if needed), rewashing facility (if needed), the batching system, cement storage, ice manufacturing, and the concrete mixing and loading system. The aggregate storage system is designed to have sufficient storage on-hand of input materials to produce about 3,000 cys of concrete. The aggregate storage system consists of three course aggregate piles and a fine blended sand pile. The aggregate would be transported to the project in belly type trucks. The trucks would dump the aggregate into a truck unloading hopper, after which it would be conveyed up to an overhead shuttle conveyer, and dropped into respective storage piles.

The sand and the aggregate would be loaded out of the storage piles with a front end loader, placed into bin hoppers, and conveyed to the batching day hoppers. The aggregates would then be mixed and transported into transit agitator trucks or mixer trucks. Once ready for placement, the concrete would be transported by truck or conveyer from the batch plant site across the spillway access road to the concrete conveyor or truck unloading hopper

It is estimated that about 24,200 cys of aggregate material would be needed to provide concrete for the construction of the approach channel. It is anticipated that the aggregates needed for the concrete would come from existing local commercial off-site sources and delivered to the site.

Generally, work associated with the batch plant operations would occur during the hours of 7:00 a.m. to 7:00 p.m., however, it is likely that some batching and placements would have to occur in the very early morning or night-time hours. This is especially true for large volume placements and placements that occur in the hot summer season. Early morning or night-time placements would be subject to traffic and noise limitations of the City of Folsom's ordinances and would have to be coordinated with the City by the contractor.

The description of the batch plant operation would be the same for the cutoff wall; however, the overall production rates would likely be less than those for the approach channel.

BIOLOGICAL RESOURCES

The American River and nearby areas, although highly modified from conditions of 150 years ago, support a diverse and highly valuable area for biological resources. The 23-mile-long reach of the American River Parkway downstream of Folsom Dam encompasses about 4,000 acres, the majority of which are in State designated floodway and contain large areas of annual grasslands, riparian forest and scrub-shrub, oak woodlands, bare sand and gravel, and surface waters of the river and its associated sloughs and dredge ponds (USFWS 2003). The Folsom State Recreation Area includes about 18,000 acres of land and water at Folsom Reservoir and some downstream areas to Nimbus Dam. About 6,000 acres of land around Folsom Reservoir are managed by the State of California.

Vegetation

The terrestrial portion of the project area currently supports limited annual grassland and oak woodland. The annual grassland is characterized species such as ripgut brome, wild oat, and various forbs. The oak woodland in the project area occurs as single trees to small patches. Typically the understory is dominated by annual grass and other forbs and shrubs such as elderberry.

The in-reservoir portion of the project area does not contain any vegetation. However, during prolonged low water periods willows occasionally colonize within the reservoir area.

Wildlife

The project area including 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 lands near the project area provide 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 several carnivores, such as badger, long-tailed weasel, river otter, gray fox, coyote, bobcat, and mink.

Reptile species likely found in the area include common kingsnake, western rattlesnake, 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 in the area, but elderberry plants are fairly common in areas, and provide habitat for the endangered valley elderberry longhorn beetle.

Fish

Folsom Reservoir encompasses about 10,000 surface acres when full (around 1 million acre-feet) and there are about 75 miles of shoreline. The reservoir extends about 15 miles up the North Fork and 10.5 miles up the South Fork of the American River. The reservoir 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 (USFWS 2007). Various common catfish can also be found near the bottom of shallower areas. Fish habitat is present within the inundation zone in the forms of young willow dominated riparian habitat which establishes during extended period of drought, as well as brush piles placed there in the past by the California Department of Fish and Game (CDFG) and various sportsman 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 increasing spawning and rearing for warmwater fish (USFWS 2001). Sport fishing is an important and popular recreation activity at Folsom Reservoir.

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. The average annual run of salmon in the American River is 25,948 (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).

Endangered Species

Based on a search of the Folsom USGS quadrangle map dated March 1, 2012, there are Federally-listed species which could occur within or near the project area. The species under the jurisdiction of the Service which may be affected by the project include the valley elderberry longhorn beetle. The complete list is included in Enclosure 1 as well as a summary of Federal agencies responsibilities under the Endangered Species Act of 1973, as amended.

DISCUSSION

Service Mitigation Policy

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

The Mitigation Policy provides Service personnel with guidance in making recommendations to protect or conserve fish and wildlife resources. The policy helps ensure consistent and effective Service recommendations, while allowing agencies and developers to anticipate Service recommendations and plan early for mitigation needs. The intent of the policy is to ensure protection and conservation of the most important and valuable fish and wildlife resources, while allowing reasonable and balanced use of the Nation's natural resources.

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

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

Mitigation planning goals range from "no loss of existing habitat value" (i.e., Resource Category 1), to "minimize loss of habitat value" (i.e., Resource Category 4). The planning goal of Resource Category 2 is "no net loss of in-kind habitat value;" to achieve this goal, any unavoidable losses would need to be replaced in-kind. "In-kind replacement" means providing or managing substitute resources to replace the habitat value of the resources lost, where such substitute resources are physically and biologically the same or closely approximate those lost.

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

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

Three fish and/or wildlife habitats were identified in the project area which had potential for impacts from the project: oak woodland, annual grassland, and lakebed and "other." The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 1.

The evaluation species selected for the open water cover-type that would be impacted is freshwater sport fish. The open water cover-type is comprised of Folsom Reservoir. These species were chosen because of their consumptive and recreational value to humans and their importance as prey species to raptors and wading birds. Although this area is highly impacted by recreational activities during portions of the year, it does support significant fishing activity. Therefore, the Service designates the "other" cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

Table 1. Resource categories, evaluation species, and mitigation planning goal for the habitats possibly impacted by the proposed excavation of the Folsom Dam Modification Project, Approach Channel, Sacramento County, California.

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Open water	Freshwater sport fish	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Annual grassland	Red-tailed hawk	3	No net loss of habitat value while minimizing loss of in-kind habitat value.
Folsom Lakebed	None	4	Minimize loss of habitat value.
Other	None	4	Minimize loss of habitat value.

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

No evaluation species were identified for the Folsom lakebed cover-type. Generally this cover-type would not provide any significant habitat value for wildlife species. Canada geese and other avian species, as well as small mammals, may occasionally forage on the lakebed as waters recede. Therefore, the Service designates the lakebed cover-type in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of in-kind habitat value."

No evaluation species were identified for the "other" or lakebed cover-types. The "other" cover-type encompasses those areas which do not fall within the other cover-types such as gravel and paved roads, parking areas, buildings, bare ground, riprap, etc. Generally this cover-type would not provide any significant habitat value for wildlife species. Therefore, the Service designates the "other" cover-type in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is "minimize loss of in-kind habitat value."

Based on our review of the proposed project most of the potential impacts for wildlife species would be temporal losses of habitat value (for species utilizing nearby annual grasslands and oak woodlands) during construction. Much of this area is already highly disturbed by past and on-going construction activities and the opening of the new Folsom Point Road. Wildlife species utilizing these areas, as well as the lakebed, have been displaced during the on-going construction activities and there would be little, if any, additional temporal loss of habitat values. Mitigation plantings have been put in place or will be put in place for the previous construction activities in this area. If new areas are disturbed (i.e., annual grassland at the Folsom Prison staging site), impacts could be minimized by reseeding all disturbed areas with annual grasses at the completion of construction.

The proposed project would take place over a 37 month period. Construction activities in the spring have the potential to adverse impacts to nesting migratory birds. Construction activities proposed for the spring or summer months should include measures to avoid impacts to migratory birds which may be nesting in affected vegetation and nearby areas around the staging area, haul roads, and MIAD disposal site. Since construction has been occurring in this area for several years any birds choosing to nest in the area should be adapted to the noise and activity levels. However, pre-construction surveys should be performed to determine if there are migratory birds nesting in these areas. If nests are located, work should be monitored to see if there are adverse effects or deferred until any young have fledged the nest.

The potential impacts to the aquatic resources of Folsom Reservoir from the proposed construction range from increasing turbidity and mobilization of existing sediment contaminants to introduction of aquatic invasive species and direct mortality to aquatic species.

Turbidity impacts are being minimized by conducting the excavation work in the dry to the extent possible. Turbidity from underwater excavation and blasting would be minimized by installing silt curtains around the work area. Since there will be heavy equipment operating on the dry lakebed there is the possibility that contaminants (fuels, oils, hydraulic fluids, etc) could be released into or adjacent the reservoir. A physical barrier has been proposed between the work area and the water to avoid any construction-related activities from affecting the water. Additional measures to minimize introducing contaminants into reservoir waters can be implemented such as restricting fueling and vehicle maintenance to areas outside the reservoir area.

The Service has expressed concern in the past about in water disturbance (dredging and blasting) associated with construction of the various features of the combined Joint Federal Project. The proposed approach channel excavation has the potential to remobilize sediment-bound contaminants, particularly mercury and the possibility for mercury methylation and subsequent bioaccumulation into the food chain. The Corps has conducted sediment testing in the reservoir in the vicinity of the approach channel and offload facility. The mercury elutriate test had a high value. Material excavated from the approach channel and offload facility would be transported and stored at the MIAD disposal site. A dredging plan has not yet been developed but it is presumed silt curtains and erosion containment features would be required.

The project has the potential to introduce aquatic nuisance species into Folsom Reservoir through use of watercraft (boats and barges) and other equipment which has been in contact with other bodies of water containing these potentially harmful species if the exploratory borings are conducted by barge. On February 3, 1999, President Clinton signed Executive Order 13112, which directs the agencies of the executive branch of the Federal government to work to prevent and control the introduction and spread of invasive species. Species that are likely to harm the environment, human health, or the economy are of particular concern. The executive order builds on the National Environmental Policy Act (NEPA) of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973 to prevent the introduction of invasive species; provide for their control; and take measures to minimize economic, ecological, and human health effects.

Since it is currently unknown who the contractor may be or where their equipment may come from it should be a condition that the contractor develop a Hazard Analysis and Critical Control Point Plan (HACCP) based on the following seven principles if in-water work is proposed:

- Conduct a hazard analysis. Prepare a list of steps in the process where significant hazards occur and describe preventive measures.
- Identify the critical control points (CCP) in the process.
- Establish controls for each CCP identified.
- Establish CCP monitoring requirements. Establish procedures for using monitoring results to adjust the process and maintain control.
- Establish corrective actions to be taken when monitoring indicates a deviation from an established critical limit.
- Establish procedures to verify that the HACCP system is working correctly.
- Establish effective record-keeping procedures that document the HACCP system.

To prevent the spread of aquatic nuisance species all vessels and vessel accessories should be thoroughly inspected. For watercraft and vessels with jet drives, impeller areas can contain quagga and zebra mussels and aquatic plants. Once upon the trailer, run the engine for 5 to 10 seconds to blow out excess water, mussels and plants. Before leaving water access, inspect and remove any mussels or plants from intake, steering nozzle, hull, and trailer.

- All vessels should be cleaned with a high pressure wash of hot water. This is especially important if the vessel has been moored for more than a day.
- Remove aquatic plants from boat, motor and trailer. Check all underwater fittings and equipment, such as rollers, axle, bilge and trailer, and above water equipment, such as anchors. Place any aquatic plants in trash if possible.
- Drain any lake or river water from equipment including the motor, bilges, heat exchangers and coolers. Ensure all drained areas are dry. Ensure the watercraft's lower outboard unit is drained and dry.
- Be aware that transferring a vessel that has been in infested waters will allow the spread of quagga mussels, or the closely related zebra mussels. Physically inspect all exposed surfaces. The presence of quagga mussels will feel like sandpaper to the touch. Report presence of quagga mussels to CDFG hotline at (866) 440-9530, open from 8 am to 5 pm PST.
- Any vessel traveling from Lake Mead, Lake Mohave, Lake Havasu, the Colorado River, or lakes that receive water from the Colorado Aqueduct, including: Lake Skinner (Riverside County), Lake Mathews (Riverside County), San Vicente Reservoir (San Diego County), Dixon Lake (San Diego County), Lower Otay Reservoir (San Diego County), and Lake Murray (San Diego County) should remain dry and out of water for a minimum of 5 days.

Wet or underwater blasting is expected to generate very little airborne noise, but has the potential to kill fish in Folsom Reservoir. It is likely that some fish will be killed during wet blasting. Noise potentially causes both auditory and non-auditory effects on fish. Injuries such as swim bladder rupture in fish may be shown only by dissection of exposed individuals. These adverse impacts only occur at high levels of sound, typically within tens, or at most a few hundred meters of underwater blasts, and hence affect relatively small areas and numbers of individuals (Nedwell and Edwards 2004 *in* Nedwell et al. 2007).

Fish response to sound can also be varied, ranging from the classic fright response that results in a startle behavior and sudden burst of short duration and distance swimming, to other responses such as packing or balling, increasing swimming speed, diving, or avoidance. Extremely loud sound levels can have very negative effects on fish including temporary or permanent deafness, tissue damage, and even acute mortality.

Indirect effects usually manifest themselves as a reduction in the ability to evade predation, a change in behavior that leads to increased exposure to predation, or an inability to detect predators or prey effectively (temporary or permanent deafness).

The Corps proposes to have the contactor use the BMPs listed below which assume use of the standard practice of linear (rather than spherical) charges, and standard timing separation of 8 milliseconds to reduce cumulative effects between adjacent charges. The BMPs include:

- Designing efficient detonations ("blast design") that fracture the rock with minimal energy released to surrounding water. This can be accomplished by the use of stemming to confine blasts. Efficient detonations are achieved by:
  - Establishing a not-to-exceed peak pressure-change (over-pressure) limit of 100kPa (14.5 psi).
  - Controlling maximum pressure thresholds by establishing cautious charge confinement rules regarding the type and amount of stemming (material placed in the upper portions of blast holes), and the amount of confining rock burden between charges and the free or open face to which they break.
  - Monitoring peak blast-induced pressure and impulse;
  - Requiring the use of multiple time-sequenced charges that will reduce the cumulative impacts on the water environment;
  - Timing blasting when fish tend to be in streams in northern tributaries far from the blast site, e.g., February through June for rainbow trout; the timing of spawning of Chinook salmon in Folsom Lake is not well characterized;
  - Setting off small charges ("scare charges") or firing air-cannons into the water before blasting to chase fish from the blast area;
  - Grouping continuous periods of noisy work or simultaneous noisy work (e.g., multiple drill barges) to prevent the fish from re-entering the area during short quiet periods);
  - Using air curtains or bubble curtains to attenuate pressure waves. Air supply to bubble pipes would be provided by clean-air compressors that contain no oil or other contaminants;

- Not using ANFO mixtures in or near water because they will not function as desired and if released into water they will dissolve and release toxic by-products (ammonia and nitrates).

Specific detail on the installation and operation and maintenance of a bubble curtain was not yet available to identify possible adverse effects on fish and /or wildlife resources. Prior to use of a bubble curtain, this information should be provided to the appropriate resources agencies for review. Also, determining the direct and indirect mortality on fish resources would be difficult to quantify. We believe the appropriate mitigation measure for this activity should be three-fold, culminating in the re-stocking of sportfish in the reservoir after the blasting activities are complete. The mortality impact should be documented by the resource agencies through conducting boat surveys of the blast area after blasting to record any direct fish mortality. This data would then be used by a multi-agency team (resource agencies and the Corps) to develop a stocking strategy, followed by stocking the reservoir.

The project is located away from the American River and thus no direct impacts are anticipated for fish species downstream of Folsom Dam.

RECOMMENDATIONS

The Service recommends:

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

2. Avoid future impacts to the site by ensuring all fill material used for the spur dike is free of contaminants.

3. Avoid impacts to migratory birds nesting along the access routes and adjacent to the proposed construction sites by conducting pre-construction surveys for active nests along proposed construction site, haul roads, staging areas, and disposal/stockpile sites. Work activity around active nests should be avoided until the young have fledged. The following protocol from the CDFG for Swainson's hawk would suffice for the pre-construction survey for raptors.

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

4. Avoid introducing aquatic invasive species into the reservoir by requiring the contractor to develop and implement a Hazard Analysis and Critical Control Point Plan (HACCP) as described above. This plan should be provided to the resource agencies for review and approval prior to any in-water work.

5. Avoid introduction of fuels/lubricants by requiring containment on barges and conducting land-based fueling operation in areas where spills cannot enter the reservoir (containment areas).

6. Minimize impacts to sportfishery resources by implementing the BMPs discussed above for all in-water blasting.

7. Minimize project impacts by reseeding all disturbed areas outside the reservoir area at the completion of construction with forbs and grasses.

8. Minimize potential for mobilizing contaminated sediments outside the immediate work area (sediment removal area and transload facility) by developing a dredging plan prior to construction which utilizes silt curtains or other means to prevent sediment from being released into the lake and potentially the lower American River.

9. Minimize the potential impacts from fuel/oil/lubricant spills by requiring the contractor develop a spill response plan. The plan should include a provision where emergency oil containment boom material and absorbent pads are on-site and workers are properly trained in proper deployment.

10. Compensate for losses to fish resources by stocking Folsom Reservoir with rainbow trout, Chinook salmon, and warmwater sportfish. The quantity of stocking should be developed by a work group comprised of the Corps and resources agencies.

11. Contact NOAA Fisheries for possible effects of the project on federally listed species under their jurisdiction.

12. Contact the CDFG regarding possible effects of the project on State listed species.

REFERENCES

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ENCLOSURE 1

FEDERAL ENDANGERED AND THREATENED SPECIES LIST

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120301021648

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio
  - Conservancy fairy shrimp (E)

- Branchinecta lynchi
  - vernal pool fairy shrimp (T)

- Desmocerus californicus dimorphus
  - valley elderberry longhorn beetle (T)

- Lepidurus packardi
  - vernal pool tadpole shrimp (E)

Fish

- Hypomesus transpacificus
  - delta smelt (T)

- Oncorhynchus mykiss
  - Central Valley steelhead (T) (NMFS)
  - Critical habitat, Central Valley steelhead (X) (NMFS)

- Oncorhynchus tshawytscha
  - Central Valley spring-run chinook salmon (T) (NMFS)
  - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- Ambystoma californiense
    - California tiger salamander, central population (T)

- Rana draytonii
    - California red-legged frog (T)

Reptiles

- Thamnophis gigas
    - giant garter snake (T)

Plants

- Orcuttia viscida
    - Critical habitat, Sacramento Orcutt grass (X)
    - Sacramento Orcutt grass (E)

Quads Containing Listed, Proposed or Candidate Species:

FOLSOM (511B)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.
See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 30, 2012.

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 120613030801

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio
- Conservancy fairy shrimp (E)

Branchinecta lynchi
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Desmocerus californicus dimorphus
- valley elderberry longhorn beetle (T)

Lepidurus packardi
- vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
- delta smelt (T)

Oncorhynchus mykiss
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- California tiger salamander, central population (T)

Rana draytonii
- California red-legged frog (T)

Reptiles

Thamnophis gigas
- giant garter snake (T)

Plants

Calystegia stebbinsii
- Stebbins's morning-glory (E)

Ceanothus roderickii
- Pine Hill ceanothus (E)

Fremontodendron californicum ssp. decumbens
- Pine Hill flannelbush (E)

Galium californicum ssp. sierrae

El Dorado bedstraw (E)

Orcuttia viscida

Critical habitat, Sacramento Orcutt grass (X)

Sacramento Orcutt grass (E)

Senecio layneae

Layne's butterweed (=ragwort) (T)

Quads Containing Listed, Proposed or Candidate Species:

CLARKSVILLE (511A)

FOLSOM (511B)

County Lists

No county species lists requested.

Key:

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Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be September 11, 2012.

Selected Elements by Scientific Name

California Department of Fish and Game

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S3	WL
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	None	G2G3	S2	SSC
Andrena blennospermatis Blennosperma vernal pool andrenid bee	IIHYM35030	None	None	G2	S2	
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Ardea alba great egret	ABNGA04040	None	None	G5	S4	
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S2	SSC
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S2S3	
Ceanothus roderickii Pine Hill ceanothus	PDRHA04190	Endangered	Rare	G1	S1	1B.2
Chlorogalum grandiflorum Red Hills soaproot	PMLIL0G020	None	None	G3	S3	1B.2
Clarkia biloba ssp. brandegeeae Brandegee's clarkia	PDONA05053	None	None	G4G5T3	S3	1B.2
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Downingia pusilla dwarf downingia	PDCAM060C0	None	None	G2	S2	2.2
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3	FP
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Falco columbarius merlin	ABNKD06030	None	None	G5	S3	WL
Fremontodendron decumbens Pine Hill flannelbush	PDSTE03030	Endangered	Rare	G1	S1	1B.2
Galium californicum ssp. sierrae El Dorado bedstraw	PDRUB0N0E7	Endangered	Rare	G5T1	S1	1B.2
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S2	FP
Helianthemum suffrutescens Bisbee Peak rush-rose	PDCIS020F0	None	None	G2Q	S2.2	3.2
Hydrochara rickseckeri Ricksecker's water scavenger beetle	IICOL5V010	None	None	G1G2	S1S2	

Selected Elements by Scientific Name

California Department of Fish and Game

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFG SSC or FP
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G3	S2S3	
Navarretia myersii ssp. myersii pincushion navarretia	PDPLM0C0X1	None	None	G1T1	S1.1	1B.1
Northern Hardpan Vernal Pool Northern Hardpan Vernal Pool	CTT44110CA	None	None	G3	S3.1	
Northern Volcanic Mud Flow Vernal Pool Northern Volcanic Mud Flow Vernal Pool	CTT44132CA	None	None	G1	S1.1	
Orcuttia viscida Sacramento Orcutt grass	PMPOA4G070	Endangered	Endangered	G1	S1	1B.1
Packera layneae Layne's ragwort	PDAST8H1V0	Threatened	Rare	G2	S2	1B.2
Phalacrocorax auritus double-crested cormorant	ABNFD01020	None	None	G5	S3	WL
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G4T2T3	S2S3	SSC
Sagittaria sanfordii Sanford's arrowhead	PMALI040Q0	None	None	G3	S3	1B.2
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC
Valley Needlegrass Grassland Valley Needlegrass Grassland	CTT42110CA	None	None	G3	S3.1	
Wyethia reticulata El Dorado County mule ears	PDAST9X0D0	None	None	G2	S2	1B.2

Record Count: 34

AMERICAN RIVER WATERSHED INVESTIGATION
FOLSOM DAM APPROACH CHANNEL
Elderberry Shrub Stem Count Data

OBSERVERS Weinrich, LeFevre **DATE** 6/6/12

Dyke 8 spoil area 6/11/12

	Shrub #	Riparian Habitat?	Stem Size At Ground Level ≥ 1" & ≤ 3"	> 3" & < 5"	≥ 5"	Exit Holes Present?
6/6/12	1	No			1	No
	2	No	1			No
	3	No	1			No
6/11/12	4	No			1	No
	EC.	~ 23"	estimated			
	Willow	~ 25"	could not measure due to high lake level and fence.			
	Cottonwood	~ 25"				
	4-5 small cottonwoods	1" ea.				
	Cottonwood	13"	Eucalyptus 23.5	conifer	18"	
	Cottonwood	38.5"				
	Species	dbh				

Cottonwood 36"
Cottonwood (3 stem) 14", 21", 16"
V. Oak 25"
V. Oak 31.5"
Live oak 9"

Live Oak 18, 20
V. oak 15.5"
V. oak 4"
V. oak 4"
L. oak 9"
(3) → L oak 1.0, 1.0, 1.0

V. oak 12.5"
V. oak 31. "
Buckeye 8, 8, 11.5, 7
L oak 2.5
L oak 2.0

AMERICAN RIVER WATERSHED INVESTIGATION
FOLSOM DAM APPROACH CHANNEL
Elderberry Shrub Stem Count Data

OBSERVERS Weinrich LeFevre **DATE** 6/11/12

Proposed Lower Ponding Area for Batch Plant.

Shrub #	Riparian Habitat?	Stem Size At Ground Level			Exit Holes Present?
		≥ 1" & ≤ 3"	> 3" & < 5"	≥ 5"	
1	No			1	no
2	"			1	no
3	"			1	No
4	"			1	No
5	N			1	No