Isabella Lake Dam Safety Modification Project Environmental Impact Statement

Final

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

US Army Corps of Engineers

U.S. Department of Agriculture, Forest Service
Sequoia National Forest – Cooperating Agency

Forest Service

Isabella Lake Dam Safety Modification Project
Final Environmental Impact Statement
Kern County, California

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Abstract

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, the U.S. Army Corps of Engineers, Sacramento District, in cooperation with the U.S. Forest Service, Sequoia National Forest, has prepared this Final Environmental Impact Statement (EIS) for the Federal proposed action to remediate seismic, seepage, and hydrologic dam safety concerns at the Isabella Lake Main and Auxiliary Dams. Isabella Lake is located on the Kern River approximately 45 miles northeast of Bakersfield, Kern County, California.

This document has been prepared in accordance with the Council on Environmental Quality's (CEQ) (NEPA Guidelines) - 40 CFR Parts 1500-1508, and Corps' NEPA implementing regulations ER 200-2-2 (33 CFR 230). This Final EIS is intended to be used as a companion document to the Draft EIS, released on March 23, 2012.

The Draft EIS document is available by request from the Public Affairs Office or online at: http://www.spk.usace.army.mil/Missions/CivilWorks/IsabellaDam.aspx.

The Corps has selected Alternative Plan 4 from the Draft EIS as the "Preferred Alternative". The Corps has made several project refinements based on comments received on the Draft EIS, and the Corps' ongoing efforts to reduce potential environmental impacts. This Final EIS identifies, evaluates, and documents the environmental effects of the Preferred Alternative designed to prevent loss of life, extensive downstream damage, functional loss of the project, and the loss of all project benefits. Implementing the Preferred Alternative represents a large and complex modification project that involves altering the Isabella Dams and Spillway, constructing new structures and facilities, and performing numerous associated support actions over an anticipated multi-year construction period. The Corps anticipates issuing a Record of Decision following filing and public distribution of the Final EIS and the 30-day waiting period.

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EXECUTIVE SUMMARY

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INTRODUCTION

This Final Environmental Impact Statement (FEIS) has been prepared by the U.S. Army Corps of Engineers (Corps), Sacramento District in cooperation with U.S. Forest Service, Sequoia National Forest, Kern River Ranger District (USFS). The FEIS is prepared as a companion document to the Draft Environmental Impact Statement (DEIS) which was released on March 23, 2012. The DEIS is the primary source for detailed affected environment and environmental impact information for the proposed Isabella Lake Dam Safety Modification Project (Isabella Lake DSM Project). The FEIS focuses on the Preferred Alternative and subsequent changes to the DEIS analyses. These documents evaluate the environmental impacts of implementing the Isabella Lake DSM Project to remediate existing seismic, seepage, and hydrologic deficiencies in the Main Dam, Spillway, and Auxiliary Dam. The Corps is the Federal lead agency and the USFS is a cooperating agency for the Isabella DSM Project. This document was prepared to meet requirements of the National Environmental Policy Act of 1969 (NEPA).

PROJECT PURPOSE AND NEED

The Corps is proposing risk reduction measures to minimize the potential for and consequences of a catastrophic downstream flooding event associated with dam failure by remediating the significant seismic, hydrologic, and seepage deficiencies at the Isabella Main and Auxiliary Dams and spillway for safe and effective functioning at authorized capacity, while reducing the risk to the downstream public to tolerable levels. This would the goal of having a safe facility that meets Corps risk reduction guidelines for existing dams and allows the project to provide the benefits for which it was authorized. Risk is defined as a measure of the probability and severity of undesirable consequences or outcome.

The Corps has determined that the Isabella Dam facilities require structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. Given the large population downstream of Isabella Lake, as well as significant dam safety issues at the dam, urgent action is needed to address deficiencies and reduce risk. These facilities are among the Corps' highest priorities for risk reduction, and the project does not meet the Corps' tolerable risk guidelines; thus, remedial actions are necessary. The Corps' need for action is to reduce the likelihood and consequences of dam failure and to restore the authorized project benefits.

PROPOSED ACTION

Five Action Alternatives and the No Action Alternative were analyzed in detail by the Corps in the DEIS. The Corps has selected Alternative Plan 4 as the "Preferred Alternative" for meeting the Isabella Lake DSM Project Purpose and Need. The main features of Alternative Plan 4 include:

- Main Dam full height filter and drain (with an approximately16-foot crest raise)

- Improvements to the existing spillway
- New 900-foot Emergency Spillway
- Auxiliary Dam Modification (with an approximately16-foot crest raise)
  - 80 feet (crest width) Downstream Buttress
  - Shallow Foundation Treatment
  - Upstream Berm
- Replacement of Borel conduit through right abutment of Auxiliary Dam
- Relocation of Highways 155 and 178 to accommodate the crest raise

Since the release of the DEIS, the Corps has made several refinements to the Preferred Alternative based upon public and agency comments received on the DEIS, and the Corps' ongoing efforts to reduce, to the maximum extent practicable, the potential environmental and socio-economic impacts associated with implementing Alternative Plan 4 as the Preferred Alternative. The major refinements include:

- The Borel Canal relocation would be moved further west, outside of the Kern Canyon Fault shear zone, and partially through Engineers Point. In addition to dam safety benefits, this reduces the need for lake lowering.
- Constructing the Upstream Berm on the Auxiliary Dam would not be proposed as the primary means of disposing of the unused rock materials from the Emergency Spillway excavation. The Upstream Berm was determined to not be necessary to reduce the likelihood of failure to a tolerable level. Excess material would be disposed of at Engineers Point. This eliminates the need for an extended lake lowering during the recreation season.
- All filter sand requirements could be met through preparation of sand at an onsite crushing plant using rock material from the Emergency Spillway excavation, supplemented by sand collection at the Auxiliary Dam Recreation Area. The South Fork Delta Filter Sand Borrow Area would not be required. This reduces potential impacts on air quality, noise, traffic, recreation, as well as on biological and natural resources in the South Fork Delta area.
- The proposed Highway 155 realignment has been modified to be closer to the existing roadway and include a widening of the existing bridge rather than constructing a new bridge; reducing potential impacts on several resources, including cultural resources, noise and traffic.
- The Corps will substitute electrical power on the worksite for the previously planned diesel generators and other equipment. This includes replacing up to four diesel generators running 24-7 to provide electrical power needed to run the dewatering pump system to dewater the area downstream of the Auxiliary Dam during the construction. The Corps anticipates that the use of electricity where possible would greatly reduce air pollutant emissions and noise.

- The Corps has made refinements to the construction schedule, duration, and sequencing that are designed to reduce or minimize impacts on the natural and human environment.

The Corps has designated Alternative Plan 4 as the "Environmentally Preferable Alternative" based on the array of remediation measures described in Chapter 2 of the DEIS and the refinements described and analyzed in this FEIS. The Environmentally Preferable Alternative is the alternative that causes the least amount of damage to the environment while protecting natural and cultural resources.

PUBLIC AND AGENCY REVIEW OF THE DEIS

During the DEIS public review period, a total of 435 comments were received from the public and agencies. Comments were received from 145 different parties, including 3 Federal agencies, 1 State of California agency, 12 local agencies and organizations, and 129 private citizens. Although the public was engaged on a variety of issues, by a large margin the most important issue identified by the public was concern about periods of lake lowering during construction and their impact on recreation, the local economy, water quality, and air quality.

MAJOR ENVIRONMENTAL IMPACTS

Refinements to Alternative Plan 4 under the Preferred Alternative, have reduced anticipated adverse environmental impacts from those anticipated in the DEIS. Impacts resulting from implementing the Preferred Alternative are primarily short-term; occurring only during the construction period. Although short term, there would be significant and unavoidable air quality and noise impacts on nearby residents during construction. In addition, there would be significant short-term impacts on recreation due to the closure of recreation sites during construction such as Launch 19 and the Auxiliary Dam Recreation Area. The refinements that minimize the frequency and duration and refine the scheduling of lake lowering would reduce a variety of anticipated construction-related impacts on recreation, biological resources, and water quality. Other impacts on biological resources such as loss of habitat and impacts on wetlands will be mitigated. Mitigation for these losses has been addressed in consultation with the U.S Fish and Wildlife Service. Existing downstream water uses would be maintained in cooperation with power generators and irrigators. With respect to the remaining resource areas analyzed (Geology, Soils, and Seismicity; Traffic and Circulation; Hazardous, Toxic, and Radiological Waste; Land Use; Aesthetic Resources; Cultural Resources; Socioeconomics and Environmental Justice; and Public Health and Safety), adverse impacts are anticipated be low to moderate.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
AAQS	ambient air quality standards
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
ALARP	as low as reasonably practicable
APE	area of potential effects
BDR	biological data report
BEA	US Bureau of Economic Analysis
BLM	Bureau of Land Management
BMP	best management practice
°C	degrees Celsius
CAA	Clean Air Act
Caltrans	California Department of Transportation
CAR	Coordination Act Report
CARB	California Air Resources Board
CEQ	Council on Environmental Quality
CDFG	California Department of Fish and Game
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide (a criteria pollutant)
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
cy	cubic yard
dB	decibel
DEIS	draft environmental impact statement
DO	dissolved oxygen
DSM	dam safety modification
DSMR	Dam Safety Modification Report
EIS	environmental impact statement
EKAPCD	Eastern Kern Air Pollution Control District
EPCRA	Emergency Planning and Community Right-to-Know Act
FEIS	Final Environmental Impact Statement
GHG	greenhouse gas
HEP	habitat evaluation procedures
HTRW	hazardous, toxic, and radiological waste

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
IMPLAN	Impact Analysis for Planning
IPCC	Intergovernmental Panel on Climate Change
IPD	Isabella Project Datum
IRRM	interim risk reduction measure
KCFD	Kern County Fire Department
KOP	key observation point
KRVR	Kern River Valley Revitalization
KRVSP	Kern River Valley Specific Plan
LEDPA	least environmentally damaging practicable alternative
M	magnitude
MDAB	Mojave Desert Air Basin
Monument	Giant Sequoia National Monument
MOU	Memorandum of Understanding
msl	mean sea level
µg/m3	micrograms per cubic meter
µS/cm	microsiemens per centimeter
MVUM	motor vehicle use map
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NAVD 88	North American Vertical Datum of 1988
NED	national economic development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOx	nitrogen oxides
NRCS	Natural Resource Conservation Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NVGD	National Geodetic Vertical Datum of 1929
OHWM	ordinary high water mark
PA	programmatic agreement
pH	potential hydrogen
PM10	particulate matter measuring 10 microns or less
PM2.5	particulate matter measuring 2.5 microns or less
PMF	probable maximal flood

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
RMP	Risk Management Plan
RMP/EIS	Resource Management Plan / Environmental Impact Statement
ROG	reactive organic gasses
ROS	Recreation Opportunity Spectrum
RWQCB	Regional Water Quality Control Board
SCE	Southern California Edison
SIP	State Implementation Plan
SOx	sulfur oxides
SQF	Sequoia National Forest
SRMA	Special Recreation Management Area
SWPPP	Storm Water Pollution Prevention Plan
TAC	toxic air contaminant
TDS	total dissolved solids
tmdl	total maximum daily load
tpy	tons per year
TS	total solids
TSS	total suspended solids
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WCM	Water Control Manual
µg/m3	micrograms per cubic meter
µS/cm	microsiemens per centimeter

LAKE LEVELS AND CONVERSIONS

Isabella Lake Vertical Datum and Capacity References

	NAVD 88	IPD	NGVD 29
Conversion from NAVD 88 to	Same	-3.76	-2.61
Conversion from IPD to	+3.76	Same	+1.15

Feature	NAVD 88 (Feet)	IPD (Feet)	Capacity (approx. acre-feet)
Gross Pool Elevation	2,609.26	2,605.5	568,070
Existing Spillway Design Flood elevation/ capacity	2,630.76	2,627.0	840,600
Main Dam Crest	2,637.26	2,633.5	-
Auxiliary Dam Crest	2,637.26	2,633.5	-
Flowage Easement acquired by the Federal Government within Isabella Reservoir (Maximum Elevation)	2,620.76	2,617.0	707,230
Flood Control Pool elevation	2,564.16	2,560.4	170,000
Current IRRM Restricted Pool	2,589.26	2,585.5	361,250
Minimum Pool for Current Operation of the Borel Canal	2,251.76	2,548.0	105,860
Minimum Pool for Current Operations of the Main Dam Power Generation Facilities	2,536.76	2,533.0	53,520
Estimated Current PMF Pool at Failure	2,638.26	2,634.5	-
Proposed Emergency Spillway Approach	2,594.26	2,590.5	412,940
Proposed Emergency Spillway Crest	2,618.26	2,614.5	675,710
Proposed Cofferdam Height for Borel Canal Tunnel-Conduit Construction	2,589.26	2,585.5	361,250
Proposed Temporary Restricted Pool for Borel Canal Approach Construction (Approximate)	2,543	2,539	72,237
Proposed Temporary Restricted Pool for Cofferdam Operations	2,585.26	2,581.5	325,400

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CHAPTER 1

APPROACH AND CONTENTS OF THIS FEIS

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1.1 INTRODUCTION

This document is the Final Environmental Impact Statement (FEIS), prepared by the U.S. Army Corps of Engineers (Corps), Sacramento District in cooperation with the U.S. Department of Agriculture, Forest Service (USFS), regarding implementing the proposed Isabella Lake Dam Safety Modification (DSM) Project to remediate existing seismic, seepage, and hydrologic deficiencies in the Main Dam, Spillway, and Auxiliary Dam. This document has been prepared in accordance with the Council on Environmental Quality's (CEQ) regulations implementing the National Environmental Policy Act (NEPA) – 40 CFR Parts 1500-1508 and Corps' NEPA-implementing Engineering Regulation (ER 200-2-2, 33 CFR 230).

This FEIS is intended to be used as a companion document to the DEIS. The DEIS was released on March 23, 2012 and was widely distributed to agencies and stakeholders for a 45-day comment period. The Corps extended the public comment period an additional 15 days until May 22, 2012 at the request of public stakeholders. For readers of this FEIS who do not already have a copy of the DEIS, the document is available online at http://www.spk.usace.army.mil/Missions/CivilWorks/IsabellaDam.aspx. Copies of the DEIS may also be obtained by contacting the Sacramento District Public Affairs Office, 1325 J Street, Sacramento, CA 95814; Phone (916) 557-5101; email: isabella@usace.army.mil.

At the time of publishing the DEIS in March 2012, the Corps had selected five Action Alternatives for analysis, which are described in detail in Chapter 2 of the DEIS, and analyzed in detail in Chapter 3 of the DEIS. However, at that time, the Corps had not yet selected a Preferred Alternative from among the five Action Alternatives analyzed in the DEIS. Since that time the Corps has selected Alternative Plan 4 as the "Preferred Alternative" for meeting the Isabella Lake DSM Project Purpose and Need. The selection process and basis for this selection are further discussed in Chapter 2 of this FEIS.

The Corps has also designated Alternative Plan 4 as the "Environmentally Preferable Alternative", i.e. the alternative that causes the least amount of damage to the environment while protecting natural and cultural resources. The Corps has determined that of the five Action Alternatives analyzed in the DEIS, Alternative Plan 4 best minimizes the downstream environmental, economic, and human consequences while adequately meeting all tolerable risk guidelines and the majority of essential Corps guidelines as defined in Corps Engineering Regulation ER 1110-2-1156 at http://140.194.76.129/publications/eng-regs/.

Since the release of the DEIS, the Corps has made several refinements to the Preferred Alternative based upon public and agency comments received on the DEIS, and the Corps' ongoing efforts to reduce, to the maximum extent practicable, the potential environmental impacts associated with implementing the Preferred Alternative. These

refinements are described in Chapter 2 of this FEIS, and the impacts associated with these refinements are discussed in Chapter 3 of this FEIS.

Considering the extent of information, data, and analyses already provided in the DEIS regarding the affected environment and potential impacts associated with implementing the Preferred Alternative (Alternative Plan 4), or any of the other four Action Alternatives, the Corps has determined that this FEIS should serve as a companion document to the DEIS, with focus on the Preferred Alternative, and particularly on the refinements made since the release of the DEIS. As a companion document, this FEIS includes cross-references to particular chapters and sections of the DEIS, where appropriate. Therefore, the information, data, and analyses presented in this FEIS are focused on providing the following:

- Descriptions of the refinements to the Preferred Alternative (Alternative Plan 4) that have occurred since the release of the DEIS;
- Identification and evaluation of the new environmental impacts (or changes to previous impacts identified in the DEIS) that are associated with these refinements; and
- Corrections to, and key updates and clarifications of some of the information in the DEIS based on public and agency comments, internal review by the Corps, and ongoing regulatory compliance efforts by the Corps and other agencies regarding the DSM Project.

Because many of the refinements made to the Preferred Alternative were based on public and agency comments received during the DEIS comment period, another important focus of this FEIS is to present a summary of the comments received and the responses by the Corps. This important part of this FEIS is provided as an overview in Chapter 5, and in more detail in Appendix A. The other appendices included in this FEIS provide updated versions of key environmental compliance documents previously provided in the DEIS, as well as additional documents; with intentional focus on the Preferred Alternative.

One key update to the DEIS resulting from internal review by the Corps and based on agency and public comments is the reevaluation of impacts on recreation. Short-term impacts on recreation were characterized in the DEIS as not significant under all of the alternatives. In consideration of the comments received and reconsideration of the factors used in assessing the context and intensity of the anticipated impacts, the Corps has determined that DSM project would result in short-term significant impacts on recreation during the construction period. The refinements under the Preferred Alternative would reduce the level of impacts on recreation, but significant impacts are still anticipated. Additional information is provided in Section 3.10 of this FEIS.

Otherwise, all other aspects of the affected environment, potential impacts, and environmental compliance actions associated with implementing the Preferred Alternative have been adequately addressed in the DEIS.

1.2 Contents and Organization of this FEIS

The information contained in this FEIS has been organized under the following chapters and appendices:

- Chapter 1 introduces the approach and contents of this FEIS; repeats some key information from the DEIS (e.g. Purpose and Need for Action); and includes updates to other important information in the DEIS (e.g. Issues to be Resolved).
- Chapter 2 provides a discussion of the process of selecting Alternative Plan 4 as the Preferred Alternative from among the five Action Alternatives analyzed in the DEIS; identifies those refinements made in the Preferred Alternative since the release of the DEIS and compares these refinements to what was described in the DEIS; and presents an updated description of the Preferred Alternative.
- Chapter 3 presents additional analyses of new environmental impacts (or changes to previous impacts identified in the DEIS) that are associated with refinements made to the Preferred Alternative since the release of the DEIS.
- Chapter 4 presents by chapter, section, page, and paragraph corrections to the DEIS text that were identified during the 60-day public and agency comment period and during Corps review of the DEIS following release. These corrections are presented by chapter, section, page, and paragraph references.
- Chapter 5 updates the status since the DEIS of the Corps' compliance with Federal and other statutes, implementing regulations, and Executive Orders potentially applicable to the proposed DSM Project.
- Chapter 6 describes the public and agency review of the DEIS and provides a narrative discussion of the major comments and Corps responses.
- Chapter 7 provides a list of additional references noted in the FEIS that are relevant to further discussion and analysis of the refinements to the Preferred Alternative.
- APPENDICES
    - A. Public and Agency Comments and Corps Responses
    - B. Clean Water Act Section 404(b)(1) Water Quality Evaluation
    - C. Biological Documents
        - Fish and Wildlife Coordination Act Report (CAR)
        - Biological Opinion (BO)
        - Habitat Evaluation Procedures (HEP) Report
        - Species List
    - D. Cultural Resource Consultation
        - Programmatic Agreement (PA)
        - Correspondence
    - E. Health Risk Assessment
    - F. Air Quality Analysis

1.3 NEED FOR AND PURPOSE OF THE PROPOSED ACTION

The Proposed Action is the implementation of the Preferred Alternative. To further emphasize the importance and timeliness of the DSM Project, the need for and purpose of taking action to remediate deficiencies in the Main and Auxiliary Dams that was stated in Section 1.7 of the DEIS (Purpose and Need for Action) has been paraphrased in the following paragraphs.

The Corps has determined that the Isabella Dam facilities require a suite of structural and non-structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. The Corps employs a widely accepted method for determining risk at dam projects in terms of "tolerable risk", that are based on appropriate tolerable risk guidelines. While the Corps views economic risk and environmental risk as important considerations when determining tolerable risk, life safety is paramount. Simply stated, it is intolerable if a dam has an annual probability of failure greater than 1/10,000; or if the assessed annualized life loss is greater than 0.001. More information can be found in Corps Engineering Regulation ER 1110-2-1156 at http://140.194.76.129/publications/eng-regs/.

In 2005, the Corps determined through a screening-level risk assessment process that the Isabella Dams posed unacceptable risk. The project received this classification due to the "extremely high risk", and that the project is not believed to be "critically near failure". Failure is not believed to be imminent. Given the large population downstream of Isabella Lake as well as significant dam safety issues at the dam, urgent action is needed to address deficiencies and reduce risk. The Isabella Dam Project facilities is among the Corps' highest priorities for risk reduction. Action is needed by the Corps to reduce the likelihood and consequences of dam failure, and to restore the authorized project benefits.

A breach of either dam at the Isabella Dam facilities has the capability to cause significant loss of life and environmental and economic impacts downstream. The Corps is proposing to implement the Preferred Alternative to reduce the risk to the public from the project by remediating the significant seismic, hydrologic, and seepage deficiencies at the Main and Auxiliary Dams to a level that satisfies tolerable risk guidelines, and also to be able to fulfill the project design functions, including operating at authorized capacity. This supports the Corps' original objective of having a safe facility that meets Corps tolerable risk guidelines, and allows the project to provide the benefits for which it was authorized.

1.4 UPDATE ON ISSUES TO BE RESOLVED

In Section 1.9 of the DEIS (Issues to be Resolved), the anticipated construction-related activities associated with implementing the proposed Action Alternatives were addressed at a level considered appropriate, given the current status of project planning and design and available information and data. Based on public and agency comments received following the release of the DEIS, and the Corps' objective of providing the most benefits at the least cost, the Corps has continued to refine remediation measures,

construction methods, equipment types, and construction schedules to further reduce adverse impacts beyond the BMPs and mitigation measures proposed in Table ES-2 and Chapter 3 of the DEIS.

Of the unresolved issues and actions described in Section 1.9 of the DEIS, only a few are not ripe for a decision at this time and, therefore, not ready for a final analysis of environmental impacts in this FEIS. These unresolved issues do not materially affect the decision on implementing the Preferred Alternative. In the following paragraphs, updates to some of the unresolved issues and actions, as well as new actions arising from refinements to the Preferred Alternative since the DEIS are presented. Where appropriate, these paragraphs will explain why the Corps does not need these analyses to make an informed decision and why unresolved issues are not currently ripe for a decision. As also described in the following paragraphs, for any actions that remain as deferred actions, the Corps would plan to address these in appropriate supplemental NEPA documents tiered to this DSM Project EIS.

1.4.1 Real Estate Plan

A future effort associated directly with the proposed action of implementing the Preferred Alternative is the preparation of a *Real Estate Plan*. This *Plan*, which would provide more detail on property acquisition requirements and on what would be done with the acquired real estate, is a separable action on its own timeline that is dependent on negotiations that cannot occur until the project is approved. Thus, the real estate issue is not ripe for decision, and it would be appropriate to address this issue in a supplemental NEPA document. Furthermore, the decision on how the Corps would acquire and deal with acquired property has no bearing on the Corps selecting a Preferred Alternative. The potential for real estate actions is assumed in the FEIS, but details on which properties may be affected and measures that the Corps may take are still being determined, and therefore cannot be fully described and analyzed. The tentative schedule for release and review of the draft of a *Real Estate Plan* is July 2013. A final *Real Estate Plan* is anticipated for December 2013.

1.4.2 Recreation Plan

The Corps plans to prepare a *Recreation Plan* during 2012-2013 to further explore and identify options for mitigation to offset adverse effects on recreation resulting from construction of the Isabella DSM Project. The Corps cannot use project funds to replace or relocate USFS recreation facilities, so the Corps would seek to collaborate with the USFS and other stakeholders to identify other options for implementation. Since the Corps does not have any authority to implement replacement of recreation facilities that are adversely affected by the proposed project, the Corps has no decision to make regarding recreation and, therefore, no need for a supplemental NEPA document. However, the impacts to recreation have been fully analyzed in this EIS. Any future decisions on recreation would likely not be made by the Corps, thus those decisions are properly deferred and do not affect the selection of a Preferred Alternative by the Corps. Although the Corps can participate in this way in the planning process, any actions that may be identified for implementation in the *Recreation Plan* may require funding and/or

implementation from other Federal, State, or local agencies; and these options would be explored. Also, any implementation actions may require NEPA and/or CEQA documentation by the action agency, as well as permits from Federal and State Agencies.

1.4.3 Fish and Wildlife Mitigation Plan and Fisheries Management Plan

Refinements to Alternative Plan 4 regarding the duration and timing of the construction pool and the source of borrow materials under the Preferred Alternative would result in negligible impacts on fish and wildlife. The Corps has worked with the USFWS to identify impacts and implement appropriate measures to avoid and minimize remaining impacts. These are included in Section 3.8 (Biological Resources) and Appendix B, (Biological Reports) of this FEIS, as well as in Section 3.10.4 of the DEIS. With implementation of the USFWS recommendations, a separate Fish and Wildlife Mitigation Plan would not be necessary and would not be prepared. Likewise, potential adverse impacts on fisheries are now considered less than significant, and therefore would not require that a Fisheries Management Plan be prepared.

1.4.4 Upstream Berm on Auxiliary Dam

As part of the refinements made to the Preferred Alternative since the release of the DEIS, the Corps has determined that constructing the Upstream Berm on the Auxiliary Dam with unused rock material from the Emergency Spillway excavation is not necessary to reduce the probability of failure of the Auxiliary Dam to a tolerable level, although it would further help increase seismic stability. Constructing this measure would have required a lake lowering to the construction pool elevation of approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a nine month period.

On this basis, and in response to many public comments, one of the important refinements identified by the Corps in an effort to shorten the duration of construction pool lake levels is to not require the Upstream Berm on the Auxiliary Dam. Instead, under the Preferred Alternative, unused rock material from the Emergency Spillway excavation would be deposited on Engineers Point, in accordance with a Corps-approved *Rock Material Disposal Plan* developed by the contractor. This refinement is further described and discussed in Section 2.2 of this FEIS and the impacts on each resource are analyzed in Chapter 3 of this FEIS. This refinement greatly reduces the length of time that the lake would need to be lowered to the construction pool.

However, the possibility of constructing a rock fill berm on the upstream side of the Auxiliary Dam has not been completely discarded, but has been relegated to an "option", to be further considered during the detailed engineering design phase, after release of the FEIS and before construction. The Corps has determined that if the Upstream Berm were to be brought back into the DSM Project, the lake level would not be lowered, but rather the contractor would take advantage of the seasonal low water levels in fall-winter to place rip-rap along the upstream toe of the Auxiliary Dam. This would reduce the level of impact associated with constructing the Upstream Berm as analyzed in the DEIS. Should this option be brought back, appropriate environmental documentation would be completed for this task, but additional NEPA documentation would not be required.

1.4.5 Accommodating the Main Dam 16-Foot Raise

As discussed in Section 2.3.8 (Alternative Plan #4) of the DEIS, Highway 155 would need to be modified to accommodate the proposed approximate 16-foot high dam raise. Two options were being considered by the Corps: a realignment of Hwy 155 to the west, and the installation of a 16-foot high flood gate. At the time of publishing the DEIS, the preferred option by the Corps was the flood gate. Since that time the Corps has determined that the preferred option is a "refined" version of the Hwy 155 realignment presented in the DEIS. This refined alignment would be closer to the existing roadway, would involve some widening of the existing bridge rather than constructing a new bridge (as was presented in the DEIS) and would still include an uphill climbing lane. This preferred option is further discussed in Section 2.2 of this FEIS.

1.4.6 Realignments of Hwy 178 and Hwy 155

At the time of the publication of this FEIS, the Corps was involved in ongoing discussions with Caltrans to develop an agreement whereby Caltrans would review and refine designs to meet Caltrans specifications and adopt and approve the Corps' NEPA approach, methods, and results regarding the analysis of impacts from the proposed realignments of Hwy 178 and Hwy 155, including the refinements to Hwy 155 described in Section 2.2.6 of this FEIS. The agreement is needed in order to insure that the baseline data gathering methods and impact identification approach, analysis, and documentation protocols typically employed by Caltrans for highway realignment projects are sufficiently covered by the Corps in regard to the proposed highway realignments.

The issue of the design and final alignments for highway realignments is not yet ripe for decision since the Corps has not yet received a plan from Caltrans regarding alternative alignments. Deferring this final decision on the exact alignments does not affect the Corps' selection of the Preferred Alternative for the DSM Project. Further consideration of alternative alignments for the final design of the realignments would have no effect on that decision. Furthermore, the FEIS clearly states highway relocation is part of the proposed action and describes the effects of the relocations on the environment. These effects are quantified to the extent possible, such as with the air quality emissions modeling provided by Caltrans and included in Chapter 3 of this FEIS, and discussed qualitatively where quantities are not available. Thus, sufficient information on these actions was available to enable the Corps to make a reasoned choice of a Preferred Alternative among the Action Alternatives analyzed in the DEIS.

Once Caltrans provides a plan that may include design alternatives for the highway realignments, the Corps would prepare a supplemental NEPA document tiered to the FEIS to evaluate the available alternatives. The Corps plans to complete this documentation in 2013.

1.4.7 Water Control Plan

Another possible effort associated directly with implementing the Preferred Alternative is a deviation to the current water control plan/flood control diagram found in the 1978

Isabella Dam and Lake Water Control Manual. This deviation would address the lowered water surface for the construction pool. The environmental effects of a lowered water surface for this purpose is addressed in both the DEIS and FEIS. The Corps would determine if a deviation to the water control plan/flood control diagram would indeed be required. If so, and if this present Isabella Lake DSM Project EIS is not deemed to sufficiently cover the potential effects of the deviation, a separate NEPA document tiered to this EIS would be prepared.

CHAPTER 2

PREFERRED ALTERNATIVE

CHAPTER 2.
PREFERRED ALTERNATIVE

2.1 SELECTION OF THE PREFERRED ALTERNATIVE

In Chapter 2 of the DEIS, a description was provided of the alternative formulation process by which the Corps had derived the eight Action Alternatives initially considered in the DEIS, and had eliminated three of the Action Alternatives from further detailed consideration in the DEIS. That formulation process has continued beyond the release of the DEIS in March 2012, as the Corps continues ongoing efforts to make refinements in order to reduce potential environmental and socioeconomic impacts associated with implementing the DSM Project.

This ongoing formulation process has been greatly augmented by the public and agency comments received during the 60-day public review period of the DEIS (See Chapter 6 and Appendix A of this FEIS). Through consideration of public and agency comments received, coupled with the ongoing rigorous and comprehensive evaluation and review procedures established by the Corps for this project, the Corps has selected Alternative Plan 4 as the Preferred Alternative above the other four Action Alternatives. Alternative Plan 4 was selected as the Preferred Alternative based on the following:

- Alternative Plan 4 adequately meets tolerable risk guidelines and maximizes risk reduction downstream compared to the other Action Alternatives. These tolerable risk guidelines are described in Safety of Dams-Policies and Procedures ER 1110-2-1156, October 2011.
- Alternative Plan 4 conforms to the majority of essential Corps guidelines for design, construction, operation, and maintenance, as also described in ER 1110-2-1156.
- Alternative Plan 4 optimizes risk reduction, consequences, cost, and schedule compared to the other Action Alternatives, based on ALARP (as low as reasonably practicable) considerations, as also described in ER 1110-2-1156.
- Alternative Plan 4 incorporates a wider spillway and higher dam crests than the other Action Alternatives, which compared to the other action Alternatives, would ensure a higher level of downstream risk reduction for large storm/flood events that could overtop the existing dams.

2.2 REFINEMENTS SINCE RELEASE OF DEIS

2.2.1 Introduction

Since selecting Alternative Plan 4 as the agency Preferred Alternative, the Corps has been actively engaged in developing refinements to the planning, design, construction methods and equipment, and construction sequencing and scheduling for this alternative. These changes are in response to public and agency comments received during the DEIS 60-day public review period. Additionally, these refinements allow the Corps to reduce potential

environmental and socioeconomic impacts associated with implementing the Preferred Alternative. Chapter 6 (Public and Agency Review of DEIS) and Appendix A of this FEIS (DEIS Comments and Corps Responses) provide a summary of the comments received during the DEIS review period. By far, the greatest number of public comments received were concerned with the potential adverse impacts on recreation, water quality, and the local economy from the periods that the lake level would be lowered to a construction pool elevation of approximately 2,543 feet NAVD 88 (72,327 acre-feet). As reported in the DEIS, this lower lake level would be required for two 2-month periods to construct and later remove a coffer dam needed to dewater the area upstream of the right abutment of the Auxiliary Dam to install the Upstream Portal of the relocated Borel Canal. Also, it was pointed out in the DEIS that this lower lake level would be required for an additional nine-month period to construct an Upstream Berm on the Auxiliary Dam with unused rock material left over from the Emergency Spillway excavation not used in other remediation measures.

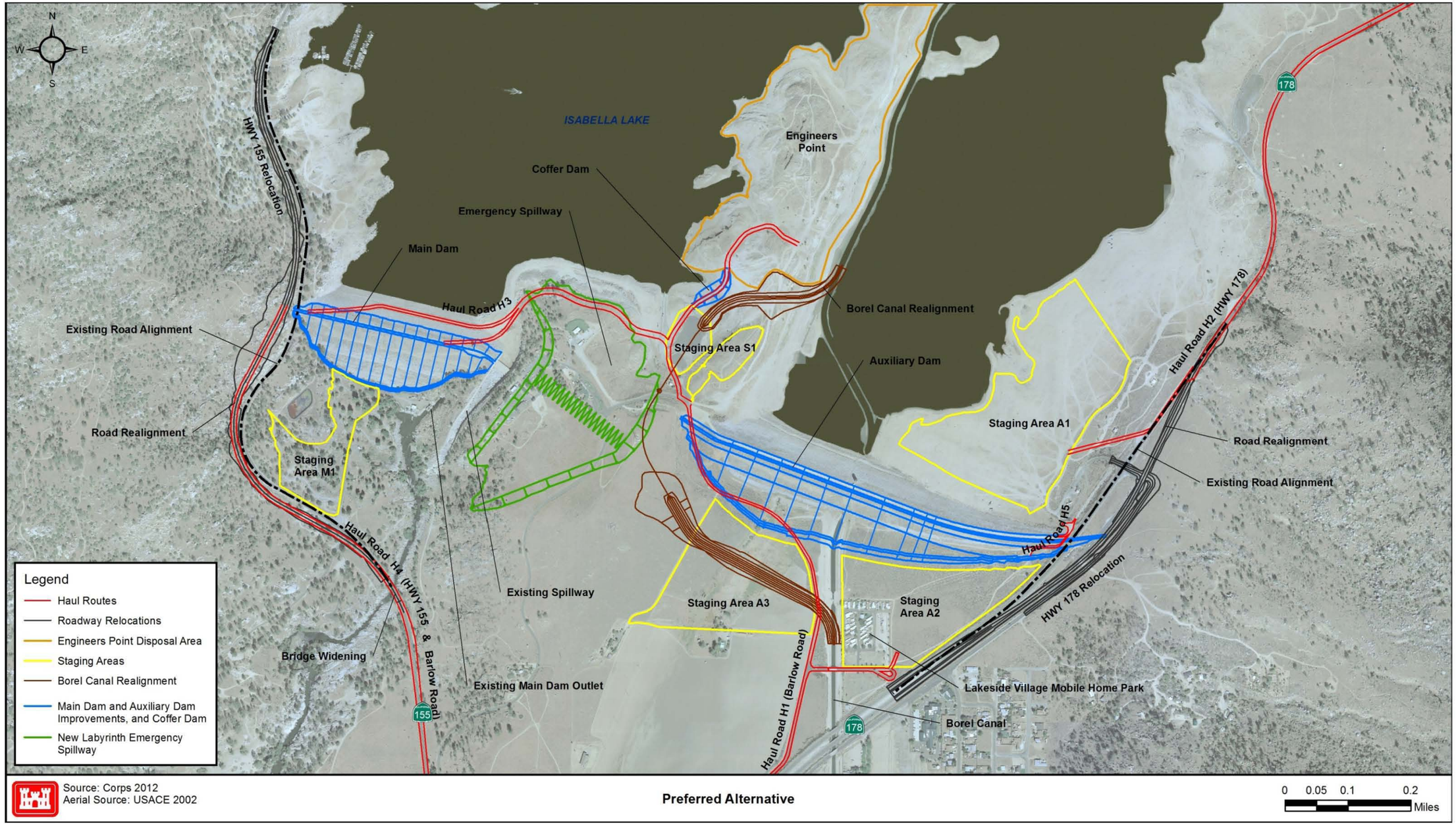
In response to the many public comments received regarding the lowering of the lake to the construction pool elevation, the Corps has made major refinements to the Borel Canal relocation and the Auxiliary Dam Upstream Berm since the release of the DEIS. These refinements would reduce the frequency and length of time that the construction pool elevation would be required for construction. Additional information on these refinements is provided in the following:

- Figure 2-1-FEIS, which illustrates the site plan for the Preferred Alternative, including refinements.
- Table 2-1-FEIS, which compares how Alternative Plan 4 is described in the DEIS with the description in this FEIS.
- Table 2-2-FEIS, which is a visual presentation of the anticipated sequencing, time frames, and duration of the anticipated construction schedule for implementing the Preferred Alternative, including refinements.
- Section 2.3 of this FEIS, which provides a complete (and updated) description of the Preferred Alternative, including refinements.

2.2.2 Borel Canal Relocation Refinements

The refinements to the Borel Canal relocation involve shifting the proposed relocation alignment further west, outside of the Kern Canyon Fault shear zone, and partially through Engineers Point. This relocation also moves the Control Tower to a safer location away from the active fault zone (Figure 2-1-FEIS). This refined alignment would no longer require the coffer dam on the Auxiliary Dam side of Engineers Point, but would require a smaller coffer dam on the Main Dam side. However, this smaller coffer dam would be constructed in the wet, without lowering the lake, in a time period that would take advantage of the lower pool elevations during the fall or winter. The location of this smaller coffer dam is shown in Figure 2-1-FEIS. Also, it is likely that this coffer dam would not require removal, since it may be retained to provide additional access to

Figure 2-1-FEIS Preferred Alternative Site Plan



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Engineers Point during and following construction. Although these refinements would remove the need for the lake to be lowered for the two 2-month periods for constructing and removing the coffer dam, there would still need to be a lowering of the lake level to the construction pool elevation for a period of four-to-six months to complete the construction of the approach channel for the realigned Borel Canal tunnel-conduit, and for removal of the short section of the existing Borel Canal that would no longer be needed between the Auxiliary Dam and the new upstream tie-in. The Corps has scheduled these actions during the fall to early spring of 2020-2021 to take advantage of seasonal lower water levels, and to be outside the summer recreation season. However, during that one year it may be necessary to begin to drawdown the lake in late summer and early fall to prepare for construction. Depending on the amount of water available that year and the needs of downstream agricultural users, more water may be released in late recreation season than is a typical, causing larger flows downstream.

2.2.3 Auxiliary Dam Upstream Berm Refinement

The Corps had originally included the addition of the Upstream Berm with the remediation measures on the Auxiliary Dam as a means of disposing of the unused rock materials from the Emergency Spillway excavation, and to provide additional stability. Since the release of the DEIS, the Corps has determined that with the suite of measures comprising the Preferred Alternative, constructing the Upstream Berm on the Auxiliary Dam is not necessary to reduce the probability of failure to a tolerable level. On this basis, one of the important refinements to the Preferred Alternative identified by the Corps in response to public comments was to no longer include adding an Upstream Berm on the Auxiliary Dam. This activity had required a lake lowering to the construction pool elevation for a nine month period. Instead, under the Preferred Alternative, all disposal of unused rock material would be on Engineers Point. This refinement would substantially reduce the overall length of time, as well as the multiple periods that the lake would need to be lowered to the construction pool elevation in order to construct the DSM Project. The Upstream Berm on the Auxiliary Dam would become an optional measure. If the Corps were to decide to exercise the optional upstream berm, it would be constructed in the dry, taking advantage of normal low pool elevations. If the lake level was low, the contractor would place rock along the upstream toe, but the lake would not be lowered specifically for this purpose.

2.2.4 Filter Sand Borrow Sources Refinement

Since the release of the DEIS, the Corps has determined that under the Preferred Alternative, all filter sand requirements could be met through preparation of sand at the Crushing Plant operation in Staging Area S1, using rock material from the Emergency Spillway excavation, supplemented by sand collection at the Auxiliary Dam Recreation Area. With this refinement, the South Fork Delta Filter Sand Borrow Area would not be required. This refinement of removing the South Fork Delta Area as a borrow site reduces potential impacts on air quality, noise, traffic, recreation, as well as on biological and natural resources in the South Fork area. As discussed in Section 2.3.13 of the DEIS (Support Actions and Activity Sites Common to the Five Action Alternatives), a

temporary sand processing and washing facility would still be established in Staging A1 to clean sand as required.

2.2.5 Engineers Point Rock Material Disposal Area Refinement

As part of the decision to remove the Auxiliary Dam Upstream Berm from the suite of measures comprising the Preferred Alternative, the Corps has determined that a rock material disposal area (of approximately 54 acres) would be established on Engineers Point, to receive the unused rock material left over from the Emergency Spillway excavation. This disposal area would be served by an additional haul road spur connection from haul road H1 that crosses over the smaller coffer dam described previously (See Figure 2-1-FEIS). By disposing unused rock material on Engineers Point from the Emergency Spillway excavation, the Corps can forego constructing an Upstream Berm on the Auxiliary Dam – as was proposed in the DEIS – which would have required lowering the lake level to the construction pool elevation (approximately 2,543 feet NAVD 88; 72,237 acre-feet) for a nine-month period.

2.2.6 Highway 155 Relocation Refinement

In the DEIS, Highway 155 was proposed for relocation to the west of the existing roadway to accommodate the approximately 16-foot raise on the Main Dam. The alignment for the relocation was to begin upstream of the dam and run roughly parallel to the existing alignment down to the Kern River. The realignment would cross the river on a new bridge, which would be constructed downstream of the existing bridge, and re-connect with the existing roadway to the east of the bridge (See Figure 2-21 in the DEIS). Since the release of the DEIS, and in response to public and agency comments, the Corps decided to refine the proposed realignment to be closer to the existing roadway, and include a widening of the existing bridge rather than constructing a new bridge, as was presented in the DEIS (See Figure 2-1-FEIS). The refined alignment would still include an uphill climbing lane and continued access to Keyesville Road. This refined alignment would reduce potential impacts on cultural resources in the area downstream of the existing Kern River Bridge. However, in order to maintain the necessary grade of the roadway, this refined alignment would need to begin farther up Highway 155 than was proposed in the DEIS, which could affect a portion of Pioneer Point Recreation Area.

2.2.7 Auxiliary Dam Dewatering Refinement

In the DEIS, the construction-related assumptions listed in Section 2.3.14 included the use of up to four diesel generators running 24-7 to provide electrical power needed to run the dewatering pump system to dewater the area downstream of the Auxiliary Dam during the construction of the planned remediation measures. The air quality emissions analysis in the DEIS included the use of the diesel generators. Since the release of the DEIS in response to public and agency comments, and with consultation with Southern California Edison (SCE), the Corps has determined that the power to run the dewatering system would be wholly supplied by SCE. Diesel generators would be available on site for temporary use should back up power be required for short periods. In making this refinement, the Corps anticipated that a reduction in air pollutant emissions would be

possible. On this basis, the air quality emissions anticipated from the Preferred Alternative, including refinements, were re-modeled and re-analyzed. The results of this re-analysis are discussed in Chapter 3 of this FEIS.

2.2.8 Refinements to Anticipated Construction Schedule

The refinements to the Preferred Alternative made by the Corps since the DEIS was released in March 2012 – many of which are in response to the public and agency comments received during the DEIS comment period – have also included making refinements to the anticipated construction schedule that was presented as Table 2-3 of the DEIS (Section 2.3.15 of the DEIS). These schedule refinements are reflected in the revised construction schedule presented in Section 2.2.10 of this FEIS.

2.2.9 Comparison of Alternative Plan 4 in DEIS, with the Refined Alternative Plan 4 (Preferred Alternative) in this FEIS

Since the release of the DEIS in March 2012, the Corps has been actively engaged in developing refinements to the planning, design, construction methods and equipment, and construction sequencing and scheduling for this alternative. These refinements were in response to public and agency comments received during the DEIS 60-day public review period and were based on the Corps' continuing efforts to reduce potential environmental and socioeconomic impacts associated with implementing the DSM Project. Table 2-1-FEIS, presented on the following pages, was created to help clarify the differences between the refined Alternative Plan 4 described and evaluated in this FEIS, and the description of Alternative Plan 4 that was provided in the DEIS. Notes are included in the table where appropriate to help evaluate the relative importance of the various refinements that have occurred.

2.2.10 Refined Construction Schedule for Preferred Alternative

The refinements that the Corps has made to the Preferred Alternative have resulted in considerable adjustments to the anticipated construction sequencing and duration schedule that was presented as Table 2-3 of the DEIS (Section 2.3.15 of the DEIS). These schedule refinements are reflected in the revised construction schedule presented below as Table 2-2-FEIS for implementing the Preferred Alternative. Table 2-1-FEIS provides a summary comparison of the differences between the Refined Construction Schedule for Alternative Plan 4 with the Construction Schedule provided as Table 2-2 of the DEIS.

2.3 DESCRIPTION OF THE PREFERRED ALTERNATIVE

2.3.1 Introduction

Because of the number of refinements that have taken place regarding the Preferred Alternative, the Corps has determined that it would be appropriate in this section of the FEIS to provide a revised and complete description of the Preferred Alternative incorporating the relevant parts of the description provided in the DEIS that have remained. Under this Preferred Alternative, all of the dam safety deficiencies that are

significant contributors to the risk would be remediated. The remediation measures planned for each structure under this Preferred Alternative, including the refinements discussed in the previous section (Section 2.2) are described in the following paragraphs and figures.

2.3.2 Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential seismic settlement and subsequent seepage; and/or overtopping during an extreme storm event, such as the Probable Maximum Flood (PMF). Under the Preferred Alternative the project would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

- Construct a full height filter and drain on the downstream slope of the dam to accommodate a crest raise (expected to be approximately 16-foot) and to further protect the structure from transverse cracking and potential settlement cracking during a seismic event (Figure 2-2-FEIS).
- Construct a toe filter/drain system to capture and collect seepage.
- Construct a crest raise (expected to be approximately 16-foot) to be able to safely pass an extreme flood event without overtopping.
- Raise the Main Dam control tower and access to the existing facility approximately 16-feet to match the increased dam crest elevation. Access to the raised tower would be provided by retaining walls and backfill material of the Main Dam.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway, discussed below. The sand material required for the full height filter and drain of the Main Dam would come from crushing and processing of the waste rock material excavated for the proposed Emergency Spillway. The Auxiliary Dam Recreation Area would serve as a sand stockpile/staging area and backup source of project sand, if necessary. The proposed borrow locations along with the operations are further described in Section 2.3.13 of the DEIS (Support Actions Common to Alternatives), and in Table 2-1-FEIS.

2.3.3 Existing Spillway

Included in this alternative would be remediation of the deficiencies identified for the Existing Spillway. The remediation includes: (a) select concrete placement and surface treatment of the Existing Spillway chute to guard against erosion undermining of the right wall; (b) addition of anchors along the Existing Spillway wall and ogee crest for additional head during operation and to increase seismic stability; and (c) construction of an approximately 16-foot high retaining wall added to the crest along the right and left walls (closest to the Main Dam) to protect against potential erosion of the Main Dam

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
1. MAIN DAM			
General:	Includes an approximately 16-foot crest raise, full-height filter and drain, excavated filter and drain at downstream toe, and tower raise.	Measures are the same, but excavation, fill, and materials quantities have been refined.	
Excavation and Materials:			
Total Excavation	410,500 CY	444,520 CY	
Core; Drain; Random Fill	286,150 CY	521,290 CY	
Filter Sand	360,400 CY	298,590 CY	
Rip Rap; Road Base	10,000 CY	No Change.	
2. EXISTING SPILLWAY			
General:	Includes channel concrete surface spot treatment, anchoring along right wall, approximately 16-foot high retaining wall added to crest of both right side and left side walls.	No Change.	
Materials:			
Concrete	Not reported.	4,200 CY	
3. EMERGENCY SPILLWAY			
General:	Includes new 900-foot-wide channel cut into Engineers Point Ridge that rejoins the grade of the Kern River floodway downstream of the existing power generating station.	Measures are the same, but excavation and concrete quantities have been refined.	
Excavation and Materials:			
Total Excavation	2,950,000 CY	3,100,000 CY	
Concrete	36,529 CY	27,262 CY	
4. AUXILIARY DAM			
General:	Includes an approximately 16-foot crest raise, downstream buttress with moderate-sized filter and drain and a 80-ft top width, partial foundation treatment to a depth of 30 ft., an upstream berm, and a relocated Borel Canal (through right abutment).	Similar to DEIS, but with three measure refinements, plus refinements to cut, fill, and materials quantities. The three measure refinements include: (1) A new alignment and configuration of the Borel Canal, which would connect farther upstream to the existing submerged canal, and pass through Engineers Point rather than the Kern Canyon Fault shear zone (See Item 5. Borel Canal, below); (2) the Downstream Buttress foundation work would be done in three sequential segments; and (3) the Upstream Berm on the Auxiliary Dam, which would be constructed with unused rock material from the Emergency Spillway excavation would become an optional measure. Instead, the unused excavated material would be deposited on Engineers Point, in accordance with an approved disposal plan (See item 7, Staging Areas and Haul Routes, below). Should the Corps determine during the design or construction period that it would be desirable to re-instate construction of an upstream berm on the Auxiliary Dam, this action would be carried out in the dry, using washed rock, and taking advantage of normal lower lake levels during fall and winter. If exercised, appropriate environmental documentation would be completed for this task.	Refinements (1) and (3) would substantially reduce the need for a lower construction pool compared to what was proposed in the DEIS. These refinements would also reduce the potential impacts on recreation, water quality, and fisheries described in the DEIS, and could result in Engineers Point becoming a higher use recreation feature after construction completion.
Excavation and Materials:			
Total Downstream Excavation	949,710 CY	895,820 CY	

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
Foundation Treatment:			
Upper 25-30 ft. liquefiable layer	Includes removal and replacement of existing foundation soil.	This measure would be done in three sequential segments (See Table 2-2-FEIS, in Section 2.2.10 of this FEIS).	
Downstream Buttress:			
Filter Sand	743,580 CY	647,560 CY	
Drain and Random Fill Rock	1,754,587 CY	1,457,640 CY	
Upstream Berm:			
Rock & Earth Fill; Rip Rap; Road base	571,521 CY	See above General discussion and item 7 (Staging Areas and Haul Routes), below. The Upstream Berm would be optional, and the rock material would be used for other measures, or deposited on Engineers Point, in accordance with an approved disposal plan.	
Unused Rock Material from Project	1,182,000 CY	See above General discussion and item 7 (Staging Areas and Haul Routes), below. The unused rock material would be placed on Engineers Point, in accordance with an approved disposal plan.	
5. BOREL CANAL			
General:	Includes relocation of canal and conduit to an alignment through the right abutment of the Auxiliary Dam. The new tunnel would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal downstream of the Auxiliary Dam (see Figure 2-10, page 2-19 of DEIS). The portion of the existing canal and conduit passing through the Auxiliary Dam would be abandoned and sealed. A temporary rock-fill coffer dam might be required in order to sufficiently dewater the area needed for construction of the upstream portal of the new tunnel. (See Figure 2-11, page 2-20 of DEIS).	Since the DEIS was published the Corps has refined the alignment for the Borel Canal, to pass further west through Engineer's Point outside of the Kern Canyon Fault shear zone. The refined tunnel alignment is intended to cross the fault line at right angles, rather than the Kern Canyon Fault shear zone. A temporary rock-fill coffer dam would be required for this new alignment, but it would be smaller, and located on the Main Dam side of Engineers Point to protect construction of the tunnel (See Figure 2-7-FEIS, in Section 2.3 of this FEIS). Also, the coffer dam may remain throughout the project construction period (and beyond), if required to provide or improve access to Engineers Point. This refined alternative also includes refinements to excavation and concrete quantities, as well as tunnel length.	The proposed new alignment would reduce the seismic risks associated with constructing the realigned Borel Canal tunnel-conduit. The coffer dam for the refined Alternative 4 would be in a different location and smaller than the one proposed in the DEIS. There would be no lake lowering to the construction pool level required for its construction. Also, with this refined alignment of the Borel Canal, no coffer dam (with associated lake lowering) would be required on the Auxiliary Dam side of Engineer's Point to construct the upstream portal. However, the lake would need to be lowered to the construction pool level of approximately 2,543 feet NAVD 88; 72,237 acre-feet for a four-to-six month period during fall to early spring 2020 -2021 to allow for excavating and lining the Borel Canal approach channel, which is on the Auxiliary Dam side of Engineers Point, and to allow for removing the section of the existing Borel Canal immediately upstream of the Auxiliary Dam (See Figure 2-6-FEIS in Section 2.3 of this FEIS). This constitutes the only intentional lowering of the lake level to the construction pool elevation required for any construction on the project.
Excavation and Materials:			
Tunnel, Portals, and Tie-in:			
Length of Tunnel	1,260 feet long	1,520 feet long	
Excavation for Downstream Portals	27,000 CY	185,396 CY	
Excavation for Control Tower and Inlet	Not reported	25,142 CY	

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
Excavation for Upstream Canal Connection	Not reported	193,741 CY	
Concrete for Portals, Tunnel, Tie-in, Control Tower, and Inlet	13,000 CY	17,000 CY	
Rock Fill Coffer Dam:			
Total Fill	101,000 CY	44,467 CY	
6. FILTER SAND BORROW AREAS AND WASHING FACILITY			
General:	Sources for filter sand material on the Main and Auxiliary Dams includes the Emergency Spillway excavation area, Auxiliary Dam Recreation Area, and South Fork Delta Area. A sand washing facility would be established in Staging Area A1 at the Auxiliary Dam Recreation Area.	Since the release of the DEIS, the Corps has determined that under the Preferred Alternative, all filter sand requirements could be met through preparation of sand at the Crushing Plant operation in Staging Area S1, using rock material from the Emergency Spillway excavation, supplemented by sand collection at the Auxiliary Dam Recreation Area. With this refinement, the South Fork Filter Sand Borrow Area would <u>not</u> be required. A temporary sand washing facility would still be established in Staging A1 to clean sand as required. The overall quantity of filter sand required for the dams has also been refined.	The removal of the South Fork Delta Area as a source of filter sand for the Preferred Alternative reduces potential impacts on air quality, noise, traffic, recreation, as well biological and natural resources in the South Fork area.
Materials:			
Clean sand	1,100,000 CY	1,000,000 CY	
7. ROCK MATERIAL DISPOSAL ON ENGINEERS POINT			
General:	Rock disposal on Engineers Point was not included in DEIS. Instead, unused rock material was to be used to construct an upstream berm on the Auxiliary Dam. See discussion of the Upstream Berm under item 4 (Auxiliary Dam), above.	The Corps has determined since the release of the DEIS that an unused rock material disposal area (approximately 54 acres) would be established on Engineers Point, to receive the unused rock material from the Emergency Spillway excavation. This disposal area refinement would be served by an additional haul road spur connection from haul road H1. See Figure 2-1-FEIS.	This refinement of disposing of the unused rock material from the Emergency Spillway on Engineers Point allows the Corps to forego constructing an Upstream Berm on the Auxiliary Dam, as was proposed in the DEIS. This berm construction would have required lowering the lake level to the construction pool elevation (approximately 2,543 feet NAVD 88; 72,237 acre-feet) for a nine-month period. This refinement substantially reduces the potential impacts on recreation, water quality, and fisheries described in the DEIS.
Rock Material (various)		1,710,000 CY	
8. RE-ALIGNMENT OF HIGHWAY 178, AND LAKE ISABELLA BOULEVARD			
General:	Highway 178 and Lake Isabella Blvd. would be realigned to the southeast of the Auxiliary Dam to accommodate the approximately 16-foot raise on the left abutment. The approximately 0.8 mile-long realignment would begin about 0.9 miles east of Route 155, swing southeast of the existing highway alignment about 215 feet southeast of the existing highway, and then curve back to meet the existing highway about 1,500 feet northeast of the present Lake Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location (see Figure 2-21, on page 2-32 of DEIS).	No Change. See Figure 2-1-FEIS, of this FEIS.	

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
9. RE-ALIGNMENT OF HIGHWAY 155			
General:	Highway 155 would also be modified to accommodate the approximately 16-foot raise on the right abutment of the Main Dam. Two options are currently being considered for Highway 155. The first option would include realigning Highway 155 to the west of the Main Dam to accommodate the approximately 16-foot crest raise. The approximately 1.0-mile long realignment would begin just upstream of the Main Dam and run parallel to the existing alignment, downhill to the Kern River, where a new bridge would be constructed about 240 feet downstream of the existing bridge feet near Keyesville Road. The realignment would also include an uphill climbing lane (see Figure 2-21, on page 2-32 of DEIS). The second option would include an approximately 16-foot high flood gate on the right abutment near existing centerline of the Main Dam. The gate would either be a permanent swing gate or a gate that would be stored on the abutment and erected when needed.	At the time of publishing the DEIS, the preferred option by the Corps was the flood gate. However, since that time the Corps has determined that the preferred option is a refined version of the Highway 155 realignment presented in the DEIS (See Figure 2-1-FEIS). This refined alignment would be closer to the existing roadway, would involve some widening of the existing bridge, rather than constructing a new bridge, as was presented in the DEIS, and would still include the uphill climbing lane. However, this refined realignment would begin farther up Highway 155 than proposed in the DEIS, which would likely affect some camp sites along Highway 155 north of the Main Dam. In this FEIS, the refined realignment (current preferred option) has been analyzed for potential environmental impacts. If during the engineering design phase of the project the Corps determines that another option (such as the flood gate) is preferred, appropriate environmental documentation would be completed for this task.	
10. CRUSHING PLANT			
General:	A temporary electric-powered rock Crushing Plant would be set up in Staging Area S1 to process rock material excavated from the Emergency Spillway channel. The Corps had initially determined that all the various sizes and type of rock material needed for the array of remediation could be generated from the spillway excavation, with the exception of the filter sand required for the Main and Auxiliary Dams. The required filter sand would be supplied from the two selected borrow sites: Auxiliary Dam Recreation area and South Fork Delta area.	The operation of the Crushing Plant would be similar to described in the DEIS, with regard to preparing the various sized rock materials required for the project. However, since the release of the DEIS, the Corps has determined that the type of rock material available from the Emergency Spillway could also be further processed to provide the majority of the required quantity of filter sand for the Main and Auxiliary Dams. Additional supplemental sand would be excavated, if necessary, from the Auxiliary Dam Recreation Area. Therefore, the South Fork Delta would not be used as a source for filter sand. Sand derived from the two on-site sources would be cleaned as necessary at a temporary sand washing facility to be established in Staging Area A1, as described in Section 2.3.13 of the DEIS.	Not using the South Fork Delta Area as a filter sand borrow source reduces potential adverse impacts on air quality, noise, traffic, recreation, and other relevant environmental resources.
11. BATCH PLANT			
General:	A temporary electric-powered concrete Batch Plant would be set up in the vicinity of the new Emergency Spillway area to prepare concrete needed to construct the labyrinth spillway. The water, coarse aggregates, and sand for making concrete in the Batch Plant would be supplied from on-site sources. The dry cement, fly ash, and water reducer ingredients would be supplied from plants in the Barstow area and stockpiled on Staging Areas A2 and/or A3. The anticipated primary haul route for these latter ingredients would be HR2 (Highway 178).	The location, set-up, and operation of the Batch Plant would be the same as proposed in the DEIS, but the quantity of the concrete required has been refined.	
Material:			
Concrete	36,529 CY	27,262 CY	

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
12. READY-MIX CONCRETE			
General:	The Corps had anticipated that up to 37,000 CY of ready-mix concrete would be required for the array of remediation measures included. This concrete would be supplied from the ready-mix plant located along Highway 178 in the South Lake area.	Similar to what was proposed in the DEIS, but the quantity of concrete has been refined.	
Material:			
Concrete	37,000 CY	21,200 CY	
13. LAKE LEVEL MANAGEMENT DURING CONSTRUCTION			
General:	Includes continuation of the current IRRM maximum level of 2,589.26 feet NAVD 88 (361,250 acre-feet) with the following exceptions: >Lowering the maximum lake level to approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a two month period (December 2016-January 2017), and for another two-month period (August-September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. >Restricting the maximum lake level to 2,585.26 feet NAVD 88 (325,400 acre-feet) during the six-month period that the coffer dam is in service, which is four feet below the existing restricted pool operation elevation. >Lowering the maximum lake level to approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a nine-month period (June 2019-February 2020), to allow for construction of the Upstream Berm on the Auxiliary Dam.	Lake level management would also include continuation of the current IRRM maximum level of 2,589.26 feet NAVD 88 (361,250 acre-feet), but with the following refinements to what was proposed in the DEIS: >The coffer dam would be constructed and removed (if appropriate) during the lake's lowest normal pool level during fall - winter, to avoid artificial lowering of the lake level to the construction pool elevation (approximately 2,543 feet NAVD 88; 72,237 acre-feet) for two 2-month periods as was proposed in the DEIS. >The maximum lake level would be restricted to 2,585.26 feet NAVD 88 (325,400 acre-feet) during a ten-month period during 2020 that the coffer dam is in service, instead of a six-month period as described in the DEIS. >The Upstream Berm on the Auxiliary Dam would become an optional measure, and the rock material from the Emergency Spillway that would have been used to construct this berm would be deposited on Engineers Point, in accordance with an approved material disposal plan. It the Corps were to decide to exercise the optional upstream berm, it would be constructed in the dry, taking advantage of normal low pool elevations. >The lake would need to be lowered to the construction pool level of approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a four-to-six month period during fall to early spring 2020-2021 to allow for excavating and lining the relocated Borel Canal approach channel, which is on the Auxiliary Dam side of Engineers Point, and to allow for removing the section of the existing Borel Canal immediately upstream of the Auxiliary Dam (See Figure 2-1-FEIS).	With the proposed refinements to the Preferred Alternative (Alternative Plan 4), a four-to-six month lowering of the lake level required for the Borel Canal approach channel, and for removing the unused portion of the existing canal immediately upstream of the Auxiliary Dam would be the only intentional lowering of the lake level to the construction pool elevation required for the project. These refinements reduce potential adverse impacts on water quality, recreation, and fisheries associated with implementing the Preferred Alternative (Alternative Plan 4).
14. CONSTRUCTION SCHEDULE			
General:	Text from DEIS reads: "Table 2-3 in the DEIS provides a visual comparison of the anticipated general construction schedules for the Alternative Base Plan, Alternative Plan 1, Alternative Plan 2, Alternative Plan 3, and Alternative Plan 4. As shown in Table 2-3, the Isabella DSM Project is proposed for construction over a continuous (not seasonal) multi-year construction period that ranges from approximately 4 ½ and-(53 months) for the Alternative Base Plan, to almost 5 years (57 months) for Alternative Plan 1, to nearly 6 years (69 months) for Alternative Plans 2 and 3."	The refinements made by the Corps to the Preferred Alternative (Alternative Plan 4) since the release of the DEIS have included a number of refinements to the anticipated construction schedule. These refinements to the construction schedule are illustrated in Table 2-2-FEIS (Anticipated Construction Schedule for Preferred Alternative), in Section 2.2.10 of this FEIS. The refinements to the anticipated construction schedule are in response to public and agency comments received during the 60-day public review period for the DEIS, and the desire of the Corps to reduce to the maximum extent practicable potential impacts on air quality, noise, traffic, recreation, water quality, and public health and safety associated with construction of the Preferred Alternative (Alternative Plan 4).	There are a number of noteworthy aspects of Table 2-2-FEIS (Anticipated Construction Schedule for Preferred Alternative; next section), based on the refinements made by the Corps since the release of the DEIS. These include: >The construction of the two highway realignments (155 and 178) have been broken out and planned for completion nine months ahead of construction of the other main components. >More details regarding the elements and features are provided for some of the main components. >The addition of the Engineers Point Rock Material Disposal Area allows the Corps to downplay the Upstream Berm on the

Table 2-1-FEIS
Summary Comparison of Alternative Plan 4 in DEIS with Refined Alternative Plan 4 in FEIS

Structure or Support Action	Alternative Plan 4 in DEIS	Refined Alternative Plan 4 in FEIS (Preferred Alternative)	Notes About Refinements
			Auxiliary Dam to an optional measure, which in turn significantly reduces the duration and frequency of an intentionally lower lake level. >Staging Areas and Haul Routes are not all constructed at the same time, but only brought on line as the need for them arises to support various construction actions within the Primary Action Area. >The support actions of De-mobilization and Site Restoration are now depicted in the refined Construction Schedule.

Table 2-2-FEIS
Anticipated Construction Schedule for the Preferred Alternative

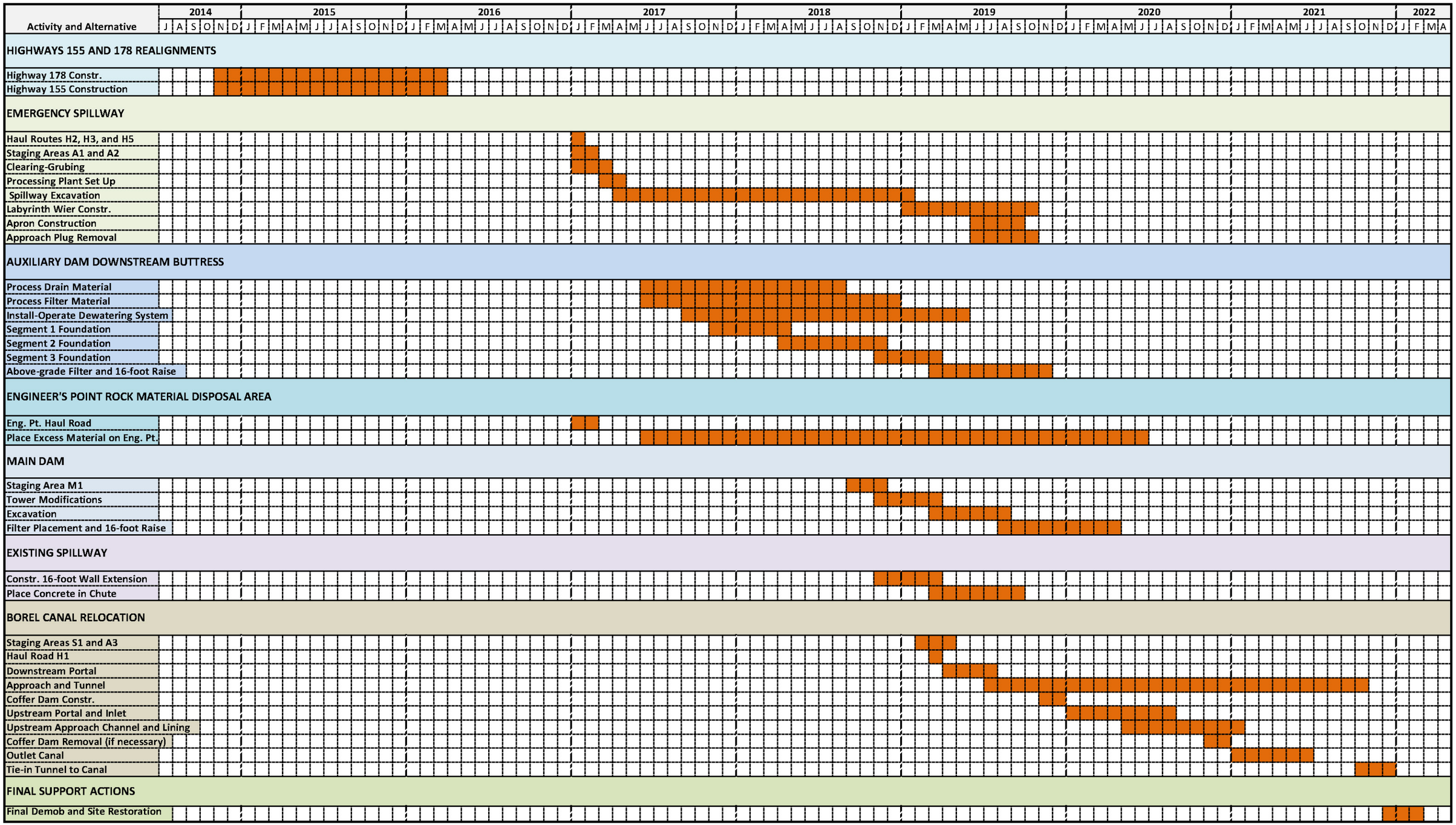

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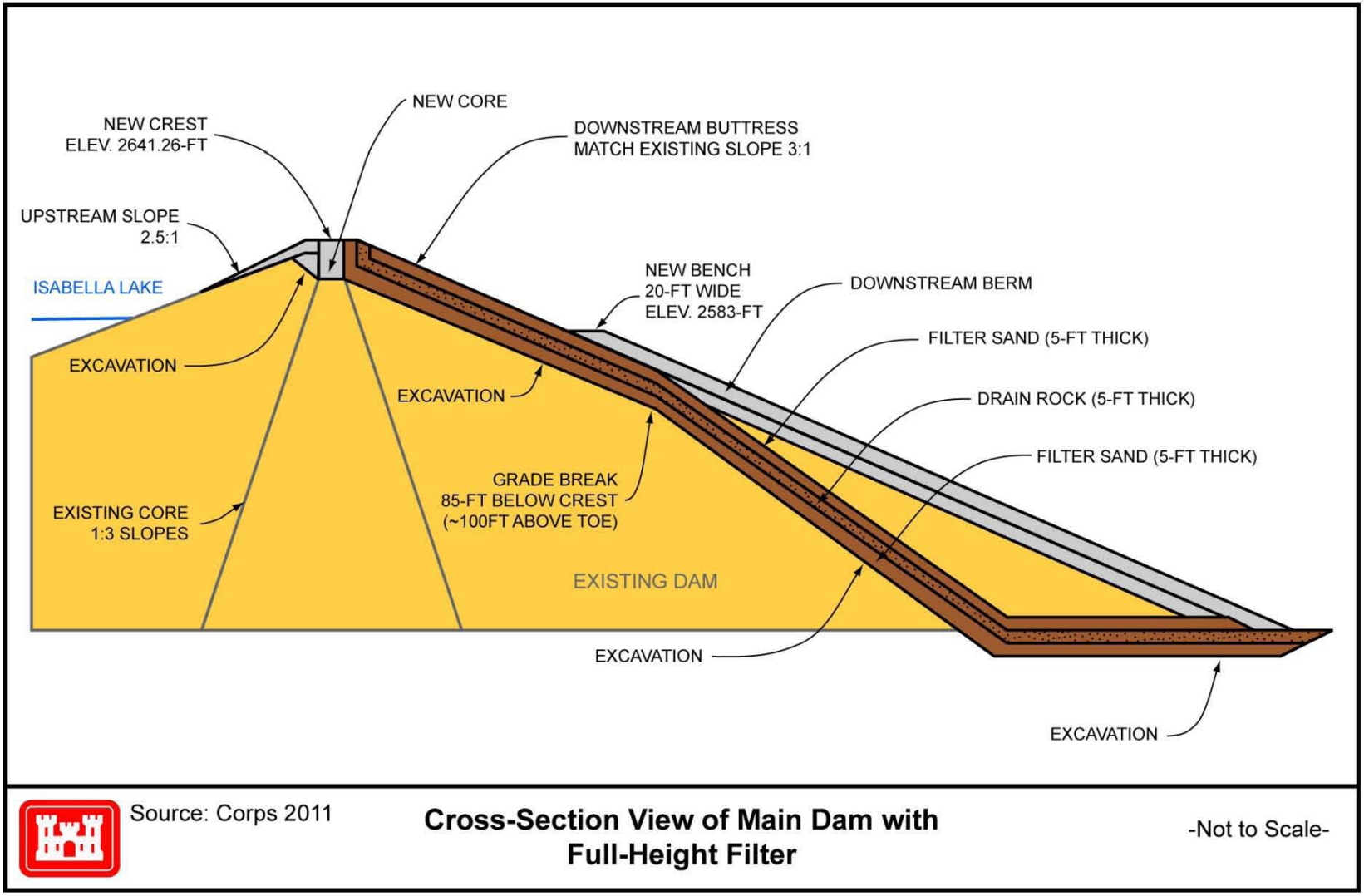
Figure 2-2-FEIS Cross-Section View of Main Dam with Full-Height Filter



during high outflows and to accommodate the crest raise. The concrete needed for all remediation measures on the Existing Spillway would be supplied by the ready-mix plant located in the South Lake area along Highway 178.

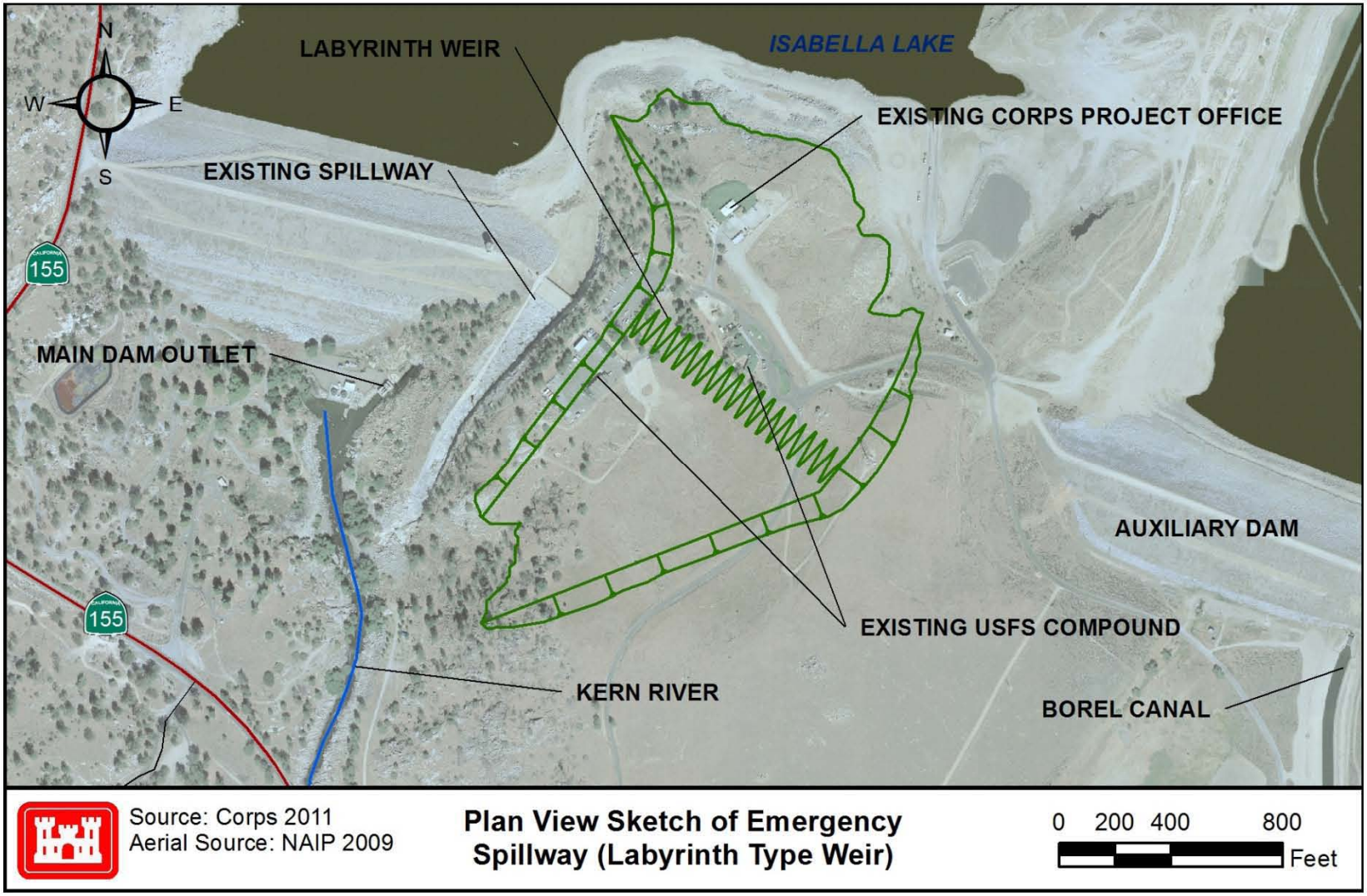
2.3.4 Emergency Spillway

The Corps has determined that the Existing Spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). It is a requirement that all Corps dams be able to safely pass the PMF, with freeboard for wind and wave run-up. As a result, this alternative includes the construction of a new "Emergency Spillway", approximately 900-feet-wide, which would be located approximately one-hundred feet east of the Existing Spillway (Figure 2-3-FEIS). The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the Existing Spillway) that could lead to overtopping of both dams. The resulting failure of one or both dams would cause extreme consequences downstream. The Emergency Spillway would function independently from the Existing Spillway, and would begin to function around elevation 2,637.26 feet NAVD 88; current elevation of the top of dam, 28.0 feet higher than Existing Spillway. The new Emergency Spillway would have a labyrinth type weir with v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel (see Figure 2-3-FEIS).

The crest elevation for the Main and Auxiliary Dams would be raised approximately 16 feet in order to safely pass the PMF without overtopping the dams. The approximately 16-foot raise would also provide approximately 4 feet of freeboard under the PMF event. Only in extreme storms would the reservoir rise to an elevation at which the Emergency Spillway would operate; the annual probability of reaching this elevation being approximately 1 in 4,700. Outflows associated with pool elevations up to the 1 in 4,700 annual exceedance probability would be handled solely by the Existing Spillway. A new Emergency Spillway crest would be set at the existing dam crest elevation so that spillway discharge is less than dam-failure flows. The emergency spillway will operate for frequencies at or near the current frequency that would otherwise overtop the existing dams. It was decided to not construct a lower emergency spillway due to the additional downstream consequences that could result from passing larger flows beyond those already possible from the existing spillway. It is noted that routing of the PMF with the dams as currently constructed results in an overtopping of both dams by approximately 10 feet (non-fail condition), which correlates to a reservoir pool elevation of approximately 2,647 (NAVD 88). Under this alternative the PMF pool is estimated to be 2,649 (NAVD 88), which correlates to an increased maximum pool elevation of 2 feet. The increased pool elevation would only occur under the PMF flood event, which is estimated as having a 1 in 10,000 probability of occurrence in any given year.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. The blasting program anticipated for this construction is described in

Figure 2-3-FEIS Plan View Sketch of Emergency Spillway (Labyrinth Type Weir)



Section 2.3.13 of the DEIS (Support Actions and Activity Sites Common to the Five Action Alternatives), and in Table 2-1-FEIS.

It is anticipated that excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source to construct the modification features for the Preferred Alternative. The excavated materials likely would be crushed, screened and washed as needed to generate the various sands, gravels and rock required. These materials would either be temporarily stockpiled or placed directly into permanent construction locations. The processing operation would likely be located at an approved onsite location, likely in vicinity of the proposed Emergency Spillway and adjacent to the Auxiliary Dam. The Plant operation and the assumed staging areas are described in more detail in Section 2.3.13 (Support Actions Common to Alternatives) of the DEIS. These materials (various sized rocks) produced in the crushing operation would be stockpiled on-site in this staging area and delivered to the appropriate construction areas as needed. Any excess material would be disposed of on Engineers Point.

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be produced by the Batch Plant set up on site in the vicinity of the Emergency Spillway. Cement and fly ash would come completely from an off-site source. See Table 2-1-FEIS for more information.

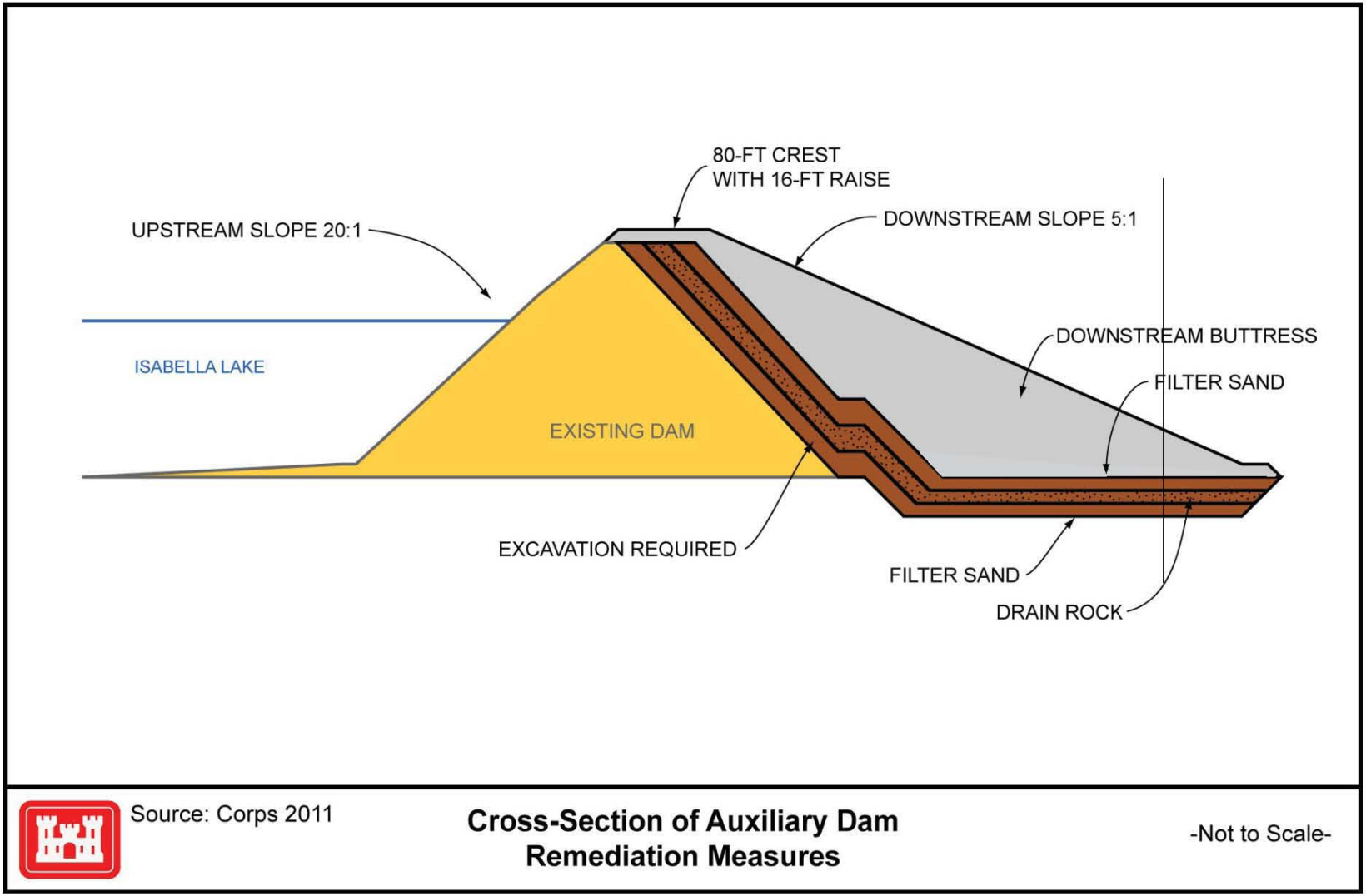
2.3.5 Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose an unacceptably high probability of failure of the dam. Under the Alternative Plan 4 the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities (Figure 2-4-FEIS):

- Addition of an approximately 80-foot-wide downstream buttress to the dam with a more gradual downstream slope (varies from 4:1 to 5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to reduce the risk associated with seepage and potential fault rupture.
- Removal of the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Construction of a crest raise to be able to safely pass an extreme storm event without overtopping. The height of the raise is approximately 16-feet, but may vary depending on final design.

The majority of the rock materials needed to complete the downstream buttress on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway.

Figure 2-4-FEIS Cross-Section of Auxiliary Dam Remediation Measures



The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation (crushed to size). If necessary, it could be supplemented with sand from the Auxiliary Dam Recreation Area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on Highway 178.

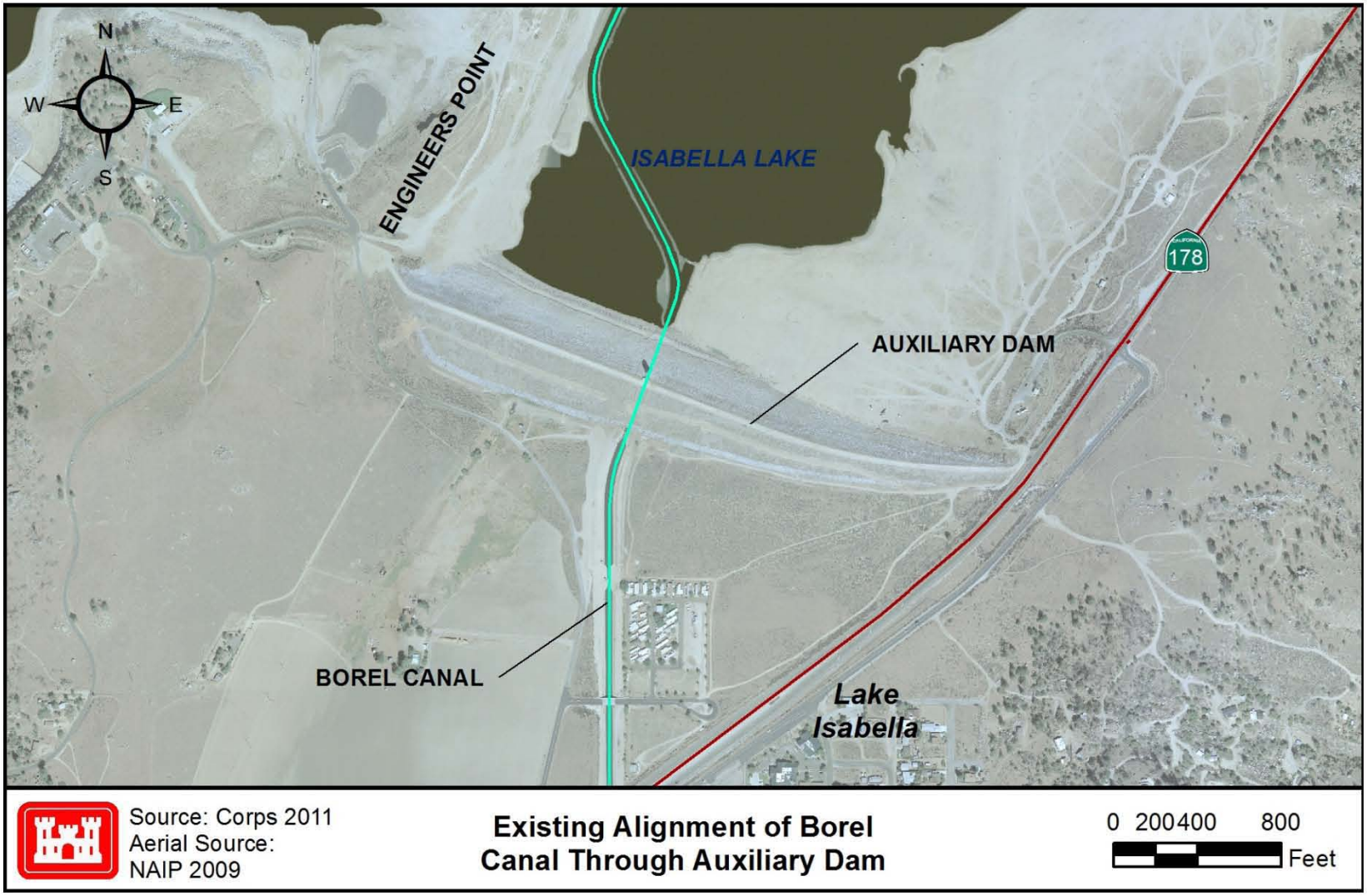
2.3.6 Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam (Figure 2-5-FEIS). The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal which has the first water rights to the flows out of the North Fork of the Kern River. Since the early 1900s, the canal has been supplying water to the SCE power plant approximately six miles downstream of the Auxiliary Dam. SCE has a water right to receive the first 605 cubic feet per second (cfs) of the North Fork Kern River flows into Isabella Lake through the Borel Canal. The Corps has contractual obligations to supply this water to the Borel Canal. The conduit and control gates at the Auxiliary Dam are part of the Borel Powerhouse system, although they are owned and operated by the Corps, not SCE. The Corps would assume responsibility for access during construction periods of low lake levels as the Borel Canal lakebed segments emerge from inundation. These measures include the installation of warning buoys, signs, and a temporary Bailey Bridge for access to the boat marina.

SCE entered into an agreement with the Corps on April 23, 1999 (1999 Agreement) regarding water releases. The 1999 Agreement, as amended in 2006, requires the Corps to provide FERC-required fish releases at Isabella Main Dam on behalf of SCE. For rain season operation (as outlined in the 1978 Water Control Manual [WCM]), releases are generally limited to normal irrigation and spreading demands (according to the 1978 WCM, can range from an average monthly flow of 1,220 cfs up to 3,090 cfs, a minimum release of 15 cfs, and the Borel Canal outlet release of 600 cfs. This release continues until the flood control pool becomes encroached. In addition, pursuant to the August 11, 2006 amendment to the 1999 Agreement between SCE and the Corps pertaining to release of Kern River water at Isabella Reservoir Main Dam (signed by Chief of Corps Water Management Section, Sacramento District, on September 1, 2006), the Corps is required to conduct year-round fish releases in the manner described in the Agreement. The 1999 Agreement requires monthly minimum flow requirements ranging from 25 cfs in the winter to 60 cfs in mid-summer. The Isabella Power Partners hold no water rights.

Under the Preferred Alternative the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement Borel Canal tunnel-conduit alignment would be constructed through the right abutment of the Auxiliary Dam outside of the Kern Canyon fault shear zone. The realigned canal and tunnel-conduit would connect the existing submerged Borel Canal in the lake

Figure 2-5-FEIS Existing Alignment of Borel Canal Through Auxiliary Dam



(upstream of the Auxiliary Dam) to the existing exposed Borel Canal downstream of the Auxiliary Dam (Figure 2-6-FEIS).

A temporary rock-fill coffer dam may also be required (depending on reservoir elevation at the time of construction) to construct this measure. The coffer dam is expected to be smaller than was required in the DEIS, and would be located on the west side of Engineers Point in order to sufficiently dewater the area to construct the upstream portal and the tunnel-conduit (Figure 2-7-FEIS). There is a natural high ridge in Engineers Point that would protect against rising water on the Auxiliary Dam side; therefore a coffer dam is not necessary on the Auxiliary Dam side to protect the portal and tunnel-conduit excavation and construction.

The coffer dam is expected to be constructed in the wet without lowering the lake level, to take advantage of the flood control pool (lower elevations). The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. The crest of the coffer dam would be set at the top of the restricted pool elevation, 2,589.26 feet NAVD 88 (361,250 acre-feet). After construction of the coffer dam the lake would be allowed to rise to within four feet below the coffer dam crest (2,585.26 feet NAVD 88; 325,400 acre-feet) to allow for storage of rain and snow melt during the spring run off season.

The Corps has determined that the lake level would have to be lowered to an approximate elevation of 2,543 feet NAVD 88 (72,237 acre-feet) for a period of four-to-six months during fall to early spring 2020-2021, to allow time to tie in the relocated canal and tunnel-conduit into the existing canal upstream of the Auxiliary Dam. This is the portion of the proposed realignment that would be located east of the Engineers Point ridge, and is subject to lake level fluctuations on the Auxiliary Dam side. The work required during this time includes completing the construction of the upstream approach channel. The demolition of the existing Borel Canal between the new upstream tie-in and Auxiliary Dam would also be required during this lowered construction pool. Scheduling these actions during fall to early spring would take advantage of the naturally occurring lower lake levels, and would be outside the summer high recreation season on the lake. However, during that one year it may be necessary to begin to drawdown the lake in late summer and early fall to prepare for construction. Depending on the amount of water available that year and the needs of downstream agricultural users, more water may be released in the late recreation season than is a typical, causing larger flows downstream.

After the construction of the upstream portal and tie-in to the existing canal in the lake, the temporary coffer dam could be removed, but more likely it would be kept in place in order to provide access to Engineers Point during and following construction.

The concrete needed for the upstream portal, the tunnel lining, the downstream portal, and the connection to the existing Borel Canal would be supplied from the ready-mix plant on Highway 178.

Figure 2-6-FEIS Borel Canal Relocation Through Right Abutment at Engineers Point

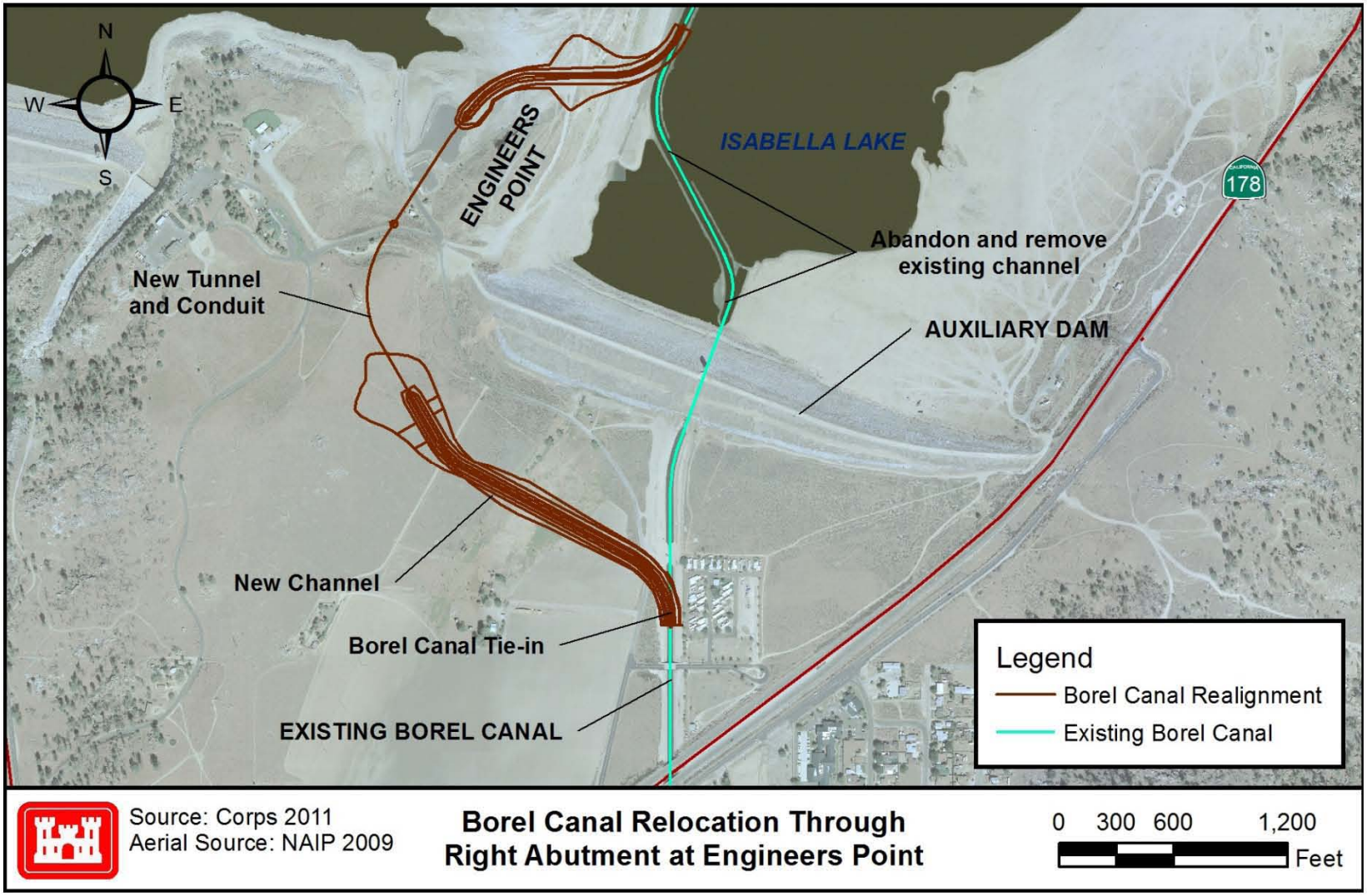
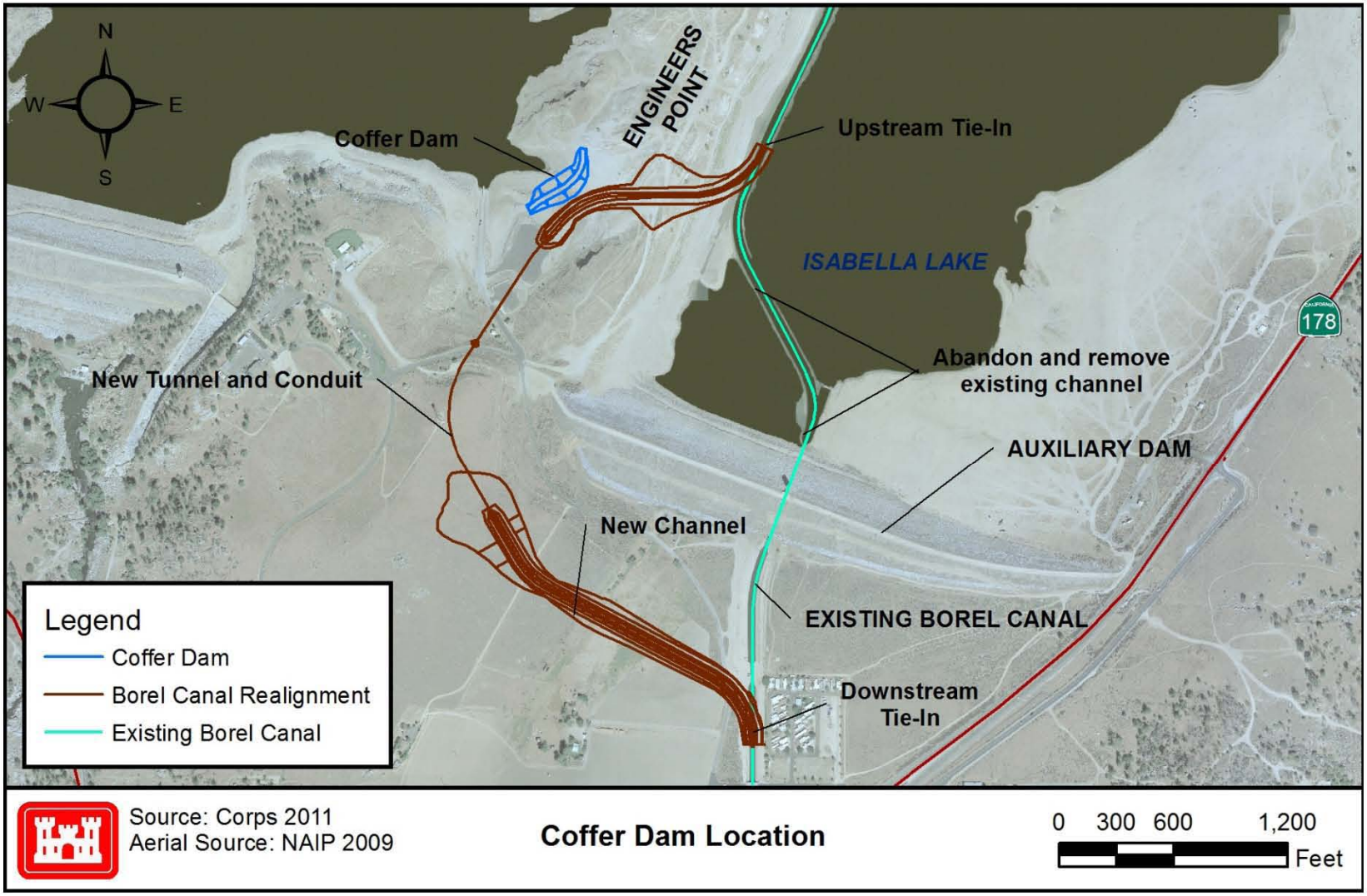


Figure 2-7-FEIS Coffer Dam Location



2.3.7 Realignment of Highway 178

Highway 178 would be realigned to the south of the Auxiliary Dam to accommodate the approximately 16-foot raise on the left abutment (See Figure 2-1-FEIS). The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 mile east of Route 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet southeast of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet northeast of the present Lake Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location (See Figure 2-1-FEIS). The realignment would also include relocation of some SCE power poles.

2.3.8 Realignment of Highway 155

Highway 155 would also be modified to accommodate the approximately 16-foot raise on the right abutment of the Main Dam (See Figure 2-1-FEIS). Two options are currently being considered for Highway 155. The first option would be to realign Highway 155 to the west of the Main Dam. The realignment would begin upstream of the Main Dam and would shift to the west and parallel the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately one mile. The maximum shift of the alignment would be about 120 feet to the west. The realignment would require a modification and widening of the existing bridge across the Kern River to stay within Caltrans standard requirements. The realignment would include an uphill climbing lane, continued access to Keyesville Road, and realignment of some SCE power poles. Finally, in order to maintain a safe grade this realignment would likely impact a portion of Pioneer Point Recreation Area.

The second option for Highway155 would not include realignment of the highway and would not change the grade and elevation of the roadway over the right abutment of the Main Dam. The second option would include installing a flood gate on the right abutment near existing centerline of the Main Dam. The flood gate would be used to close off the low point for extreme flood events and would prevent travel on Highway 155 for those rare events. The gate structure would include a concrete gravity retaining wall adjacent to the Main Dam and a concrete support wall near the existing rock face cut. The gate would either consist of a permanent swing gate or a gate that would be stored on the abutment and erected when needed. Access to this gate during extreme flood events may be limited, which could impact the reliable operation of the gate.

Currently, the preferred option for modifying Highway 155 is the roadway realignment. If during the engineering design phase of the project it is determined that another option for modifying Highway 155 is preferred, then appropriate environmental documentation would be completed for this task.

2.3.9 Rock Material Disposal Area on Engineers Point

Since the release of the DEIS the Corps has determined that an unused rock material disposal area (approximately 54 acres) would be established on Engineers Point, to receive the unused rock material from the Emergency Spillway excavation. This disposal area refinement would be served by an additional haul road spur connection from haul road H1 (See Figure 2-1-FEIS). This refinement of disposing of the unused rock material from the Emergency Spillway on Engineers Point allows the Corps to forego constructing an Upstream Berm on the Auxiliary Dam, as was proposed in the DEIS. This berm construction would have required lowering the lake level to the construction pool elevation (approximately 2,543 feet NAVD 88; 72,237 acre-feet) for a nine-month period. This refinement significantly reduces the potential impacts on recreation, water quality, and fisheries described in the DEIS.

2.3.10 Support Actions, Activity Sites, and Construction Assumptions

With the exception of those refinements to support actions described above (e.g. addition of Engineers Point Rock Material Disposal Area), the construction support actions and activity sites as described in Section 2.3.13 of the DEIS are pertinent and essential to the implementation of the Preferred Alternative. Additional corrections or minor edits made to the discussion of these actions based on comments received on the DEIS or refinements to the Preferred Alternative made by the Corps are included in Chapter 4 (Corrections to the DEIS Text).

Likewise, the construction-related assumptions provided in Section 2.3.14 of the DEIS still pertain to and provide an important framework for evaluating potential impacts associated with implementation of the Preferred Alternative. As with the support actions, any additional corrections or minor edits made to the description of these actions based on comments received on the DEIS or refinements to the Preferred Alternative made by the Corps are included in Chapter 4 (Corrections to the DEIS Text).

2.3.11 End Note to Chapter 2 of FEIS

The potential environmental impacts associated with the refinements presented and discussed in this Chapter 2 of this FEIS have been evaluated and the results are discussed in the next chapter (Chapter 3) of this FEIS.

CHAPTER 3

ADDITIONAL ANALYSIS OF IMPACTS NOT ADDRESSED IN DEIS

CHAPTER 3.
ADDITIONAL ANALYSIS OF IMPACTS NOT ADDRESSED IN DEIS

3.1 INTRODUCTION

In Chapter 3 of the DEIS, the Corps provided a detailed discussion of the affected environment for thirteen resources and evaluation of potential impacts on the environment that would likely occur from implementation of the Isabella Lake DSM Project. The resource overview and impact analyses were based on the five Action Alternatives, common support actions and assumptions that were under consideration at the time of its preparation, and information that was available to the preparers.

The previous chapter of this FEIS (Chapter 2) discussed the selection of the Preferred Alternative and refinements since the publication of the DEIS. The focus of this chapter is to update relevant resource background information. It identifies and evaluates any new impacts on each resource, or changes in impacts from those described in the DEIS.

The assumptions and approach to this Chapter 3 of the FEIS are as follows:

- The affected environment for each resource has been described in the DEIS and is incorporated by reference. Only refinements or additions such new field studies or data, issues raised by comments or changes of the action areas since the release of the DEIS are included here.
- The environmental consequences on each resource of implementing Alternative Plan 4 have been described in the DEIS and are incorporated by reference. Only additional impacts, or revisions to the impacts identified in the DEIS resulting from the refinements in the Preferred Alternative are included here.
- No new additional cumulative actions have been identified. If any additional impacts, or revisions to the impacts identified in the DEIS have resulted from the refinements incorporated into the Preferred Alternative, they are included here.
- Any new mitigation measures that would help reduce potential impacts and have been developed subsequent to the release of the DEIS or are associated with refinements to the Preferred Alternative are included here.
- The Corps will continue to develop information relevant to the resources that may be affected by the implementation of the Isabella Lake DSM Project. This analysis in the FEIS is based on information and assumptions that were available at the time of its preparation.

The environmental impacts of the Preferred Alternative on each resource are measured against the environmental conditions that would otherwise occur if no action was taken. Impacts are disclosed in terms of their context, duration, intensity, and level of significance. For a further discussion of the impact terminology and level of significance, please refer to Section 3.3.2.of the DEIS.

3.1.1 No Action Alternative

In accordance with NEPA guidelines, the No Action Alternative is included here as a baseline for comparison with the Preferred Alternative. The Preferred Alternative is described in detail in Chapter 2 of this FEIS.

Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Isabella Main Dam, Spillway, or Auxiliary Dam. Isabella Dam would continue to be operated in accordance with the established Water Control Plan and Flood Control Diagram. In accordance with ER 1110-2-1156, the lake capacity (gross pool elevation) would be returned to and the dam would be operated at the pre-IRRM elevation of 2,609.26 feet NAVD 88. However, under the No Action Alternative the project has an unacceptably high risk of failure. The potential environmental, economic, and human consequences of dam failure would be extremely high.

In accordance with NEPA guidelines and project-specific guidance from the Corps, the following resource areas are discussed and evaluated here, as they were in the DEIS:

- Geology, soils and seismicity;
- Air quality and climate change;
- Water resources;
- Traffic and circulation;
- Noise and vibration;
- Hazardous, toxic and radiological waste;
- Biological resources;
- Land use;
- Recreation;
- Aesthetic resources;
- Cultural resources;
- Socioeconomics and environmental justice; and
- Public health and safety.

3.2 GEOLOGY, SOILS, AND SEISMICITY

3.2.1 Affected Environment

The Geology, Soils and Seismicity section of the DEIS (Section 3.4.1, 3.4.2) sufficiently characterizes the affected environment for this resource. There have been no additional revisions, studies, or new data relevant to the discussion of the affected environment.

3.2.2 Environmental Consequences

The DEIS (Section 3.4.3) details the potential impacts of the Preferred Alternative. Refinement of the location of the realignment and reconfiguration of the Borel Canal and tunnel-conduit to pass through Engineers Point west of the Kern Canyon Fault shear zone may result in less vulnerability to future seismic events. The realignment and relocation of the Borel Canal would require greater excavation in the vicinity of the fault than what was analyzed in the DEIS, but this increase would be less than significant when compared with the size and orientation of the geologic formations that form the Kern Canyon Fault.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.1 of the DEIS) or environmental commitments and mitigation measures (Section 3.4.4 of the DEIS).

3.3 AIR QUALITY

Introduction

Subsequent to the release of the DEIS, the Corps selected Alternative Plan 4 as the Preferred Alternative, and has developed the array of refinements to the Preferred Alternative described in Section 2.2 of the FEIS to further reduce potential environmental impacts. A detailed Air Quality Analysis (Corps 2012c), included as Appendix F of this FEIS, has been conducted to determine the level and intensity of the impacts from these refinements, and the analysis provides the basis for this updated air quality section of the FEIS. The detailed analysis incorporated changes in air quality guidelines, protocols, and standards used by the agencies responsible for establishing thresholds for evaluating potential impacts (U.S. Environmental Protection Agency [USEPA]; California Air Resources Board [CARB]; and the East Kern Air Pollution Control District [EKAPCD], as well as other considerations affecting air quality that have taken place since the release of the DEIS. Some of these changes and considerations are briefly discussed in the following paragraphs, and are further discussed in the Air Quality Analysis.

Regulatory Changes Since the DEIS

Since the release of the DEIS, EKAPCD has adopted the CalEEMod Version 2011.1.1, rather than the Urbemis 2007 Version 9.2.4, which was used to model impacts in the DEIS. CalEEMod incorporates CARB's EMFAC2007 model for on-road vehicle emissions and the OFFROAD2007 model for off-road vehicle emissions. CalEEMod is designed to model emissions for land development projects and allows for the input of project-specific information.

In addition, the State enacted a regulation in 2008 for the reduction of diesel particulate matter and criteria pollutant emissions. This regulation applies to owners of fleets of diesel-fueled off-road vehicles, and involves reducing particulate and NO_x emissions from these vehicles over a prescribed time period to achieve lower emission rates. This regulation has been incorporated into the detailed Air Quality Analysis and has contributed to a reduction of air quality impacts associated with implementation of the

Preferred Alternative. See Chapter 3, Regulatory Setting (Section 3.2.1) in the detailed Air Quality Analysis (Appendix F of this FEIS) for additional information.

Realignment Of Highways 155 and 178

With the exception of the Highway 155 realignment and bridge widening and the Highway 178 realignment, all project-generated air emissions analyzed in the detailed Air Quality Analysis (Corps 2012c) were modeled based on specific information provided in the Alternative Plan 4 project description in the DEIS, as well as reasonable assumptions, and in some cases, default CalEEMod settings to estimate reasonable worst-case emissions that would be generated by the proposed DSM project. The modeling also included the refinements to the Preferred Alternative, including an increased duration of construction, electric batch plant, rock crusher, and dewatering pumps, as well as the realignment of Highways 155 and 178. Onsite construction equipment exhaust for the Staging Areas, Existing Spillway, Emergency Spillway, Auxiliary Dam, Main Dam, and Borel Canal Construction emissions were estimated using CalEEMod. Highway 155 and 178 construction emissions were estimated using the Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model. Construction employees' vehicular emissions were estimated using EMFAC2011 based on miles traveled.

Caltrans determined the timing and scope of the work required to complete the realignments and bridge widening and provided the Corps with construction, timing and emission impacts estimates. Caltrans calculated all emissions from the two realignments using the Sacramento Metropolitan Air Quality Management District Construction Emissions Spreadsheet. This program utilizes CARB-approved EMFAC 2007 On-Road and Off-Road emissions factors as well as USEPA AP-42 equipment emissions factors to estimate emissions. The Caltrans-supplied emissions were incorporated into the emissions impacts presented in the detailed Air Quality Analysis (Corps 2012c) and have been summarized in this section of the FEIS. It was assumed that all equipment proposed by Caltrans would meet at least minimal state emissions standards for each type and class of equipment.

Caltrans' projected total emissions were reported for calendar year 2014 even though these emissions would be spread over the entire construction period that includes the year 2015 and a portion of 2016. Therefore, in order to more realistically present the scope of emissions impacts associated with these road projects, the analysis conducted in the detailed Air Quality Analysis and summarized in this section of the FEIS assumed that Caltrans' emissions would be spread equally over the construction period stipulated in their construction plans.

Assessment of Health Risk

As reported in the DEIS, cancer risk and chronic non-cancer health risk (e.g. heart disease, stroke, diabetes, arthritis) are attributable to emissions of diesel engine exhaust particulate matter from on-site construction equipment. The DEIS modeled isopleth of cancer risk and the health hazard index for chronic noncancer risk at the point of maximum impact. The DEIS indicated the maximum predicted on-site cancer risk was

five in one million and the off-site cancer risk of one in one million. Since the release of the DEIS, the Corps has refined the Preferred Alternative to reduce the potential for health hazard risks during construction. These additional refinements include the elimination of construction traffic from the South Fork Delta Area, and the use of electricity instead of diesel generators to operate the concrete batch plant, rock crushing equipment, and dewatering pumps.

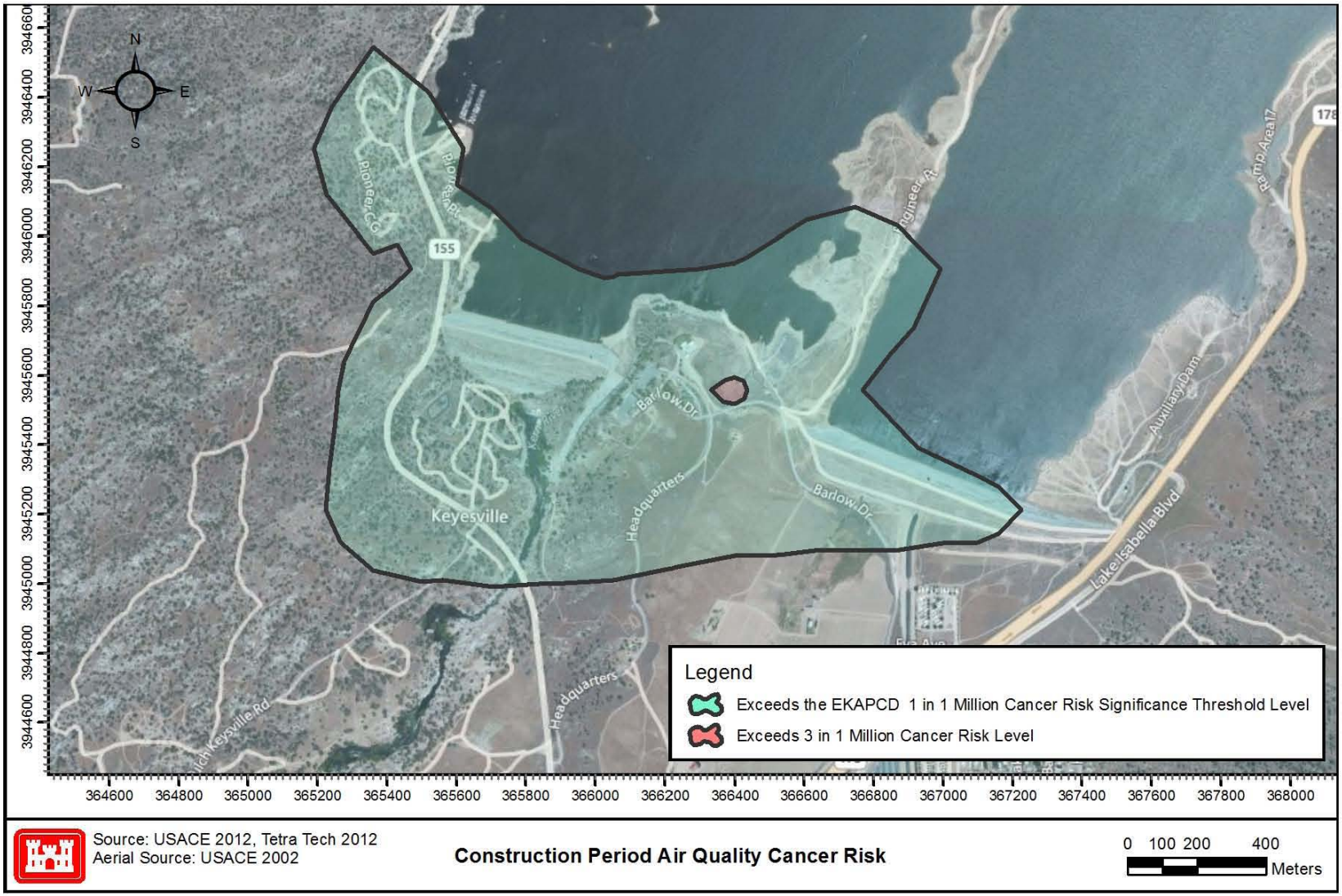
Since the release of the DEIS, a Health Risk Assessment (HRA) was conducted by the Corps in order to determine if diesel emissions associated with implementation of the Preferred Alternative (including refinements) would cause significant health risk to local sensitive receptors (i.e. residences). Details of the modeling of the diesel emissions can be found in the HRA report (Corps 2012d), included as Appendix E of this FEIS. Results of the modeling conducted for the HRA indicate the maximum estimated chronic health index for non-cancerous ailments predicted is 0.014, which is well below the EKAPCD significance standard of 0.2. Therefore, the diesel emissions associated with implementation of the Preferred Alternative would pose a less than significant chronic health risk for non-cancerous ailments.

In addition, isopleth maps included in the HRA report and as shown in Figure 3-1-FEIS, below, illustrate the area with potential cancer risk from prolonged exposure to diesel emissions during the multi-year construction period for the Preferred Alternative. With regard to potential cancer risk to residences in the project area, all residences are located in areas that are below the EKAPCD significance risk level of one chance in one million (See Figure 3-1-FEIS). Being below this threshold means that for all residents in the vicinity of the proposed project, there is less than one chance in one million that anyone could develop cancer from being continuously exposed to the levels of diesel emissions anticipated during the multi-year construction period for this project.

General Conformity for Federal Actions

Section 176(c) of the Clean Air Act prohibits Federal entities from taking actions in nonattainment or maintenance areas which do not conform to the State Implementation Plan (SIP) for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). On November 30, 1993, the USEPA promulgated the General Conformity Regulations which applies to all other Federal actions to ensure that such actions also conform to applicable SIPs (58 FR 63214). The purpose of "general conformity" is to ensure that Federal activities do not interfere with emissions budgets within the affected SIP, that such actions do not cause or contribute to new violations, and that the NAAQS are attained. The EKAPCD, under Rule 210.7, adopted the provisions of the Federal General Conformity Rule (CFR Title 40, Chapter 1, Subchapter C, Parts 6 and 51 effective October 13, 1994) stating that all Federal actions shall comply with applicable standards, criteria and requirements set forth therein.

Figure 3-1-FEIS Construction Period Air Quality Cancer Risk



3.3.1 Affected Environment

The Air Quality section of the DEIS (Section 3.5) sufficiently characterizes the affected environment for this resource.

3.3.2 Environmental Consequences

The DEIS (Section 3.5) details the potential impacts of the Alternative Plan 4 on air quality. Refinements of the Preferred Alternative since the release of the DEIS which impact air quality include: (1) the elimination of the South Fork Delta Area as a source of filter sand, (2) electric-powered concrete batch plant, rock crusher, and dewatering pumps, and (3) a revised construction schedule (See Table 2-2-FEIS in Section 2.2 of Chapter 2 of this FEIS). These refinements remove the potential source for a portion of the heavy construction-related truck traffic on Highway 178 and reduces on-site construction-related air emissions in the DSM Project Action Area, from what had been identified in the DEIS.

The refinements to the Preferred Alternative since the DEIS was released prompted the preparation of a revised Air Quality Analysis (Corps 2012c; Appendix F of this FEIS) and a revised Health Risk Assessment (Corps 2012d; Appendix E of this FEIS) to analyze the Preferred Alternative and refinement emissions. The results of these revised studies are discussed in the following paragraphs.

Tables 3-1-FEIS and 3-2-FEIS present the total project-related unmitigated and mitigated annual and daily air emissions from construction of the Preferred Alternative and refinements since the release of the DEIS. "Unmitigated" emissions are emissions from various sources that represent the "gross" emissions that can be produced from a particular piece of equipment, activity, time period, or project. "Mitigated" emissions represent the "net" emissions from a particular piece of equipment, activity, time period, or project after various types of controls or emission-reducing measures are applied. Both types of emissions are presented herein to demonstrate the level of controls being placed on construction equipment and activities in order to reduce these impacts to the greatest extent possible while allowing completion of the Project. Section 3.5.4 of the DEIS described the environmental commitments and mitigation measures for Air Quality. Based on additional refinements, public and agency comments, and the revised Air Quality Analysis, the Mitigation for Known Impacts have been revised and are presented at the end of this section of the FEIS (*Environmental Commitments /Mitigation Measures*). The mitigated construction emissions shown in the following tables reflect the impact emission reductions attained through application of these environmental commitments/mitigation measures.

The EKAPCD thresholds of significance are also included in Tables 3-1-FEIS and 3-2-FEIS as well as information regarding whether annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. As shown in Tables 3-1-FEIS and 3-2-FEIS, temporary emissions during construction of the Preferred Alternative during the year 2015 would exceed NOx EKAPCD thresholds.

Table 3-1-FEIS
Estimated Annual Construction Emissions – Preferred Alternative

	Criteria Pollutants (tons/yr)					
Construction Year	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
UNMITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	15.68	122.15	73.29	0.26	10.10	6.39
2018 Emissions	3.42	23.08	23.88	0.02	5.79	2.37
2019 Emissions	10.07	62.92	50.37	0.14	7.10	5.26
2020 Emissions	6.65	38.92	37.31	0.11	4.41	2.98
2021 Emissions	0.80	3.81	13.57	0.01	0.22	0.12
2022 Emissions	0.48	2.11	12.14	0.00	0.23	0.09
EKAPCD Significance Thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed Threshold?	*No*	*Yes*	*No*	*No*	*No*	*No*
MITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	7.50	16.65	124.88	0.26	2.22	1.82
2018 Emissions	1.54	3.83	30.57	0.02	3.69	0.93
2019 Emissions	4.55	10.47	78.48	0.14	2.88	2.14
2020 Emissions	3.38	8.60	57.08	0.11	1.60	0.98
2021 Emissions	0.61	1.92	15.26	0.01	0.12	0.04
2022 Emissions	0.42	1.46	12.39	0.00	0.09	0.03
EKAPCD Significance Thresholds	*25*	*25*	*--*	*27*	*15*	*--*
Exceed Threshold?	*No*	*Yes*	*No*	*No*	*No*	*No*

Source: Corps 2012c

Table 3-2-FEIS
Estimated Daily Construction Emissions – Preferred Alternative

	Criteria Pollutants (lbs/day)					
Construction Year	**ROG**	**NO_x**	**CO**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
UNMITIGATED						
2014 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2015 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2016 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2017 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2018 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2019 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2020 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2021 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2022 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
EKAPCD Significance Thresholds	*137**	*137**	--	--	--	--
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*
MITIGATED						
2014 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2015 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2016 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2017 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2018 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2019 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2020 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2021 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2022 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
EKAPCD Significance Thresholds	*137**	*137**	--	--	--	--
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

*Indirect vehicle trips emissions only
Source: Corps 2012c

All other years and pollutants remain below the EKAPCD significance thresholds. This is in contrast to the air dispersion modeling results in Tables 3-27 and 3-28 of the DEIS that reported that PM_{10} emissions would also exceed the EKAPCD significance threshold. Therefore the refinements to the Preferred Alternative have resulted in a reduction of construction-related air quality impacts. Nevertheless, the mitigated construction emissions of NO_x from the Preferred Alternative would still exceed the EKAPCD significance thresholds (see Table 3-1-FEIS) for year 2015[1] and is unavoidable. On this basis, construction of the Preferred Alternative would conflict with applicable air quality plans. The Corps would implement all feasible mitigation measures to reduce these impacts as much as practicable.

[1] Year 2015 emissions are primarily from Caltrans Hwy 155 and Hwy 178 realignments. These emissions could likely be reduced further by agreement with Caltrans to utilize lower emitting equipment.

Since the Preferred Alternative and refinements consist of repairs and modification of existing structures, the Corps anticipates there would be no changes to facility operations or personnel. Consequently, facility operations would remain unchanged since publication of the DEIS. These emissions are already included in the EKAPCD Emissions Inventory since the dam and associated facilities have been in place since the 1950s. Therefore, operational emissions would not exceed EKAPCD significance thresholds. Operation of the proposed project would not exceed any established EKAPCD thresholds; therefore, operation of the project would not obstruct implementation of an air quality plan during operation.

Greenhouse Gas / Global Climate Change

The primary source of Greenhouse Gas (GHG) emissions from the construction of the Preferred Alternative would be mobile sources. Not all GHGs exhibit the same ability to induce climate change; therefore, GHG contributions are commonly quantified in carbon dioxide equivalencies (CO_2e). The CO_2e portions of GHGs during construction of the proposed project were estimated using the CalEEMod and EMFAC2011 programs and California Climate Action Registry – Intergovernmental Panel on Climate Change (IPCC) Emissions Factors. These estimated GHG emissions are presented in Table 3-3-FEIS.

Mitigation measures that are incorporated into this analysis reduce CO_2 from the unmitigated levels using control measures such as limiting engine idling time on mobile sources, electrification of as many devices as practicable, and restricting most construction implements to using newer engines. These reductions represent the most reasonable controls available. EKAPCD's GHG reporting limit for CO_2e is based on portable and stationary source emissions. Projects with significance (or reporting) levels over 25,000 tons/year of CO_2e are required by EKAPCD to reduce GHG emissions to the extent practicable but are not treated as a "major" source unless these emissions reach 100,000 tons/year.

Table 3-3-FEIS
Estimated Greenhouse Gas Emissions – Preferred Alternative

Construction Year	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
2014 Construction	844	-	-	844
2015 Construction	5,049	-	-	5,049
2016 Construction	1,258	-	-	1,258
2017 Construction	32,529	1.28	0.03	32,567
2018 Construction	15,056	0.34	0.05	15,076
2019 Construction	15,344	0.76	0.00	15,360
2020 Construction	10,637	0.51	0.00	10,647
2021 Construction	829	0.03	0.00	830
2022 Construction	173	0.00	0.00	173
EKAPCD Significance Thresholds	--	--	--	25,000
Exceed Threshold?	*No*	*No*	*No*	*Yes*

Source: Corps 2012c

As shown in Table 3-3-FEIS emissions during construction of the Preferred Alternative would exceed CO_2e EKAPCD thresholds for the year 2017. All other years remain below the significance thresholds. The EKAPCD thresholds of significance are also included in Table 3-3-FEIS as well as information regarding whether annual construction emissions for CO_2, CH_4, N_2O, and CO_2e would exceed those thresholds. As shown in Table 3-3-FEIS, temporary emissions during construction year 2017 would exceed CO_2e EKAPCD thresholds adopted by Kern County.

GHG impacts would be considered less than significant for construction activities because the majority of CO_2e construction emissions are neither portable nor stationary and are temporary emissions. Impacts would be less than significant for operational activities.

Health Risk

As discussed previously in this section of the FEIS, the maximum estimated chronic health index for non-cancerous ailments is 0.014, well below the EKAPCD significance threshold of 0.2. Also, the potential cancer risk to all residences in the project area is below the EKAPCD significance threshold of one chance in one million. Therefore, the potential health risk to all residences in the project area for cancer and non-cancerous ailments is considered less than significant.

General Conformity

At issue for the Isabella Lake DSM Project (i.e. implementing the Preferred Alternative) is the potential for an increase in total annual NOx emissions in excess of de minimis levels during project construction. The mitigated project would result in no change to the current operational (long-term) emissions of all criteria pollutants, thus no consideration of these emissions are required. General Conformity de minimis levels established under 40 CFR Part 51§51.853 and adopted by EKAPCD are presented in Table 3-4-FEIS.

Comparing the estimated annual construction emissions presented previously in Table 3-1-FEIS with the EKAPCD de minimis levels in Table 3-4-FEIS, it is apparent that emissions with implementation of the unmitigated Preferred Alternative would exceed the de minimis emission level for NO_x. However, Table 3-1-FEIS illustrates that the anticipated emissions with implementation of the mitigated Preferred Alternative is below the de minimis level for NO_x. Therefore, the mitigated Preferred Alternative would be in conformity with the CAA and would be considered exempt from a General Conformity analysis.

Table 3-4-FEIS
EKAPCD General Conformity De Minimis Levels[1]

Pollutant	Attainment Status	Tons Per Year
Ozone (VOC or NOx)	Ozone Nonattainment Area Outside an Ozone Transport Region	100
PM_{10}	Serious Nonattainment	70

Source: IEC 2012, EKAPCD
[1] 40 CFR Part 51§51.853

Cumulative Impacts

Cumulative impacts resulting from the implementation of Alternative Plan 4 (now Preferred Alternative) on air quality were addressed in the DEIS. New modeling including the refinements of the Preferred Alternative and newly certified emissions inventory have been analyzed and are discussed in the Air Quality Analysis report (Corps 2012c) and summarized here

The most recent, certified Mojave Desert Air Basin (MDAB) Emission Inventory data available from the CARB is based on data gathered for the 2008 annual inventory. Table 3-5-FEIS provides a comparison of the emissions of the proposed Preferred Alternative to the MDAB Emissions Inventory.

Table 3-5-FEIS
Comparative Analysis Based on Mojave Desert Air Basin 2008 Inventory

	Pollutant (tons/year)				
Emissions Inventory Source	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**
Mojave Desert Air Basin – 2008	48,289	100,448	192,172	3,577	76,358
2017 Construction Emissions	7.50	16.65	124.88	0.26	2.22
Proposed Project's % of MDAB	0.016	0.017	0.065	0.01	0.003

Source: Corps 2012c

As shown, the emissions projected by the Preferred Alternative's worst case construction year appear to be negligible in comparison to overall emissions. Basin emissions would be barely impacted if the project is approved and would result in an even smaller impact for all other years of construction.

Tables 3-6-FEIS through 3-8-FEIS provide CARB Emissions Inventory Projections for the year 2020 for both the MDAB and the Kern County portion of the air basin. Looking at the MDAB Emissions predicted by the CARB year 2020 emissions inventory, the Kern County portion of the air basin is a moderate source of the emissions. The implementation of the Preferred Alternative would be an extremely minute source of the total emissions in both Kern County and the entire MDAB.

Table 3-6-FEIS
Emission Inventory Mojave Desert Air Basin 2020 Projection – Tons per Year

	ROG	**NO_X**	**PM_{10}**
Total Emissions	48,508	75,591	83,512
Percent Stationary Sources	14.52	45.96	24.73
Percent Area-Wide Sources	15.04	1.10	66.69
Percent Mobile Sources	40.78	51.56	4.37
Percent Natural Sources	29.64	1.35	4.19
Total Stationary Source Emissions	7,044	34,748	20,659
Total Area-Wide Source Emissions	7,300	839	55,699
Total Mobile Source Emissions	19,783	38,982	3,650
Total Natural Source Emissions	14,381	1,022	3,504

Source: (CARB 2012)
Note: Total may not add due to rounding.

Table 3-7-FEIS
Emission Inventory Mojave Desert Air Basin – Kern County Portion 2020 Projection – Tons per Year

	ROG	NO_X	PM_{10}
Total Emissions	13,687	18,870	13,249
Percent Stationary Sources	4.26	54.73	23.96
Percent Area-Wide Sources	5.86	0.57	54.26
Percent Mobile Sources	22.40	42.16	10.74
Percent Natural Sources	67.20	2.51	11.29
Total Stationary Source Emissions	584	10,329	3,175
Total Area-Wide Source Emissions	803	109	7,190
Total Mobile Source Emissions	3,066	7,957	1,423
Total Natural Source Emissions	9,198	474	1,496

Source: (CARB 2012)
Note: Total may not add due to rounding.

Table 3-8-FEIS
2020 Emissions Projections – Proposed Project, Kern County, and Mojave Desert Air Basin

	ROG	NO_X	PM_{10}
2017 Construction Emissions	7.5	16.65	2.22
Kern County	13,687	18,870	13,249
Mojave Desert Air Basin	48,508	75,591	83,512
Proposed Project Percent of Kern County	0.05%	0.09%	0.02%
Proposed Project Percent of MDAB	0.02%	0.02%	0.003%
Kern County Percent of MDAB	28.21	24.96	15.86

Source: CARB 2012
Notes: The emission estimates for Kern County and the MDAB are based on 2020 Projections. The Proposed Project emission estimates are for the proposed incremental emissions increase that is not already included in the MDAB Emissions Inventory. Project emissions are based on 2008 emissions estimates to present the most conservative comparison. The Project's emissions are expected to decline as cleaner, less polluting vehicles replace vehicles with higher emissions.

As shown in the preceding tables, the worst case construction year for the implementation of the Preferred Alternative would result in a small impact on regional ozone and PM_{10} formation and would result in an even smaller impact for all other construction years. When the environmental commitments and compliance with applicable EKAPCD rules are considered, along with the fact that these emissions are temporary, short-term construction emissions, the regional contribution to these cumulative impacts would be almost negligible. It is reasonable to conclude, therefore, that implementation of the Preferred Alternative is not cumulatively significant with regard to regional air quality impacts.

A review was conducted of current Kern County planning records for tentative small construction projects within a six-mile radius of the Preferred Alternative Action Area (Corps 2012c). The projects reported by Kern County did not include enough data in order to estimate emissions from the projects. However, this is of no particular consequence since the NO_x emissions during construction year 2015 for the Preferred

Alternative (with mitigation) exceed EKAPCD significance thresholds, and is considered significant and unavoidable at the project level. Therefore, the implementation of the Preferred Alternative is also considered significant and unavoidable as to cumulative impacts.

Cumulative impacts would be significant and unavoidable for construction activities because of NO_X construction emissions during the year 2015 and less than significant for operational activities.

Environmental Commitments/Mitigation Measures

The DEIS (Section 3.5.4) describes the environmental commitments and mitigation measures for Air Quality. Based on additional refinements, public and agency comments, and the revised Air Quality Analysis, additional mitigation measures and revisions to those described in the DEIS are outlined here.

Two essential mitigations were included in the new modeling for the Preferred Alternative as baseline assumptions that substantially reduce air quality impacts:

- The Corps will ensure that all heavy and off-road emissions sources would be classified as Tier 4. The Air Quality analysis is based on the assumption that Tier 4 emission standards would be fully implemented at the time of the projected start date for the proposed project.
- The Corps will ensure that stationary emission sources such as rock crushing, bulk concrete plant operations and dewatering pumps would be electrified and would have no engines associated with their regular operation.

Implementation of the following mitigation measures are recommended to help to reduce air quality impacts during construction of the Preferred Alternative. However, even with these measures, localized impacts from short-term construction emissions of NO_x would remain significant and unavoidable:

- Prepare a Dust Control Plan (DCP) compliant with EKAPCD Rule 402, approved by EKAPCD prior to construction activities being started. The DCP would take into account all sources of PM emissions including, but not limited to, potential lakebed wind erosion. The DCP would provide adequate controls to ensure that wind-blown PM is controlled to the extent reasonably possible. The DCP would also consider development of a traffic management plan to maintain traffic flow and minimize vehicle travel on unpaved roads. The DCP would also consider installation of real-time PM_{10} monitors, i.e. Beta Attenuation Monitor (BAM) or Tapered Element Oscillating Microbalance (TEOM) monitor to ensure that local communities are not adversely impacted by PM_{10} emissions.
- Sufficiently water all soil excavated or graded to prevent excessive dust. Watering would occur as needed with complete coverage of disturbed soil areas. Watering would take place a minimum of twice daily on unpaved/untreated roads and on disturbed soil areas with active operations. All clearing, grading, earth moving,

and excavation activities would cease during periods of winds greater than 20 miles per hour (averaged over one hour), if disturbed material is easily windblown, or when dust plumes of 20% or greater opacity impact public roads, occupied structures, or neighboring property.

- Sufficiently water or securely cover all fine material transported off site to prevent excessive dust.
- Minimize areas disturbed by clearing, earth moving, or excavation activities.
- Stabilize by watering or other appropriate method stockpiles of soil or other fine loose material to prevent wind-blown fugitive dust.
- Control weeds, where acceptable to the fire department, by mowing instead of disking, thereby leaving the ground undisturbed and with a mulch covering.
- Treat all inactive soil areas within the construction site by: (1) seeding and watering until plant growth is evident; (2) treating with a dust palliative; and/or (3) watering twice daily until soil has sufficiently crusted to prevent fugitive dust emissions.
- Limit on-site vehicle speed to 15 miles per hour and speed limit.
- Post speed limits should throughout all construction areas with 15 miles per hour limit on all unpaved surfaces.
- Pave all areas with vehicle traffic, treat with dust palliatives, or water a minimum of twice daily.
- Keep streets adjacent to the project site clean, and remove project-related accumulated silt.
- Provide an apron into the project site at access points from adjoining surfaced roadways. The apron would be surfaced or treated with dust palliatives. If operating on soils that cling to the wheels of vehicles, a grizzly or other such device would be used on the road exiting the project site, immediately prior to the pavement, in order to remove most of the soil material from vehicle tires.
- Maintain all equipment as recommended by manufacture manuals.
- Shut down equipment when not in use for more than 5 minute periods of time.
- Use electric equipment whenever possible in lieu of diesel or gasoline-powered equipment.
- Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order to substantially reduce NOX emissions.
- Ensure that on-road and off-road equipment that is under the control of the Corps meets meet Tier 4 emissions standards.

Portable equipment such as generators, rock crushing and screening operations, concrete batch plants, etc. that are to be on-site for more than one year may be required to obtain a

Permit to Operate from the EKAPCD. If such equipment is to be on-site less than one year and would not return the following year, it may be permitted under CARB's Portable Equipment Registration Program. The EKAPCD should be consulted to clarify if and when specific equipment is to be permitted.

3.4 WATER RESOURCES

3.4.1 Affected Environment

The water resources section of the DEIS (Section 3.6.2) sufficiently characterizes the affected environment for this resource. There have been no additional revisions, studies, or new data relevant to the discussion of the affected environment.

3.4.2 Environmental Consequences

The DEIS (Section 3.6.3) details the potential impacts of Alternative Plan 4 on water resources. The following revisions have been added to the water resources impact analysis to clarify effects associated with the refinements of the Preferred Alternative.

During the multi-year construction period, refinements under the Preferred Alternative would reduce the amount of time by 7 to 9 months that the maximum lake level would be lowered to an elevation of approximately 2,543 feet NAVD 88 (72,237 acre-feet). The construction pool elevation has been limited to a four-to-six-month window from Fall 2020 to early Spring 2021. This takes advantage of the natural low reservoir elevations. However, maintaining a significantly lower pool elevation can be difficult given the unpredictability of rain flood and snowmelt inflow and downstream local flow runoff. The maximum release out of the dam is approximately 4,600 cfs. The refinements reduce the potential requirement for large releases due to the shorter period of restricted pool elevation.

The proposed use of Engineers Point for material disposal under the Preferred Alternative would eliminate the need for lowering the lake to an elevation of approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a nine–month period to construct an upstream berm on the Auxiliary Dam. Eliminating this need to lower the pool would reduce the potential for adverse impacts on water quality. The lower lake levels, especially in the summer season, could increase turbidity, algal blooms, water temperatures, nutrients, and create an imbalance in dissolved oxygen and optimum pH. Reducing the frequency and duration of the periods when a low construction pool is required would substantially reduce the potential for adverse impacts on water quality.

Appendix B of this FEIS is the *Clean Water Act Section 404(b)(1) Water Quality Evaluation* for all of the actions proposed in the Preferred Alternative (Corps 2012j). As supported by the 404 (b)(1) (Appendix B), the Preferred Alternative represents the environmentally preferable alternative. This is the least environmentally damaging practicable alternative (LEDPA). Under the refinements, approximately 54 acres would be utilized for disposal of up to 1,710,000 CY of material at Engineers Point. This would include approximately 36.5 acres below the Ordinary High Water Mark (OHWM) and approximately 17.5 acres above OHWM. The OHWM is considered the gross pool

elevation at 2,609.26 feet NAVD 88 (568,070 acre-feet). Isabella Lake is a regulated facility and the in-water disposal site is devoid of vegetation. Impacts on water quality caused by construction activities would be short in duration and conditions would return to pre-construction levels upon project completion. Effects on water quality would include erosion, circulation and drainage, turbidity, and impacts on aquatic ecosystems and fish habitat. With the use of best management practices (BMPs) impacts would be reduced to less than significant levels. The proposed project would not adversely change the environmental value of the lake and the Corps intends to provide habitat enhancements as part of the project to mitigate for adverse aquatic habitat impacts.

Under the existing water control plan, diagram, and procedures for managing lake levels, the historical reservoir operating guidance would be followed. Therefore, reservoir releases during construction would be similar to those before construction. Significant water quality impacts as a result of reservoir releases are not anticipated. Normal water control operations, including reservoir releases, and the short-term deviations in water control operations as described above are not expected to adversely impact hydrology and flood management in Isabella Lake and less than significant impacts are anticipated.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.4 of the DEIS). The following mitigation measures have been updated from the language included in the DEIS (Section 3.6.4).

Rock Material Disposal Management Plan

- The Corps will require and approve a *Rock Material Disposal Management Plan* for the placement of unused rock material from the Emergency Spillway on Engineers Point on and below the OHWM. The plan would include BMPs for avoiding and minimizing impacts on water quality and enhancing fish habitat around the perimeter of Engineers Point by judicious placement of larger rocks and boulders as an irregular revetment.

Protect Water Quality

- The Corps will conduct monitoring throughout the Isabella Lake DSM Project to assist in preventing adverse water quality impacts and ensure compliance with all environmental regulations. Action levels will be based on the USACE water-quality baseline study, the Clean Water Act, the NPDES Permit for construction-related activities, the Tulare Lake Basin Plan, coordination with the CVRWQCB, and other applicable regulations.

3.5 TRAFFIC AND CIRCULATION

3.5.1 Affected Environment

The Traffic and Circulation section of the DEIS (Section 3.7) characterizes the affected environment for this resource. There have been no studies or new data generated to date that are relevant to the discussion of the affected environment.

3.5.2 Environmental Consequences

The DEIS (Section 3.7.3) describes the potential impacts of the Isabella Lake DSM project on Traffic and Circulation. A comparative analysis was conducted for potential impacts resulting from Alternative Plan 4. Refinements to the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand (Section 2.2.4 of DEIS). The DEIS (Section 3.7.3) characterized the worst case scenario for increased traffic volumes that would occur when sand filter transportation overlaps with the largest-demand periods for ready-mix concrete from the plant in the South Fork Delta Area. It is anticipated that elimination of the South Fork Delta Area as a source of filter sand would reduce the potential for short-term construction-related traffic effects on to portions of Hwy 178.

Additional refinements since the DEIS include the realignment of Highway 178 and Highway 155. The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways in Kern County. Caltrans enforces various policies and regulations related to modification of, or encroachment on state-owned roadways. The potential impacts from the highway realignments will be analyzed and further addressed in a follow-on tiered NEPA action (See Section 1.4.6 of this FEIS). It is anticipated that an increase in construction-related traffic associated with the realignments would occur along both highways. However, it is anticipated that this increase would not exceed existing roadway and intersection capacities. In addition, it is anticipated that the proposed realignment of Highway 155 would result in increased capacity for this roadway based on the addition of an uphill climbing lane, structure widening, and reconstruction of the roadway to current Caltrans standards as well as continued access to Keyesville Road.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.1 of the DEIS) or environmental commitments/mitigation measures (Section 3.7.4 of the DEIS).

3.6 NOISE AND VIBRATION

3.6.1 Affected Environment

The Noise and Vibration section of the DEIS (Section 3.8) characterizes the affected environment for this resource. There have been no studies or new data generated to date that are relevant to the discussion of the affected environment.

3.6.2 Environmental Consequences

The DEIS (Section 3.8.3) describes the potential impacts of the Isabella Lake DSM project on noise and vibration. A comparative analysis was conducted for potential impacts resulting from Alternative Plan 4.

Refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand (Section 2.2.4). Elimination of the South Fork Delta Area as a source of filter sand would reduce the

amount of heavy trucks travelling on portions of Highway 178 (Section 3.5.1 of the FEIS). It is anticipated that sensitive receptors identified in the DEIS (Section 3.8 of the DEIS) along Highway 178 would experience a reduction in construction-related traffic noise from the effects identified in the DEIS.

Construction of the Emergency Spillway is expected to require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. The controlled blasting program anticipated for this construction is described in Section 2.3.13 of the DEIS. As discussed in Section 3.8.3 of the DEIS, the potential noise and vibration effects for Alternative Plan 4 are expected to be similar to those described for the Alternative Base Plan, although the duration of impacts would be longer (See Table 2-2-FEIS). Overall noise and vibration impacts are anticipated to remain low to moderate, and be less than significant.

The construction-related noise levels at the proposed dam construction, staging, and borrow sites under Alternative Plan 4 are expected to be similar with the refinements in the Preferred Alternative. However, some noise and vibration impacts may be potentially reduced by the use of electricity for the crushing equipment, batch plant, and dewatering pumps.

Additional refinements since the DEIS, include the realignment of Highway 178 and Highway 155. The noise and vibration impact analysis would be updated for these highway realignments in a supplemental NEPA document tiered from the FEIS (See Section 1.4 of FEIS). Because the realignments would change the physical alignment of the highways, noise levels at nearby sensitive receptors (such as single-family residences) could be affected. It is anticipated that the proposed realignments would need to increase noise levels by more than 9 dBA L_{eq} to approach or exceed the exterior noise level standard of 67 dBA L_{eq} for residential or recreational uses. It is unlikely that the shifting of the highway centerlines alone would cause an increase in noise levels exceeding 2-3 dB. This will be determined in the supplemental NEPA analysis.

Detailed roadway geometrics are currently being refined by the Corps in collaboration with Caltrans. Noise impacts associated with state or Federal highway projects are subject to the requirements of Title 23, Part 772 of the Code of Federal Regulations (23 CFR 772) "*Procedures for Abatement of Highway Traffic Noise*." This regulation provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for Federal and Federal-aid highway projects. According to 23 CFR 772.3, all highway projects must be developed in conformance with Federal Highway Administration (FHWA) noise standards. The *Caltrans Noise Analysis Protocol for New Highway Construction, Reconstruction, and Retrofit Barrier Projects* (Protocol) (Caltrans 2011) provides Caltrans policy for implementing CFR 772 in California. The planned supplemental NEPA analysis would take these procedures and protocol into account.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.1 of the DEIS) or environmental commitments/mitigation measures (Section 3.8.4 of the DEIS).

3.7 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

3.7.1 Affected Environment

The hazardous, toxic, and radiological waste (HTRW) section of the DEIS (Section 3.9.2) sufficiently characterizes the affected environment for this resource. Since the DEIS, the affected environment has been updated to include further background information on the Big Blue Mine.

In January of 1956, the Corps was ordered by the United States District Court U.S. v. Certain Parcels of Land in the County of Kern, State of California, etc., et al., No. 1211-ND (E.D. Cal. Jan. 11, 1956) to install and maintain protective measures preventing water from Isabella Lake from entering the mine and permit drainage of the mine waters into Isabella Lake. A drainage tunnel and connecting vertical sump shaft were excavated and built by the Corps. In 2005, sampling of the excavation material near Highway 155 revealed 145 cubic yards of spoils that exceeds the USEPA screening level for arsenic.

There have been no additional revisions, studies, or new data relevant to the discussion of the affected environment.

3.7.2 Environmental Consequences

The DEIS (Section 3.9.3) details the potential impacts of Alternative Plan 4 on HTRW. The following revisions have been added to the HTRW impact analysis to clarify effects associated with the Big Blue Mine, asbestos associated with building demolition and potential HTRW issues associated with concrete batch plant operations.

The construction pool would remain within levels established by the current Isabella Lake Water Control Manual. Therefore, construction lake levels would not affect the existing spoils from the Big Blue Mine drainage tunnel and sump shaft.

During construction of the Emergency Spillway, the existing Forest Service buildings would require demolition. The project construction specifications and contract would require contractors to properly identify and lawfully dispose of any asbestos contaminated materials encountered during demolition. No impacts from the handling or release of asbestos associated with the demolition are anticipated.

The concrete required for construction of the Emergency Spillway would be manufactured in a temporary Batch Plant established and operated for that purpose in the area excavated for the Emergency Spillway. The proposed cement mix materials stored for use during on-site manufacture could be subject to release of hazardous materials. Cement can cause ill health by skin contact, eye contact, or inhalation. In addition, the concrete produced in the Batch Plant could result in a hazardous condition since prolonged contact between skin and wet concrete allows alkaline compounds to penetrate

and burn the skin. With proper precautions taken and BMPs used in handling the cement materials and concrete, potential HTRW impacts are not anticipated to be significant.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.7 of the DEIS) or environmental commitments and mitigation measures (Section 3.9.4 of the DEIS).

3.8 BIOLOGICAL RESOURCES

3.8.1 Affected Environment

The Biological Resources section of the DEIS (Sections 3.10) sufficiently characterizes the affected environment for this resource. Since release of the DEIS, additional field surveys have been conducted in the DSM Project action area to further delineate jurisdictional wetlands, determine the presence or absence of sensitive (rare) plant species, and survey for evidence of the Federally threatened valley elderberry longhorn beetle and its host plant. These additional actions are discussed in the following paragraphs.

Wetlands

As reported in the DEIS, potential wetlands were recorded below the Auxiliary Dam during a reconnaissance level survey of vegetation communities and waterbodies undertaken in April 2011 (Corps 2012e). Since the release of the DEIS, access to private land was obtained and in June 2012, contract biologists performed a wetland delineation on the private land to determine the possible presence of wetlands or Other Waters of the U.S. The biologists visually inspected and documented site conditions in the area below the Auxiliary Dam within Staging Area A3 that is proposed for staging and construction work on the relocated Borel Canal. The surveys included plant inventories, habitat mapping, and the delineation of boundaries for wetlands and Other Waters of the U.S (Corps 2012f).

Several wetland features were mapped (Figure 3-2-FEIS) in the study area, including a narrow band of emergent wetland, a small area of forested/shrub wetland, ponded water near the pumping station, and Other Waters of the U.S. (e.g., Borel Canal) (Table 3-9-FEIS). The results of the hydrological analysis suggest that the hydric features mapped within this study area are fed by surface and groundwater flowing from the North and South Fork Kern Rivers, which rejoins the Kern River after flowing through Hot Springs Valley.

The previous alteration of soils during dam construction, corresponding changes in local hydrology, and agricultural land uses, produced complex conditions within the study area. This is evident in the results of sampling, such as the presence of obligate plants that indicate the persistence of water in areas lacking obvious hydrology or hydric soils.

Figure 3-2-FEIS Wetlands and Other Waters of the U.S. in the Action Area

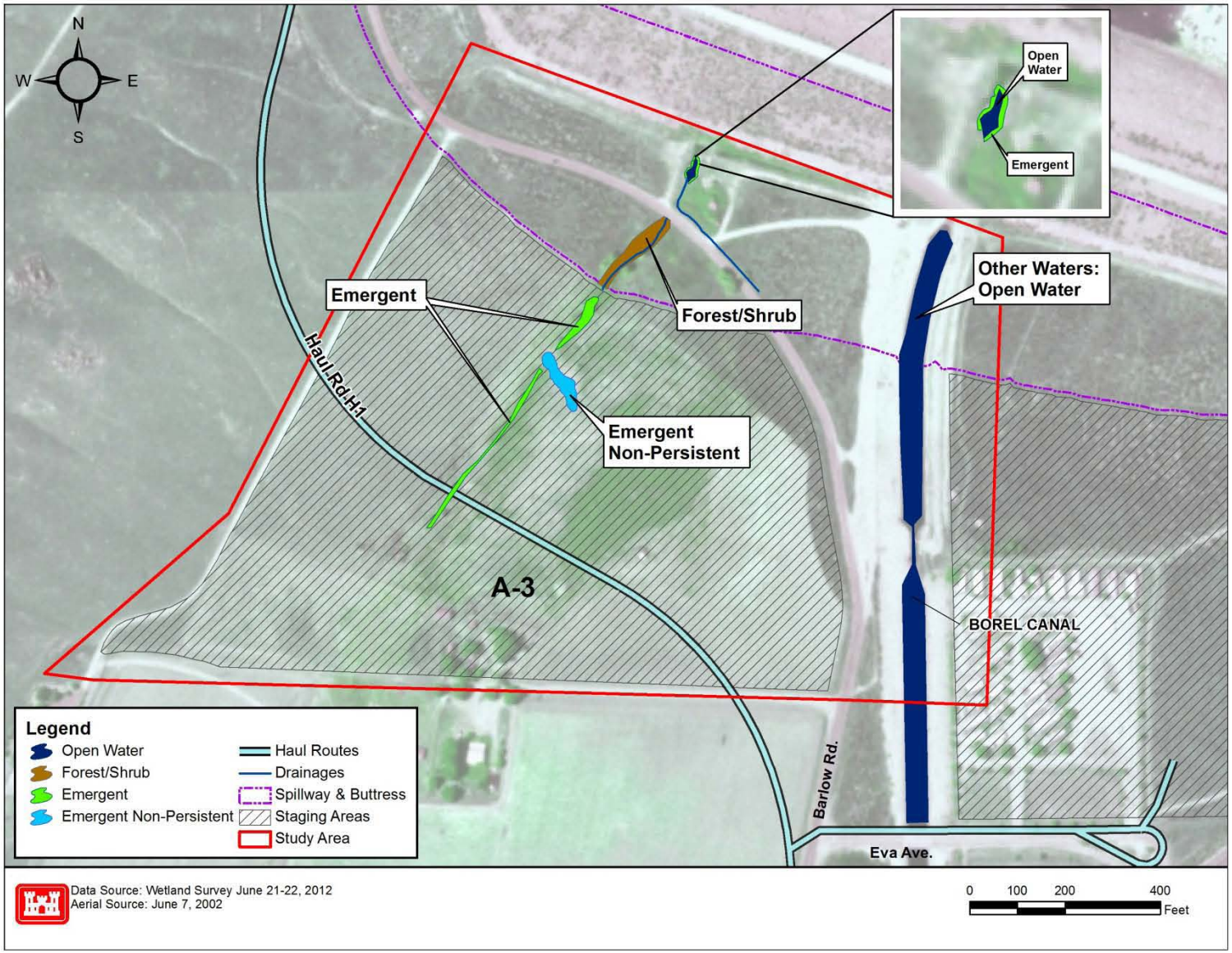


Table 3-9-FEIS
Summary of Wetlands and Other Waters of the U.S. in the Action Area

Waterbody Type	Acres
Emergent	0.12
Emergent Non-Persistent	0.078
Forested/Shrub	0.13
Total Wetlands	**0.33**
Other Waters of the U.S. – Auxiliary Dam toe and Borel Canal	1.18
Other Waters of the U.S. – Isabella Lake Maximum Material Disposal Below the OHWM	36.5

Source: Corps 2012f

Based on the delineation conducted in June 2012, the total area of this wetland within the study area was found to be substantially smaller (.33 acres) than what was presented in the DEIS (approximately 6 acres), which had been estimated using data from the National Wetland Inventory (NWI). NWI data are largely based on high altitude imagery and not on-the-ground investigations (Corps 2012f).

There are also approximately 1.18 acres of other Waters of the U.S. in the study area below the Auxiliary Dam. These areas include standing water along the toe of the Auxiliary Dam (presumably due to seepage) that drains to open waters in the north portion of the study area. This water is either pumped from the open water to the Borel Canal or it flows southeast through a drainage canal along the north side of Barlow Road or south under Barlow Road to forested/shrub wetland and emergent non-persistent wetland.

Other Waters of the U.S. in the study area includes the portion of Isabella Lake that would be used for material disposal. This would include up to approximately 36.5 acres below the OHWM at Engineers Point or upstream of the Auxiliary Dam. The OHWM is considered the gross pool elevation at 2,609.26 feet NAVD 88 (568,070 acre-feet).

Rare and Sensitive Plants

During the post-DEIS surveys in June 2012, the Corps conducted additional surveys focused on rare and sensitive plant species. The disturbance footprints of Staging Areas A1, A2, A3, M1 and S1, Haul Roads H1, H2, H6, and H3; the Borel tunnel, the proposed Highway 155 and Highway 178 realignments; Barlow Road; the footprint of the new Emergency Spillway; and the Main and Auxiliary Dams were surveyed. The surveys generally followed California Department of Fish and Game Protocols for Surveying and Evaluating Impacts on Special Status Native Plant Populations and Natural Communities (CDFG 2009). The surveys provided a snapshot of the late spring and summer season for the 2012 survey year, a below normal rainfall year (Corps 2012g).

Table 3-10-FEIS updates information presented in Table 3-62 of the DEIS regarding the presence or likelihood of Special Status plant species in the Action Area (Corps 2012g).

Table 3-10-FEIS
Special Status Plant Species Occurrence in the Action Area

Common Name *Scientific Name*	Federal Status	State Status	CNPS Rank[1]	Occurrence Likelihood and Description[2]
Alkali Mariposa-lily *Calochortus striatus*	None	None	1B.2	**May Occur (Occurs Nearby).** Occurs in moist alkaline areas in the arid interior of southern California and southern Nevada. Populations are known from the nearby Kern River Preserve.
Calico Monkeyflower *Mimulus pictus*	None	None	1B.2	**May Occur.** This plant occurs in broad-leafed upland forest and cismontane woodland. It grows in bare ground around gooseberry bushes or around granite rock outcrops from 1,000 to 4,200 feet. Suitable habitat occurs within the Study Area.
Kelso Creek Monkeyflower *Mimulus shevockii*	None	None	1B.2	**May Occur.** This plant flowers from March to May and occurs in granitic or metamorphic, sandy or gravelly soils. Joshua tree woodland, Pinyon and juniper woodland. Marginally suitable habitat occurs in the project vicinity.
Kern Canyon Clarkia *Clarkia xantiana* ssp. *parviflora*	None	None	4	**May Occur (Occurs Nearby).** This plant flowers from May to June. It occurs on dry slopes in cismontane woodland and Great Basin scrub from 3,000 to 4,500 feet. It is only known from the Kern River drainage and the Big Rock Wash, in north central Los Angeles County. Nearby populations are known and suitable habitat exists within the Study Area.
Kernville Poppy *Eschscholzia californica*[d]	None	None	3	**Occurs.** Formerly a unique species now considered a variant of the more widespread California poppy. This species flowers from June to August and occurs in Cismontane woodland (sandy floodplain). Suitable habitat occurs throughout the Study Area and three individuals were found near the Borel Canal.
Piute Mountains Navarettia *Navarretia setiloba*	None	None	1B.1	**May Occur.** This species occurs in clayey or gravelly loam soils within cismontane woodland, Pinyon and juniper woodland, and Valley and foothill grassland. This species flowers from April to July. Populations are known from nearby locations and suitable habitat occurs within the Study Area.
Rose-flowered Larkspur *Delphinium purpusii*	None	None	1B.3	**May Occur (Occurs Nearby).** Rose-flowered larkspur occurs on rocky soils, often carbonates. It grows in chaparral, Cismontane woodland, Pinyon and juniper woodland from 0 to 4,000 feet. It flowers from March to May. None were detected during the survey, although suitable habitat exists within the Study Area and the survey was conducted outside of the flowering season.

Table 3-10-FEIS
Special Status Plant Species Occurrence in the Action Area

Common Name *Scientific Name*	**Federal Status**	**State Status**	**CNPS Rank[1]**	**Occurrence Likelihood and Description[2]**
Round-leaved Filaree *California macrophylla*	None	None	1B.1	**May Occur.** This species occurs in cismontane woodlands and valley and foothill grasslands. It is often associated with clay soils below 4,000 feet. Suitable habitat occurs within the Study Area and this species may occur there.
Shevock's Golden-aster *Heterotheca shevockii*	None	None	1B.3	**May Occur.** This species occurs in sandy soils in chaparral and cismontane woodlands from 755 to 2,953 feet. It flowers from August to November. No individuals were detected during the survey, although suitable habitat exists within the Study Area and the survey was conducted outside of the flowering season.
Tracy's Eriastrum *Eriastrum tracyi*	None	Rare	1B.2	**Occurs.** Tracy's eriastrum grows in chaparral and cismontane woodlands in gravelly shale or clay. Often found in open areas, it grows at elevations from 1,000 to 2,500 feet. The Study Area encompasses several populations of this species.

[1]Rare Plant Rank and Description:
California Rare Plant Rank 1A: Plants Presumed Extinct in California
California Rare Plant Rank 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
California Rare Plant Rank 2: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
California Rare Plant Rank 3: Plants About Which We Need More Information - A Review List
California Rare Plant Rank 4: Plants of Limited Distribution - A Watch List

The CNPS Threat Rank is an extension added onto the California Rare Plant Rank and designates the level of endangerment by a 1 to 3 ranking with 1 being the most endangered and 3 being the least endangered:

CNPS Threat Rank 0.1 Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat).
CNPS Threat Rank 0.2 Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).
CNPS Threat Rank 0.3 Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known).

[2] Determination of occurrence probability for plants is based on site conditions observed at the time of the survey, survey results, growth habits and distribution as summarized in Calflora (www.calflora.org), CDFG (2012) and the Jepson Manual (Hickman ed. 1993), and collection records from the Consortium of California Herbaria available at: http://ucjeps.berkeley.edu/consortium/about.html

Source: (Corps 2012g).

As indicated in the table, Tracy's eriastrum and Kernville poppy were observed during the survey. Alkali mariposa lily, rose-flowered larkspur, and Kern Canyon clarkia were noted as "may occur" and have been recorded in the vicinity of the proposed Isabella Lake DSM Project Action Area. The lack of observation of these species may not indicate their absence, but rather environmental conditions (e.g. low rainfall) or plant phenology (e.g. blooming period) may have precluded sightings.

Valley Elderberry Longhorn Beetle

The additional surveys conducted in June 2012 included surveys for the presence of the valley elderberry longhorn beetle and its host plant (Elderberry shrubs). Elderberry shrubs were recorded at three locations near or within in the Action Area. Two of the locations are associated with the proposed road realignments and one is directly below the Auxiliary Dam. No valley elderberry longhorn beetles or exit holes were observed, although the diameter of the shrubs (all are at least one inch at ground level) suggest they could serve as potential habitat for the valley elderberry longhorn beetle (Corps 2012h). However it remains unlikely for valley elderberry longhorn beetles to be present in the proposed project area due to their poor dispersing abilities (Corps 2012e).

3.8.2 Environmental Consequences

The DEIS (Section 3.10.3) details the potential impacts of the Alternative Plan 4 on biological resources. Refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand. This would remove the potential for disturbance to patches of riparian woodland, woody vegetation, and hydrophytic herbaceous vegetation in the South Fork area, as well as to the birds and other species that use the nearby habitat and potential habitat. Also, the truck traffic and noise associated with transporting the sand would be eliminated, reducing the potential for animal strikes and noise disturbance to wildlife between the South Fork area and the DSM Project Action Area.

Additional refinements since the DEIS that minimize the frequency and duration of a low construction pool would reduce potential impacts on water quality in the lake. Water quality impacts fish, wildlife, and birds. As was indicated in Section 3.6.2 of the DEIS, water quality standards are not always met at present. The lower lake levels, especially in the summer season, could increase turbidity, algal blooms, water temperatures, nutrients, and create an imbalance in dissolved oxygen and optimum pH. However, as a result of the refinement to reduce the frequency and duration of the periods when a low construction pool is required, the potential adverse impacts on fish and wildlife and their habitat would be considerably less than what was anticipated in the DEIS. This is further discussed under the Water Quality section (Section 3.4) of this FEIS.

As a result of the wetlands delineation conducted in June 2012, a smaller areal extent of wetland disturbance is anticipated than was presented in the DEIS. Approximately 0.33 acres of wetlands would be impacted or filled due to construction and staging activities. Approximately 0.05 acres of open water located in the Borel Canal immediately downstream of the Auxiliary Dam would be filled as part of the relocation of the Borel

Canal. The Corps anticipates that this loss of open water would be replaced in kind with the new canal to be constructed between the Borel tunnel and the downstream tie-in to the existing canal. With implementation of mitigation measures, impacts on the wetlands would be direct, adverse, low, and less than significant and would be less than what was anticipated in the DEIS.

The sensitive and rare plant survey conducted in June 2012 identified direct impacts on Tracy's eriastrum and Kernville poppy likely to occur due to construction actions in the Action Area. The survey indicated that potential impacts could also occur to alkali mariposa lily, rose-flowered larkspur, and Kern Canyon clarkia, which have been noted in the vicinity of the Isabella Lake DSM Project. Impacts on these species were not identified in the DEIS. Although these species are not Federally-protected, the Corps would implement mitigation measures to minimize impacts. With implementation of these mitigation measures, impacts on these species would be direct, adverse, moderate, and less than significant.

During the June 2012 surveys nine elderberry shrubs providing potential host habitat for the Federally threatened valley elderberry longhorn beetle were recorded at three locations near or within in the Action Area. No valley elderberry longhorn beetle or exit holes were observed. Because these host plants would be impacted by the proposed construction activities, the Corps has prepared a Biological Assessment and requested Programmatic Section 7 Consultation with the USFWS on impacts on this species, to include a Biological Opinion (Corps 2012i). The Corps has also proposed conservation measures including transplantation, compensatory plantings, and protection in place, consistent with USFWS guidelines (USFWS 1999). With implementation of these mitigation measures impacts on this species would be direct, adverse, moderate, and less than significant. Impacts on this species were previously discussed in Section 3.10.3 of the DEIS.

With regard to cumulative impacts on Biological Resources, there would be no changes from what was presented in Section 4.4.8 of the DEIS under the Preferred Alternative, including the refinements presented in Chapter 2 of this FEIS, and the additional surveys and refinements discussed in this Section 3.8 of the FEIS.

Mitigation for Known Impacts

The DEIS (Section 3.10.4) describes the environmental commitments and mitigation measures for Biological Resources. Additional recommended measures for the impacted rare plants onsite based on the additional post-DEIS surveys conducted during June 2012 include:

Rare and Sensitive Plants

- Develop a habitat restoration plan that incorporates seeding, planting, and other vegetation rehabilitation techniques. The plan should also address pre-construction vegetation and topsoil salvage, as appropriate, and post-construction monitoring.

- Salvage seeds to re-spread on impacted areas for recovering natural biotic processes in recovery areas;
- Carefully salvage plants suitable for transplanting, if necessary and as appropriate;
- Clearly mark avoidance areas on project plans;
- Survey native habitat areas prior to construction and flag, fence, or otherwise mark avoidance areas in the field for exclusion ensuring that protected areas and sites suitable for plant and propagule collection are secured; and,
- As necessary, implement post-construction monitoring to determine overall restoration success.

Valley Elderberry Longhorn Beetle

- Prior to site preparation, the Corps will implement avoidance and minimization measures from the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999) as proposed in the Biological Assessment (Corps 2012i).
- The Corps will implement the Reasonable and Prudent Measures (RPMs) necessary to minimize impacts as required by the Biological Opinion prepared by the USFWS.

Wetlands

- In order to mitigate for the permanent loss of .33 acres of wetlands resulting from project feature construction, the Corps would purchase appropriate acreage compensation off-site at an approved wetland mitigation bank approved by the USFWS before completion of project. 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 the loss of .33 acres of wetland habitat.

Fish and Wildlife

Implement the following recommendations from the USFWS:

- Provide the USFWS with any changes to the acreage of each cover-type that would be permanently impacted, temporarily impacted, or created in each alternative as planning progresses.
- Avoid impacts on migratory birds nesting in trees along the access routes, haul routes, staging areas, and adjacent to the proposed construction areas by conducting pre construction surveys for active nests. These surveys and results should be factored into the proposed project schedule.
- Avoid potential future impacts by ensuring all fill material is free of contaminants.

- Minimize temporary impacts in all disturbed areas by replanting/reseeding with appropriate native plant species. Revegetated areas should be monitored for 5 years or until they have been determined to be fully established.
- Focus on decreasing/minimizing the duration of gross pool drawdown necessary for construction. Likewise, focus on decreasing/minimizing the duration and depth of inundation of upstream delta habitat on the North and South Forks Kern River.
- Use the following compensation acreages for permanent impacts on the three habitat types calculated in the HEP. Compensate for impacts on the sagebrush scrub upland cover-type by creating 110.45 acres sage-brush scrub. Compensate for impacts on the emergent wetland cover-type by creating 0.30 acre of emergent wetlands. Compensate for impacts on the pineoak woodland cover-type by creating 41.88 acres of pine-oak woodland.
- Coordinate with the USFWS, the USFS and the California Department of Fish and Game (CDFG) to develop a strategy for habitat development at the mitigation site.
- Contact the CDFG regarding possible effects of the proposed project on State listed species.

3.9 LAND USE

3.9.1 Affected Environment

The Land Use section of the DEIS (Section 3.11) sufficiently characterizes the affected environment for this resource. In addition to other BLM lands described in the DEIS, the BLM manages a small parcel south of State Highway 155 on the Kern River that abuts the Keyesville Special Recreation Management Area (SRMA). This land was formerly managed by the Corps. There have been no additional revisions, studies or new data relevant to the discussion of the affected environment.

3.9.2 Environmental Consequences

The DEIS (Section 3.11.3) details the potential impacts of the Alternative Plan 4 on Land Use. Refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand, which would eliminate the impacts of a temporary change in land use in that area during construction.

The exact realignment footprints of Highway 178 and Highway 155 may require adjustment of existing rights of ways or the attainment of additional rights of ways. This could result in a change in land use. The exact alignments would be determined during final design with rerouting options determined in consultation with Caltrans and analyzed in detail in a follow-on action (See Section 1.4.5 of this FEIS). Subsequent to the release of the DEIS, the Corps is considering a refinement of the Highway 155 realignment to be closer to the existing roadway, and include a widening of the existing bridge rather than constructing a new bridge. This would likely result in very little change in land use in the

highway corridor but could impact recreational land use at Pioneer Point, north of the Main Dam along Highway 155.

The Corps has determined since the release of the DEIS that a rock material disposal area (approximately 54 acres) would be established on Engineers Point, to receive the unused rock material from the Emergency Spillway excavation. The analysis in the DEIS had determined that recreational facilities, uses and public access to Engineers Point would be precluded during construction. The Corps anticipates that recreational land use could resume on Engineers Point after construction and that the excess material disposed on the site may result in enhanced recreational opportunities at Engineers Point. Plans for Engineers Point would likely be included in the *Recreation Plan* to be prepared and completed prior to the start of the proposed Isabella Lake DSM Project construction (See Section 1.4.2 of this FEIS).

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.9 of the DEIS) or environmental commitments and mitigation measures (Section 3.11.4 of the DEIS).

3.10 RECREATION

3.10.1 Affected Environment

The recreation section of the DEIS (Section 3.12.2) sufficiently characterizes the affected environment for this resource. There have been no additional revisions, studies, or new data relevant to the discussion of the affected environment. The Corps continues to gather observational baseline information about the timing and intensity of recreational facility use.

3.10.2 Environmental Consequences

The DEIS (Section 3.12.3) details the potential impacts of Alternative Plan 4 on recreation. One key update to the DEIS resulting from internal review by the Corps and based on agency and public comments is the reevaluation of impacts on Recreation. Short-term impacts on Recreation were characterized in the DEIS as moderate, or moderate-to-high during construction and not considered significant due to the limited area or degree of effect. In consideration of the comments received and reconsideration of the factors used in assessing the context and intensity of the anticipated impacts, the Corps has determined that DSM project would result in short-term significant impacts on Recreation. This is because during the multi-year construction period access to recreational opportunities and some key facilities would be eliminated or restricted, there would be a substantial disruption in recreational use and activities and the quality of the quality of the recreational experience would be diminished.

Under the Preferred Alternative, the use of Engineers Point for material disposal would eliminate the need for lowering the lake to an elevation of approximately 2,543 feet NAVD 88 (72,237 acre-feet) for a nine–month period to construct an upstream berm on the Auxiliary Dam. The construction pool elevation has now been limited to a four to six month window from Fall 2020 to early Spring 2021. This takes advantage of the

seasonal low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This further minimizes the construction-related impacts on recreation as described in the DEIS (Section 3.12.3) and further reduces the environmental impacts on recreation over the entire construction period.

Under the refinements, the relocated and smaller coffer dam required for the relocated Borel Canal would be constructed outside of the recreation season at a time when lower pool levels are expected. It is likely that this coffer dam would not require later removal, since it may be retained to provide additional access to Engineers Point during and following construction. These refinements would remove the need for the lake to be lowered to the construction pool elevation for the two 2-month periods for constructing and removing the coffer dam as previously proposed in the DEIS. It is anticipated that most of the construction proposed within the gross pool of the lake may be accomplished without a major reduction of the average summer recreation pool level shown in Figure 3-31 of the DEIS.

For the majority of the multi-year construction period the lake would remain under its current IRRM operation with the pool restriction (elevation 2,589.26-feet NAVD 88; 361,250 acre-feet). The maximum lake level would be restricted by 4 feet to 2,585.26 feet NAVD 88 (325,400 acre-feet) during a ten-month period during 2020 that the coffer dam is in service, instead of a six-month period as described in the DEIS. Recreation would continue on the lake during construction. The periods of lowered lake elevation would have an adverse impact on water–based recreation and recreation access, as well as the overall experience for camping and other land-based recreation activities. The typical drawdown of the lake through the summer months is followed by a reduction in recreation use at the lake.

In order to assess impacts on recreation from these lowered lake pool levels, the levels should be compared to the historic summer averages recorded for Isabella Lake. Except for the construction pool elevations now scheduled for the fall and winter, the restricted lake levels under the Preferred Alternative are similar to the levels experienced in recent years under the IRRM restrictions (See Figure 3-31 of DEIS). Also, while the design gross pool elevation prior to the implementation of the restricted IRRM pool was much higher, historically the average summer elevation of the lake has been approximately 2,576 feet NAVD 88 (248,200 acre-feet).

It may be necessary to begin to draw down the lake in late summer of 2020 to prepare for construction. Depending on the amount of water available that year and the needs of downstream agricultural users, more water may be released in late recreation season than is normal, causing higher flows downstream. These higher flows may provide short-term benefits to rafting and kayaking. The Corps would work with local interest groups to provide notification regarding any changes to normal flow conditions. Also, the Corps would coordinate any necessary early releases with downstream users.

Impacts on fishing conditions are not expected to change greatly from those experienced under IRRM levels in recent years and summer lake levels historically. Under the

Preferred Alternative there would be no induced construction pool lowering during the summer months and the construction pool level would only be required during a four-to-six-month window from October 2020 through March 2021, reducing the potential for impacts on fishing. There is always the potential for drought in any given year and the few remaining pool restrictions may affect the Corps' ability to store water that may be needed to maintain levels beneficial to recreational fisheries immediately after the construction period.

The Annual Isabella Lake Fishing Derby is held in March or April, which are typically wet months. Under the refinements, an induced construction pool is only anticipated in the months prior to the event in 2021. All other years, the construction is not anticipated to affect lake levels for this event. Stocking of fish during the winter months may need to account for a lowered pool. Impacts on visitation to the lake for fishing or for this event would continue during the construction period in 2021 if the overall recreation experience is degraded by low fish catches, diminished water surface, and increased distance between amenities such as campgrounds to the new construction-level shoreline.

The placement of unused rock material from the Emergency Spillway on Engineers Point above and below the OHWM may impact adjacent fisheries during construction. These impacts would be temporary, and with the use of BMPs and implementing an approved *Rock Material Disposal Management Plan,* impacts would be reduced to less than significant levels. The proposed project would not adversely affect the environmental value of the lake and the Corps intends to provide fish habitat enhancements as part of the project. Excess material disposed on the site could be used to enhance recreational opportunities at Engineers Point, and such plans could be included in the *Recreation Plan* to be prepared and completed prior to breaking ground for the proposed Isabella Lake DSM Project construction (See Section 1.4.2 of this FEIS).

Lower lake levels would directly impact public boat launch facilities, making some unusable and increasing visitor congestion at others. The refinements minimizing the low construction pool would reduce the potential for these impacts. Pool restrictions under the IRRM or when construction is occurring behind the coffer dam should not inhibit use of these facilities, but dam operations or natural drought conditions could also create low lake levels.

The elimination of the South Fork Delta Area as a borrow source would eliminate identified impacts on recreation and the overall recreational experience from the audible intrusion of heavy construction equipment and sand hauling dump trucks, thereby degrading the quietness and less developed recreation experience often sought by campers. Construction and support actions at this location would have also generated dust from the movement of vehicles, soil excavation, and wind blowing across exposed soil. Fugitive dust would indirectly affect the recreation experience by diminishing atmospheric clarity. The elimination of this borrow source area would also remove anticipated impacts on recreation and the overall recreation experience from noise and truck traffic along Highway178 resulting from the transport of sand material to and from the construction site.

As a refinement under the Preferred Alternative, the Highway 155 realignment would be closer to the existing roadway, and include a widening of the existing bridge rather than constructing a new bridge, as was presented in the DEIS. To maintain the necessary grade of the roadway, this refined alignment would need to begin farther up Highway 155 than was proposed in the DEIS and would likely involve adverse impacts on a portion of the Pioneer Point Recreation Area. An impact analysis of the realignments of Highways 155 and 178 would be updated in a supplemental NEPA document tiered from the EIS (See Section 1.4.6 of this FEIS).

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.10 of the DEIS) with the exception of the release of the Final Bakersfield Field Office RMP/EIS. Under the Proposed Plan cumulative positive effects on recreation may occur with the expansion and marketing of the Keyesville Special Recreation Management Area (SRMA). The SRMA would be established with a "destination" market strategy for southern and central California, including the population centers of Bakersfield, Los Angeles, Riverside, and San Bernardino, along with nearby rural communities. Promotion of adjacent recreational uses and new recreation amenities would enhance local recreational opportunities until lake facilities are restored.

There would be no additional negative impacts on wildlife viewing and hunting, day use visitation, special recreation events, regional recreation, or the long-term impacts associated with implementing the Preferred Alternative beyond those discussed in the DEIS.

There are no additions to the environmental commitments and mitigation measures described in Section 3.12.4 of the DEIS associated with refinements to the Preferred Alternative with the following exception:

- The Corps plans to prepare a *Recreation Plan* during 2012-2013 to further explore and identify options for mitigation to offset adverse effects to recreation resulting from construction of the Isabella Dam Safety Modification Project. The Corps cannot use project funds to replace or relocate USFS recreation facilities, so the Corps will seek to collaborate with the USFS and other stakeholders to identify other options for implementation.

3.11 AESTHETIC RESOURCES

3.11.1 Affected Environment

The Aesthetics Resources section of the DEIS (Section 3.13) characterizes the affected environment for this resource. There have been no additional revisions, studies or new data generated that are relevant to the discussion of the affected environment.

3.11.2 Environmental Consequences

The DEIS (Section 3.13.3) assesses the general construction-related and long-term impacts on visual resources that would be anticipated from implementing the Isabella

Lake DSM Project. Visual simulations of various project elements from several KOPs are provided of the current views and those of proposed construction-related and permanent

The proposed realignment of Highway 155 and Highway 178 would change the visual character of the existing features and likely change public viewpoints of the lake, dams, and surrounding communities. An impact analysis of the realignments of highways 155 and 178 would be updated in a supplemental NEPA document tiered from the EIS (See Section 1.4.6 of this FEIS).

Other refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand. This refinement would eliminate the temporary construction-related adverse visual impacts in this area due to the sand borrow operation, security lighting, equipment use, staging, dust, and transport to the action area.

Additional refinements since the DEIS that minimize the frequency and duration of a low construction pool would also reduce adverse visual impacts resulting from the low water elevation, exposure, runoff of sediment into the lake, blowing dust, shoreline vegetation loss, and possibly wildlife viewing opportunities.

Use of Engineers Point as a material disposal area would permanently alter the existing contours and visual character of this area. In the long-term, material placed on Engineers Point could be configured to enhance recreational uses and be aesthetically pleasing. Therefore, long-term aesthetic impacts resulting from changes in visual features to Engineers Point are likely to be beneficial and less than significant. Construction-related visual impacts would be temporary and include the presence of construction equipment and vehicles, glare, worker activity, dust, and material storage and movement.

3.12 CULTURAL RESOURCES

3.12.1 Affected Environment

The cultural resource section of the DEIS (Section 3.14) sufficiently characterize the affected environment for this resource. For further discussion of Traditional Cultural Properties, as well as the regulatory setting for compliance with the Archaeological Resources Protection Act and the Native American Graves Protection and Repatriation Act refer to pages 3-319 through 3-323 of the DEIS.. An additional cultural resource inventory reference for the survey and evaluation of USFS Administrative Building and Compound, Corps Project Office site, and other structures has been added to Chapter 4 of this FEIS as well.

Native American Consultation

Subsequent to the release of the DEIS, the Corps executed a programmatic agreement (PA) on July 31, 2012 to provide guidelines for compliance with Section 106 when the effects on historic properties are unknown. The Corps invited the USFS to be a signatory to the PA, and invited the Tule River Indian Tribe, The Bishop Paiute Tribe, the Santa Rosa Tachi Yokut Rancheria, and the Tübatulabal Tribe to be concurring parties.

Outreach to these and other tribal representatives and other potential concurring parties to the PA would continue.

Tübatulabal Tribal Chairwoman Ms. Donna Miranda-Begay responded to the invitation to participate in the PA and offered a number of comments on it. The Corps was able to address most comments without making any changes to the PA with the exception of the inclusion of a stipulation regarding confidentiality. Additionally, Chairwoman Miranda-Begay sent the Corps ethnographic information that had been compiled by ethnographer Dr. Dorothea Theodoratus.

Consultation correspondence prepared subsequent to the release of the DEIS and the executed PA can be found in Appendix D of this FEIS. Consultation is ongoing and the Corps will continue to engage tribal representatives, other Federal agencies and relevant stakeholders in the identification, evaluation and analysis of effects resulting from the DSM Project on cultural resources.

3.12.2 Environmental Consequences

The DEIS (Section 3.14.3) details the potential impacts of Alternative Plan 4 on cultural resources. The following revisions have been added to the cultural resource impact analysis to clarify effects associated with the Preferred Alternative.

Refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand. This refinement would eliminate the potential impacts due to sand excavation, removal, and vehicle use on buried cultural resources that may have been present at that location.

The refinements to the Borel Canal relocation involve shifting the proposed relocation alignment further west, outside of the Kern Canyon Fault shear zone, and partially through Engineers Point. Although these refinements would remove the need for the lake to be lowered for the two 2-month periods for constructing and removing the coffer dam, there would still need to be a lowering of the lake level to the construction pool elevation for a period of four to six months to complete the construction of the approach channel for the realigned Borel Canal tunnel-conduit, and for removal of the short section of the existing Borel Canal that would no longer be needed between the Auxiliary Dam and the new upstream tie-in. Induced lake lowering for the construction of the upstream berm on the Auxiliary Dam has also been eliminated. Refinements since the DEIS that minimize the frequency and duration of a low construction pool would also reduce the potential for impacts resulting from the exposure of inundated cultural resource sites. The removal of the small section of the Borel Canal in the lake and the relocation of the alignment are not expected to impact cultural resources. The Borel Canal has been evaluated as a cultural resource and has been determined to be not eligible for listing on the NRHP.

Although the Area of Potential Effects (APE) for the Preferred Alternative has not been formally defined, the APE would be expanded and include Engineers Point. The use of a portion of Engineers Point as a material disposal area and reconfiguring this land and

material would add a higher degree of disturbance to this area and could impact cultural resources, if present.

Impact analyses of highway realignments would be updated in a supplemental NEPA document tiered from this EIS. Appropriate cultural resource identification and evaluation efforts, and compliance with the NHPA through the PA would be completed prior to implementation of the road projects. Tribal consultation will be ongoing throughout the planning and the implementation of the road projects, as appropriate.

As a refinement under the Preferred Alternative, the Highway 155 realignment would be closer to the existing roadway, and include a widening of the existing bridge rather than constructing a new bridge, as was presented in the DEIS. This refinement would reduce potential impacts on cultural resources that may have been directly impacted by the corridor described in the DEIS.

Much of the APE for the Preferred Alternative has been surveyed for cultural resources. However, the older surveys are out of date, and are possibly inadequate by contemporary standards. All of the APE would require additional surveys that meet contemporary standards for survey procedures and documentation; and would include consideration of a landscape level analysis, if needed. The Corps will ensure that the identification, evaluation and effects analyses are completed for this undertaking in accordance the executed PA. Tribal consultation will be ongoing throughout the planning and the implementation of the DSM Project, as appropriate.

If the Corps determines that an adverse effect would result from the undertaking, acceptable measures will be developed in consultation with interested parties to resolve adverse effects and thus mitigate impacts to a less-than-significant level. If the action were to have an adverse effect that could not be resolved, a significant impact under NEPA could result.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.12 of the DEIS) with the following exception.

The Corps acknowledges that past actions during the construction and operation of the dams over the last 60 years have impacted cultural resources. Since the passage of the NHPA and other requirements, the Corps has taken into account the effects of its undertakings on historic properties and will continue to do so through the recently executed PA. Consultation is ongoing and the Corps will continue to engage tribal representatives, other Federal agencies and relevant stakeholders in the identification, evaluation and effect analysis of the DSM Project on cultural resources. Compliance with cultural resource laws and regulations would reduce the level of impact associated with the proposed DSM project and not contribute to cumulative impacts.

The following mitigation measure has been updated from the language included in the DEIS (Section 3.14.4).

Specific mitigation measures would be developed to address any adverse effects on historic properties. Depending on the nature of the adverse effect, these could include the following:

- Developing a plan of action, pursuant to NAGPRA; between the Corps, USFS, and interested Indian Tribes to manage the disposition and treatment of human remains should any be encountered during project implementation. The principle purpose of the plan will be to prevent halting construction, while the remains are disinterred, and to determine the cultural affiliation of any human remains, sacred objects or items of cultural patrimony.

3.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.13.1 Affected Environment

The Socioeconomics and Environmental Justice section of the DEIS (Section 3.15) sufficiently characterizes the affected environment for this resource. There have been no additional revisions, studies, or new data generated that would be essential to the discussion of the affected environment.

3.13.2 Environmental Consequences

The DEIS (Section 3.15.3) describes the potential construction-related and long-term impacts on Socioeconomics and Environmental Justice that would be anticipated from implementing the Isabella Lake DSM Project. Assessment of potential project impacts on the local economy found both short- and long-term benefits associated with construction related spending in the Kern River Valley and unrestricted reservoir operations upon completion of the project. There may be negative short-term impacts on property values during the construction period, but it is anticipated that in the long-term property values would improve with restored lake-levels, recreational and employment opportunities, and lower safety risk.

Additional refinements since the DEIS that minimize the frequency and duration of a low construction pool would reduce potential construction-related impacts on the recreation-based economy. Low lake levels are associated with a variety of potential impacts that could lead to reduced recreation use and perceived decrease in recreation quality that could affect recreation-related spending patterns and local economic activity. These refinements would help maintain consistent recreational use and recreation-related spending during the construction period and reduce the potential for adverse impacts on income and employment in the region, particularly in the towns surrounding Isabella Lake.

Likewise, the refinements that minimize the low construction pool would also maintain more consistent power generation and flexibility in releasing water for downstream uses. Under low-pool conditions, hydropower generating facilities would be less likely to produce electric power, resulting in economic loss. Likewise for irrigation use, the timing of releases may not be beneficial or efficient for downstream use or storage resulting in

economic loss. The refinements would reduce the potential for adverse impacts on these important economic uses during the construction period.

Under the Preferred Alternative, the construction of the Highway 155 and Highway 178 highway realignments would be moved forward in the schedule to 2014 through 2016. Positive regional and local expenditures, employment, and income related to these construction projects would be realized prior to initiating the actual dam remediation work. Although the project construction end date would be similar, the need for worker lodging and housing for the highway realignment work would not overlap with that of the dam remediation project and thus have less potential adverse impact on community services, housing, and community cohesion.

The elimination of the South Fork Delta Area as a source of filter sand would reduce the need for expenditures for equipment, labor, fuel, and trucking of the sand to the construction action area at the dams. This would reduce positive construction-related inputs to the economy from that project element, but some expenditures would be shifted to the action area. The reduction in anticipated truck traffic would have a positive effect on the quality of life outside of the action area by reducing the potential for noise, diminished air quality, traffic, disruption of recreation, and slower emergency response.

There would be no changes from what was presented in Section 4.4.13 of the DEIS for cumulative impacts with the exception of the release of the Final Bakersfield Field Office RMP/EIS. Under the Proposed Plan cumulative positive economic effects may occur with the expansion and marketing of the Keyesville Special Recreation Management Area (SRMA). The SRMA would be established with a "destination" market strategy for southern and central California, including the population centers of Bakersfield, Los Angeles, Riverside and San Bernardino, along with nearby rural communities. Promotion of other recreational uses and new recreation amenities may help sustain or expand the local recreation-based economy until lake facilities are restored.

There are no additions to the environmental commitments and mitigation measures described in Section 3.14.4 of the DEIS associated with refinements to the Preferred Alternative with the exception of the clarification of the purpose and scope of the Recreation Plan as described in Section 1.4.2 of this FEIS.

3.14 PUBLIC HEALTH AND SAFETY

3.14.1 Affected Environment

The Public Health and Safety section of the DEIS (Sections 3.16) characterizes the affected environment for this resource. As described in Section 3.16.2 public health and safety issues and concerns can include seismic activity and landslides, flooding, degraded air quality, traffic obstructions to emergency response, HTRW, noise and vibration, recreation safety, vector-borne diseases (such as West Nile virus), air-borne fungal spores from disturbed soils (such as valley fever), water-borne threats (such as cyano bacteria), and project and homeland security. Some of these concerns are described in other sections of the DEIS. These are the following:

- Seismic activity and landslides (Sections 3.6.1 and 3.6.2);
- Degraded air quality (Sections 3.7.1 and 3.7.2);
- Water-borne threats (Sections 3.8.1 and 3.8.2);
- Traffic obstructions to emergency response (Sections 3.9.1 and 3.9.2);
- Noise and vibration (Sections 3.10.1 and 3.10.2); and
- HTRW (Sections 3.11.1 and 3.11.2).

Subsequent to the release of the DEIS, there have been no additional revisions, studies or new data relevant to the discussion of the affected environment. The public has identified health and safety concerns regarding air quality and dust, lower lake levels exposing in-lake hazards, valley fever, hazardous materials, blasting, and increased traffic and emergency response.

3.14.2 Environmental Consequences

The DEIS (Section 3.16.3) details the potential impacts of the Alternative Plan 4 on Public Health and Safety. Additional information regarding the Public Health and Safety effects associated with the Alternative 4 analysis may be found Sections 3.6.3, 3.7.3, 3.8.3, 3.9.3, 3.10.3, and 3.11.3 of the DEIS. It has been subsequently noted that the closure of Launch 19 during construction would remove from service the only *Americans with Disabilities Act* compliant boat launch currently available. Likewise, the construction closures of recreational sites and increased use and demand at other recreation sites will increase the need for additional sanitary facilities and upgrades.

Refinements in the Preferred Alternative since the release of the DEIS include the elimination of the South Fork Delta Area as a source of filter sand. This refinement would eliminate the potential for worker accidents and dust generation at this site. In addition to reducing health concerns from dust particulate there may be some reduction in the disturbance of soils containing fungal spores for valley fever, although typically these would be present in more arid soils. This refinement would also eliminate a considerable amount of construction-related truck traffic and reduce the potential for accidents and delays in emergency response.

Additional refinements since the DEIS that minimize the frequency and duration of a low construction pool would also reduce potential human health impacts from fugitive dusts, poor water quality, and safety issues from in-lake hazards for boating and other recreation on the lake. The potential for more frequent larger releases into the river of up to 4,600 cfs to maintain the construction flood pool and during the temporary closure of the Borel Canal would be reduced under this refinement, reducing some of the safety concerns for rafters and riverside recreation resulting from high flows downstream in the Kern River.

Subsequent to the release of the DEIS, air quality modeling and a health risk assessment have been prepared on the Preferred Alternative (See Appendices E and F of this FEIS).

Additional information regarding the Public Health and Safety effects associated with the Preferred Alternative analysis may be found Sections 3.2, (Geology and Soils), 3.3 (Air Quality), 3.4 (Water Resources), 3.5 (Traffic and Circulation), 3.6 (Noise and Vibration) and 3.4 (HTRW) of this FEIS.

There would be no changes from what was presented in the DEIS for cumulative impacts (Section 4.4.14 of the DEIS) or environmental commitments and mitigation measures (Section 3.16.4 of the DEIS).

CHAPTER 4

CORRECTIONS TO DEIS TEXT

CHAPTER 4.
CORRECTIONS TO DEIS TEXT

4.1 INTRODUCTION

This chapter identifies specific corrections to the DEIS that were identified in public and agency comments received during the 60-day DEIS review period and during review by the Corps following the release of the DEIS. Text corrections are organized sequentially for those chapters and sections of the DEIS receiving corrections. For each correction, the location is identified by page and paragraph number on the particular page or pages of the DEIS. Where text is corrected, deleted text is indicated in "strikethrough" format and new text is underlined.

4.2 CORRECTIONS TO DEIS CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

Section 1.5 DESCRIPTION OF THE ISABELLA DAM PROJECT

Page 1-7, first paragraph has been corrected as follows:

The Main Dam is a zoned, earth-filled structure with an impervious central core and decomposed granite outer shell. Its maximum height is 185 feet tall and its crest length is 1,695 feet, with a top width of 20 feet. The crest elevation is 2,637.~~76~~ 26 feet NAVD 88 (unless otherwise stated. all elevations are "above mean sea level" based on NAVD 88 vertical datum). This provides 6.5 feet of freeboard above the Spillway design flood elevation of 2,630.76 feet. The storage capacity is ~~586,100~~ 568,075 acre-feet (an acre-foot is the amount of water that would cover an acre to a depth of one foot). The embankment materials are essentially homogeneous. A five-foot-thick drainage blanket was placed beneath the downstream shell along about one-third the width of the base of the dam. The foundation consists primarily of granitic rock; however, a zone of streambed alluvium beneath a portion of the downstream shell (two to five feet thick) was left in place. A thick layer of riprap 2.5 feet thick armors the upstream face for erosion protection. A wedge-shaped zone of rockfill, varying from 0 feet to about 40 feet thick, was also placed on the downstream face below elevation 2,254.61 feet. A 12-foot-wide centerline cutoff/inspection trench was excavated along portions of the foundation, and then a grout curtain was installed, with a variable depth of 15 to 75 feet.

Vertical Datum

The North American Vertical Datum of 1988 (NAVD 88) is used as the standard vertical control datum in this Draft EIS to express height above mean sea level. The NAVD 88 replaced the National Geodetic Vertical Datum of 1929 (NGVD 29). References are also made in some supporting documents to the Isabella Project Datum (IPD) that was established to construct the dam.

Approximate conversions are:

NGVD 29 datum to NAVD 88 datum: add 2.61 ft.

IPD to NAVD 88 datum: add 3.76 ft.

4.3 CORRECTIONS TO DEIS CHAPTER 2: DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Section 2.3 ALTERNATIVES CONSIDERED IN THIS EIS

Section 2.3.13 Support Actions and Activity Sites Common to the Five Action Alternatives

Page 2-46, Staging Areas and Haul Routes, first paragraph has been corrected as follows:

To support the activities needed to construct the remediation measures on the Main Dam, spillway, and Auxiliary Dam over the multi-year construction period, the Corps has determined that five construction staging areas and ~~four~~ five temporary haul routes would be established to support construction activities in the Primary Action Area (See Figure 2-25). In Table 2-2, some of the key information about these support staging areas and haul routes is summarized.

Pages 2-52 to 2-53, Batch Plant, first paragraph has been corrected as follows:

A temporary electric-powered concrete Batch Plant would be set up in the vicinity of the new Emergency Spillway area to prepare concrete needed to construct the RCC Overlay and/or the concrete footing for the labyrinth spillway. This is required for either the 400-foot-wide or 900-foot-wide spillway. The concrete prepared in the Batch Plant would be moved along an electric-powered conveyor over the existing spillway channel to the Main Dam for the RCC overlay, and/or to the location of the labyrinth spillway structure. This Batch Plant would not be required for the Alternative Base Plan, but would be required for Alternative Plans 1, 2, 3, and 4 since these four alternatives include an RCC Overlay measure on Main Dam or, in the case of Alternative Plan 4, a large spillway structure. The total amount of concrete anticipated to construct the RCC Overlay is 125,000 CY. The total amount of concrete needed for the 900-foot-wide spillway ~~along~~ is 36,529 CY. The water, coarse aggregates, and sand for making concrete in the Batch Plant would be supplied from on-site sources (lake, rock Crushing Plant, the two sand borrow sites), respectively. The dry cement, fly ash, and water reducer ingredients would be supplied from plants in the Barstow area and stockpiled on Staging Areas A2 and/or A3. The anticipated primary haul route for these ingredients would be HR2 (Hwy 178).

Page 2-53, Filter Sand Borrow Sites and Washing Facility, second paragraph has been corrected as follows:

Constructing the filter layers on the Main and Auxiliary Dams is anticipated to require sand quantities that would range from about 675,400 CY for the Alternative Base Plan; about 1,000,600 CY for Alternative Plan 1; about 1,032,500 CY for Alternative Plans 2 and 3; and about ~~1,500,000~~1,100,000 CY for Alternative Plan 4. The Corps has determined that for all five alternatives, 50% of the required amount of sand would be collected from each of the two selected borrow sites.

Pages 2-53 to 2-54, Filter Sand Borrow Sites and Washing Facility, third paragraph has been corrected as follows:

Although sand available from the two selected borrow sites has the required characteristics, the excavated sand would need to undergo a washing process to remove fines, organics, and other material that could reduce the filtering effectiveness of the sand. The Corps has determined that for efficiency and to help reduce potential environmental effects, a temporary sand washing operation would be established within Staging Area A1, which is the Auxiliary Dam Recreation Area (See Figures ~~2-23 and 2-24~~2-26 and 2-27). Establishing the washing operation at Staging Area A1 would allow for raw sand extracted from the Auxiliary Dam Recreation Area to be directly conveyed to the washing facility, cleaned, and stockpiled in Staging Area A1. Also, raw sand extracted from the South Fork Delta area would be temporarily stockpiled at the South Fork Delta area and hauled via trucks along Patterson Lane and Hwy 178 to the washing facility and stockpiled at Staging Area A1. Patterson Lane may need to be improved with gravel or other materials to accommodate truck use.

Page 2-55, Lake Level Management during Construction, sixth paragraph has been corrected as follows:

Also, the Corps would endeavor to ensure that during the multi-year construction period, the expected flows under agreement with all the downstream users would be maintained or otherwise accounted for. This would include either continuing to provide water (up to 605 cfs) to SCE, or reaching some other agreement regarding the loss of SCE's ability to generate electricity should the Borel Canal flow need to be interrupted. This situation would occur under all ~~four~~ five Action Alternatives for the nine month period of June 2019-February 2020. This situation is also likely for the approximately four-month period of time required to complete the final upstream and downstream tie-ins to the Borel Canal associated with the relocation of the Borel Conduit through the Right Abutment of the Auxiliary Dam included under the Alternative Base Plan and Alternative Plans 1, 2, and 4. This situation would also occur under all five Action Alternatives for the nine-month period of June 2019-February 2020.

Page 2-56, Work-around of Important Local Events, first paragraph has been corrected as follows:

The Corps has determined that suitable adjustments in the ongoing multi-year construction schedule may need to be made to accommodate important short-term local reoccurring events such as the 3-day Annual Fishing Derby, traditionally held on a Saturday, Sunday, and Monday; the weekend before Easter ~~in April~~. The Corps would require the contractor to coordinate with the USFS, local communities and organizations to safely accommodate in so far as is practicable, local events that might be affected by construction and support activities. Adjustments to the construction schedule might include restricting off-site truck hauling on certain days to accommodate short-term spikes in tourist and/or recreation-related traffic in the Isabella Lake area that may be associated with special local events.

Section 2.3.14 Construction-related Assumptions Included in this Draft EIS

Pages 2-56 to 2-57, first paragraph, second, fourth, and seventh bullets have been corrected as follows:

- Isabella Lake levels would be managed in accordance with the current deviation from the Water Control Plan with the exception of the lowering the maximum lake elevation to 2,543.76 feet for a period of nine months for construction of an Auxiliary Dam upstream berm. For the Alternative Base Plan and Alternatives 1, ~~and~~ 2, and 4 there would also be a lowered pool of 2,543.76 feet for a two month period (December 2016-January 2017), and for another two-month period (August-September 2017), to allow for construction and removal of a coffer dam at the Right Abutment of the Auxiliary Dam. When the coffer dam is in operation, the maximum pool would be 2,585.26 feet, approximately four feet lower than the current deviation.
- The typical work day (including daylight) would be ~~10~~ 8 hours for workers, with a daily running time for the majority of equipment and vehicles of 8 (daylight) hours, except for mechanics trucks, fuel/lube trucks, and pick-up trucks, whose typical running time would be 4 (daylight) hours. A notable exception to the typical equipment running time would be the diesel generators (up to four) required at the Auxiliary Dam to keep the dewatering pumps at the Auxiliary Dam operating 24-7 for the duration of the construction periods (for each alternative) to support construction of the remediation measures at the Auxiliary Dam. The dewatering wells would be required when the downstream foundation area of the Auxiliary Dam is temporarily excavated and re-compacted below the existing ground surface. Dewatering would be required during this time to ensure dam safety and to improve constructability.
- The Crushing Plant, Batch Plant, and all conveyors would be powered by electricity rather than diesel or gasoline. However, diesel back-up generators would be on-site if needed should short electrical power interruptions occur.

Section 2.3.15 Anticipated Construction Schedule for the Action Alternatives

Page 2-58, first paragraph has been corrected as follows:

Table 2-3 provides a visual comparison of the anticipated general construction schedules for the Alternative Base Plan, Alternative Plan 1, Alternative Plan 2, Alternative Plan 3, and Alternative Plan 4. As shown in Table 2-3, the Isabella DSM Project is proposed for construction over a continuous (not seasonal) multi-year construction period that ranges from approximately 4-and-one-half years (53 months) for the Alternative Base Plan, to almost five years (57 months) for Alternative Plans 1 and 4, to nearly six years (69 months) for Alternative Plans 2 and 3.

4.4 CORRECTIONS TO DEIS CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Section 3.4 AIR QUALITY

Section 3.4.5 Environmental Commitments/Mitigation Measures

Pages 3-73 to 3-74, Bullet list has been corrected as follows:

- Prepare a *Fugitive Dust Control Plan*, that would include at least the following:
    - Sufficiently water excavated or graded soil as needed to prevent excessive dust, with disturbed soil areas being completely covered. Water a minimum of twice daily on unpaved or untreated roads and on disturbed soil areas with active operations.
    - Cease all clearing, grading, earth moving, and excavation during periods of winds greater than 20 miles per hour (averaged over one hour), when disturbed material is easily windblown, or when dust plumes of 20 percent or greater opacity impact public roads, occupied structures, or neighboring property.
    - Sufficiently water or securely cover all fine material transported off-site to prevent excessive dust.
    - Minimize areas disturbed by clearing, earth moving, or excavation.
    - Stabilize by watering or other appropriate method stockpiles of soil or other fine loose material to prevent windblown fugitive dust.
    - Where acceptable to the fire department, control weeds by mowing instead of disking.
    - Once initial leveling has ceased, seed and water until plant growth is evident all inactive soil areas within the construction sites, or treat with a dust palliative, or water twice daily until soil has sufficiently crusted to prevent fugitive dust emissions.
    - Sufficiently water at least twice daily all active disturbed soil areas to prevent excessive dust.
    - Limit on-site vehicle speed to 15 miles per hour.
    - Pave, treat with dust palliatives, or water a minimum of twice daily all areas with vehicle traffic.
    - Keep streets next to the project site clean, and frequently remove project-related accumulated silt and debris.
    - Access the main project work sites via an apron from adjoining surfaced roadways. Surface or treat the apron with dust palliatives. If equipment is operating on soils that cling to wheels, use a “grizzly” or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the project site,

immediately before the pavement, in order to remove most of the soil from vehicle tires.

- Maintain all equipment as recommended by manufacturers' manuals.
- Shut down equipment when not in use for extended periods.
- Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment.
- Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order to substantially reduce NO_X emissions.
- Use diesel particulate filters on on-road and off-road diesel equipment, if they are permitted under manufacturers' guidelines.

Section 3.11 LAND USE

Section 3.11.3 Environmental Consequences

Page 3-255, Alternative Plans 1, 2, 3, and 4, first paragraph has been corrected as follows:

Land use impacts associated with these Action Alternatives would be basically the same as under the Alternative Base Plan. More sand and rock materials would be needed for construction, but would be obtained from the same source locations and thus not change land use further. Portions of the Main Dam Campground would be developed as a temporary staging area (Staging Area M1) supporting the construction of the RCC Overlay (Alternative Plans 1, 2, and 3), and the other remediation measures on the Main Dam (Alternative Plans 1, 2, 3, and 4). As a separate action, the Corps is working with the USFS to transfer this parcel back to the Corps on a permanent basis. It is likely that the campground would remain closed and continue to be managed as a buffer for dam security. Site preparation and use as a staging area would result in a temporary change in land use and probable removal of mature trees and campground equipment. The change in land use is not in conflict with existing plans for the site and its current use; and therefore the potential impact would be direct, adverse, short- and long-term, low, and less-than-significant.

Page 3-256, Alternative Plans 1, 2, 3, and 4, third paragraph has been corrected as follows:

For Alternative Plan 4, realignment of State Highways 178 and 155 may require adjustment of existing rights of ways or the attainment of additional rights of ways. This could result in a change in land use. The exact alignment will be determined during final design with rerouting options determined in consultation with Caltrans. The preliminary realignment is sited on a narrow strip between two existing roads; therefore, the impacts of a change in land use would not be significant.

Section 3.12 RECREATION

Pages 3-258 to 3-281, Header has been corrected as follows:

3. Affected Environment and Environmental Consequences – ~~Land Use~~Recreation

Pages 3-282 to 3-290, Header has been corrected as follows:

3. Affected Environment and Environmental Consequences – ~~Public Health and Safety~~Recreation

Section 3.14 CULTURAL RESOURCES

Section 3.14.2 Affected Environment

Isabella DSM Project – Inventories and Investigations

Page 3-334, Table 3-77 has been corrected as follows to add the following report:

Table 3-77
Cultural Resource Inventories Relevant to the Isabella DSM Project

Author	Year	Title	Results
Dodd, D.	2009	Historic Resource Evaluation Report for the Lake Isabella Forest Service Administrative Complex Near Lake Isabella, Kern County, California.	Negative survey – none of the structures are eligible for the NRHP. SHPO concurrence March 20, 2010.

Section 3.16 PUBLIC HEALTH AND SAFETY

Section 3.16.3 Environmental Consequences

Page 3-398, Alternative Base Plan, third full paragraph has been corrected as follows:

It is likely that even with a comprehensive worker safety program there would be accidents and incidents that would require emergency services related to construction activities. Also, the presence of a large construction project extending over a number of years may be an enticement for increased criminal activity in the surrounding area. The provision of routine police investigation and surveillance actions and emergency response services may be taxed if project activities lead to more service calls and routine investigations than the fire, medical, or police personnel are able to attend to. As a popular recreation area the Kern River Valley is better prepared to provide emergency services and planning for contingencies than other similarly sized communities. It is anticipated that the Corps would coordinate with local emergency and health services in the project vicinity to ensure that adequate levels of routine and emergency medical and law enforcement services are available through the construction period. Therefore, it is anticipated that the potential for these services to become overtaxed would be low, and less-than-significant.

Section 3.16.4 Environmental Commitments and Mitigation Measures

Pages 3-400 to 3-401, second sub-bullet (under the first bullet), and seventh bullet have been corrected as follows:

- Implement a contractor-prepared *Public Safety Management Plan* to maintain public health and safety during all phases of construction. Components of the plan would include:
  - Notifying the public of the location and duration of construction activities, closing pedestrian and bicycle paths and trails, and restricting portion lake use for boating, water-skiing, fishing, and swimming;
  - Coordinating with the public and local jurisdictions to minimize impacts and to plan contingencies for maintaining emergency response, emergency evacuation plans and capacity of emergency services, as well as routine medical and law enforcement services during construction;
  - Posting signs locating construction sites and warning of the presence of construction equipment;
  - Fencing construction staging areas if dangerous conditions exist when construction is not occurring; and
  - Providing temporary walkways (with appropriate markings, barriers, and signs to safely separate pedestrians from vehicular traffic) and posting detour signs where a sidewalk or pedestrian or bicycle path or trail would be closed during construction.
- A contractor-prepared *Confined Space/Ventilation Safety Plan.*
- The Corps, in consultation with the KCFD, USFS, and BLM fire suppression agencies, before construction begins, require the contractors to prepare and implement a F*ire Management Plan*. The plan would include fire prevention and response methods, including fire precaution, prevention, and suppression measures consistent with the policies and standards in the affected jurisdictions.
- The Corps require all contractors to prepare and implement a *Worker Health and Safety Plan* before construction activities start; at a minimum the plan would include:
  - All appropriate worker, public health, and environmental protection equipment and procedures;
  - Designated heavy equipment traffic circulation route plans;
  - Emergency evacuation routes and procedures;
  - Emergency response procedures;
  - Most direct route to a hospital and safe air ambulance landing zone;
  - Name of the Site Safety Officer; and

- A requirement for documenting that all workers have reviewed and signed the plan.

- Compliance with all applicable local, regional, State, and Federal laws, policies, and regulations regarding the transportation, storage, handling, management, and disposal of hazardous materials and wastes.
- A contractor-prepared *Solid and Hazardous Materials and Waste Management Plan.* Details of this plan are provided in Section 3.8 (HTRW).
- Contractor consultations with local jurisdictions to ensure that construction activities do not impede adopted emergency response plans and that medical and law enforcement services are adequate.
- A contractor-prepared *Controlled Blasting Management Plan* that would include any short-term road closures and other public safety management measures that may be required in the vicinity of the blasting.
- A contractor-prepared *Traffic Management Plan* to address emergency access to the construction site areas and contingencies for addressing road closures affecting emergency response.

Section 3.17 SUMMARY OF IMPACTS

Page 3-402, introductory paragraph has been corrected as follows:

Table ~~3.19-1~~ 3-125 Summary of Potential Impacts provides a summary of the potential impacts on the 13 resource areas evaluated in this Draft EIS from the No Action Alternative and the four Action Alternatives. Suggested mitigation measures to avoid, minimize, or reduce potential impacts are also included in the table. More detailed information on potential impacts and mitigation measures is found in each of the resource sections in this Chapter.

4.5 CORRECTIONS TO DEIS CHAPTER 4: CUMULATIVE IMPACTS AND OTHER REQUIRED DISCLOSURES

Section 4.4 SUMMARY OF CUMULATIVE IMPACTS BY RESOURCE AREA

Section 4.4.10 Recreation

Page 4-37, text has been corrected as follows:

Implementation of any of the proposed Isabella DSM Project Action Alternatives would not have long-term adverse recreation impacts that could contribute incrementally to potential recreation impacts of the other relevant actions and projects identified in Section 4.3. The potential adverse recreation impacts from implementing any of the proposed Isabella DSM Project Action Alternatives would be temporary occurring only during the construction period within the Isabella DSM Project area. Such impacts would include temporary closures of and restricted access to existing recreation sites at Isabella Lake such as Launch 19, Engineers Point, and the Auxiliary Dam ~~Recreatoin~~ Recreation Area; periodic lower lake levels reducing the areas available for water-based recreation; and

somewhat degraded recreation experiences from construction noise, lights, dust, and increased traffic, and possible over-crowding at the available sites. These impacts on recreation at Isabella Lake could result in some potential visitors leaving or bypassing Isabella and seeking recreation opportunities in other locations that may be within the project and plan areas of other relevant actions described in Section 4.3; which could result in greater demand (and stress) on recreation sites in these other locations. Because the Corps and USFS would intend to maintain to the extent possible the quantity of recreation sites and the quality of the recreation experience at Isabella Lake during the Isabella DSM Project construction period, the potential cumulative impacts to recreation are anticipated to be low.

Section 4.4.13 Socioeconomics and Environmental Justice

Page 4-38, second paragraph has been corrected as follows:

If construction of the proposed Weldon Solar Projects were to take place during the construction period for the Isabella DSM Project, the potential socioeconomic cumulative impacts– would be considered low, because housing for construction workers and local and regional community services that may be required during these construction periods would be accommodated within the existing capacity of the area.

CHAPTER 5

REGULATORY COMPLIANCE AND CONSULTATION

CHAPTER 5.
REGULATORY COMPLIANCE AND CONSULTATION

This chapter updates the status since the DEIS of the Corps' compliance with Federal and other statutes, implementing regulations, and Executive Orders potentially applicable to the proposed DSM Project.

5.1 COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

The relationship of the DSM Project to applicable Federal and State environmental requirements is summarized in the following paragraphs.

5.1.1 Federal Requirements

National Historic Preservation Act of 1966, as amended (16 U.S.C. SEC. 470 ET SEQ.)
Full Compliance. The Act requires Federal agencies to take into account the effects of Federal undertakings on historic properties. Section 106 of the NHPA describes the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This process does not require historic properties to be preserved but does ensure that the decisions of federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and the options available to protect the properties.

Under these requirements, the area of potential effect of the selected project is inventoried and evaluated to identify historical, archeological or traditional cultural properties that have been placed on the NRHP and those that the agency and the State Historic Preservation Office (SHPO) agree are eligible for listing on the NRHP. If the project is determined to have an effect on such properties, the agency must consult with the SHPO and the Advisory Council on Historic Preservation (ACHP) to develop alternatives or mitigation measures. Compliance with these and other provisions of the NHPA is required as a process separate from, but concurrent with NEPA.

The evaluation of cultural resources presented in the DEIS and FEIS comply with the NHPA. Research (literature and archival research) and field surveys in the Area of Potential Effect (APE) are summarized in the DEIS and FEIS. The Corps has prepared a programmatic agreement (PA) to provide guidelines for compliance with the Section 106 process when the effects on historic properties are unknown. The Corps invited the USFS to be a signatory to the PA, and invited the Tule River Indian Tribe, The Bishop Paiute Tribe, the Santa Rosa Tachi Yokut Rancheria, and the Tübatulabal Tribe to be concurring parties. The final signed PA is included in Appendix D of this FEIS.

Ongoing coordination and communication will be maintained by the Corps with signatories, concurring parties, and other key stakeholders as planned follow-on efforts are undertaken and the proposed DSM Project proceeds. By carrying out the terms of the

PA, the Corps will have fulfilled its responsibilities under Section 106 of the NHPA and ACHP regulations. This would constitute full compliance with this act.

Farmland Protection Policy Act (7 U.S.C. Section 4201 ET SEQ.)
Full Compliance. This act requires a Federal agency to consider the effects of its action and programs on the Nation's farmlands. The Farmland Protection Policy Act is regulated by the Natural Resources Conservation Service (NRCS). The NRCS is authorized to review Federal projects to see if the project is regulated under the act and establish what the farmland conversion impact rating is for a Federal project.

Temporary disturbance or perhaps permanent conversion of approximately 10 acres of agricultural land is required for preparation and use of Staging Area A3 under the Preferred Alternative. Although not considered to be prime farmland, the site is adjacent to an area designated as unique farmland by the California Department of Conservation (see Figure 3-25 of the DEIS). The Corps will provide the NRCS with a copy of the DEIS and FEIS.

Clean Air Act (42 U.S.C. SEC. 1857 ET SEQ. (1990), as amended and re-codified 42 U.S.C. SEC 7401 ET SEQ. (SUPP II 1978))
Full Compliance. The proposed DSM project is subject to the General Conformity Rule (40 CFR Part 51, Subpart W) promulgated by the U.S. Environmental Protection Agency (USEPA). The purpose of the General Conformity Rule is to ensure Federal projects conform to applicable State Implementation Plans so that they do not interfere with strategies employed to attain National Ambient Air Quality Standards (NAAQSs). The rule applies to Federal projects in areas designated as in nonattainment for criteria pollutants for which USEPA has established NAAQSs and some areas designated as maintenance areas. The project is in a nonattainment area for ozone, and a serious nonattainment area for PM_{10}. In Section 3.3 of this FEIS the potential impacts of implementing the Preferred Alternative (and refinements) on local and regional air quality are summarized, and in particular, the project's compliance with the State Implementation Plan (SIP) for air quality. Also, a complete Air Quality Analysis of the Preferred Alternative is included as Appendix F of this FEIS. Based on the analyses conducted in accordance with the USEPA General Conformity Rule and California SIP, anticipated air emissions associated with implementation of the mitigated Preferred Alternative fall below the de minimis emission levels and therefore is considered exempt from a General Conformity Analysis.

Clean Water Act 33 U.S.C. SEC. 1251 ET SEQ., (1976 & SUPP II 1978)
Full Compliance. The Corps will ensure that the DSM Project complies with the Federal Clean Water Act, including Section 404(b)(1) and Section 401. Some placement of fill within jurisdictional wetlands and waters of the United States is required for the project. This is detailed in the Section 404(b)(1) Water Quality Evaluation that has been conducted and is included as Appendix B of this FEIS. A Section 401 State Water Quality Certification for activities associated with implementation of the proposed DSM Project is required and the Corps will submit a 401 certification application (including the 404 (b)(1)) to the Central Valley Regional Water Quality Control Board (CVRWQCB).

Endangered Species Act (16 U.S.C. SEC 1531 ET SEQ.)
Full Compliance. Section 7 of the Endangered Species Act requires Federal agencies, in consultation with the Secretary of the Interior, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species.

To ensure that the proposed DSM project is in full compliance, the Corps is involved in formal consultation with the USFWS. A biological assessment has been prepared by the Corps for the proposed DSM Project, and a USFWS biological opinion is included in Appendix C of this FEIS. Also, discussions of Federal listed species and the USFS and state species of interest have been included in Section 3.8 of the DEIS and Section 3.8 of the FEIS. A current (updated) list of threatened and endangered species relating to the proposed DSM Project has been obtained from the USFWS and is included in Appendix C of this FEIS.

Fish and Wildlife Coordination Act (16 U.S.C. SEC. 661 ET SEQ.)
Full Compliance. This act requires Federal agencies to consult with the USFWS and the California Department of Fish and Game (CDFG) before undertaking projects that control or modify surface water. The consultation is intended to promote conservation of wildlife resources by preventing loss of or damage to fish and wildlife, and to provide for the development and improvement of these resources in connection with water projects. The USFWS and CDFG are authorized to conduct surveys and investigations to determine the potential damages, and to determine measures to prevent losses. Representatives of the Corps participated in these studies. Recommendations of USFWS and CDFG must be integrated into reports seeking permission to construct a project or to modify plans for previously authorized projects. This act requires the Corps to incorporate justifiable means for the benefit of wildlife that should be adopted to obtain maximum overall project benefits. The USFWS provided a Planning Aid Letter to the Corps for the DSM Project (see Appendix C of the DEIS). The Corps has collaborated with the USFWS, and a Final Coordination Act Report (CAR), and a Final Habitat Evaluation Procedures (HEP) report, is included in Appendix C of this FEIS. The recommendations of the USFWS regarding mitigation for adverse effects of the project are included in the CAR. The Corps has and will continue to maintain coordination and communication with the USFWS and CDFG if and as the proposed DSM Project is implemented.

Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)
Full Compliance. The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 U.S.C. 715j. Most impacts as a result of the proposed action are anticipated to be short-term direct disturbances to migratory birds, which would likely temporarily avoid the construction area. However, approximately 9 acres of pine woodlands and sparse sagebrush-scrub uplands and valley grasslands would be permanently lost due to the construction of the Emergency Spillway. The Corps has collaborated with the USFWS, and a Final Coordination Act Report (CAR), and a Final Habitat Evaluation Procedures (HEP) report, is included in Appendix

C of this FEIS. The recommendations of the USFWS regarding mitigation for adverse effects of the project are included in the CAR. To ensure that the proposed project does not affect migratory birds in areas adjacent to the project, preconstruction surveys would be conducted by a qualified biologist. If breeding birds are found in the area, a protective buffer would be delineated and USFWS and CDFG would be consulted for further actions.

National Environmental Policy Act (42 U.S.C. SEC 4321 ET SEQ.)

Full Compliance. The DEIS and FEIS companion documents provide the information required by NEPA for the decision-makers to consider the environmental consequences of the proposed action and alternatives. Chapter 6 of this FEIS provides an overview of the public and agency review of the DEIS and summarizes the main public issues raised and the Corps' responses. Appendix A of this FEIS includes all comments received during the 60-day public review period, and the Corps response to each comment. As the lead Federal agency, the Corps anticipates that a Record of Decision will be issued following filing and public distribution of the FEIS and a 30-day waiting period.

Wild and Scenic River Act (16 U.S.C. SEC. 1271 ET SEQ.), President's Environmental Message of August 1979, and CEQ Memorandum of August 10, 1980, for Heads of Agencies

Full Compliance. The proposed DSM Project complies with this act as no river segments designated as Wild and Scenic Rivers exist in the project area.

Executive Order 11988, Flood Plain Management

Full Compliance. This Executive Order requires the Corps to provide leadership and to take action to (1) avoid development in the existing 100-year flood plain, unless such development is the only practicable alternative; (2) reduce the hazards and risk associated with floods; (3) minimize the impact of floods on human health, safety, and welfare; and (4) restore and preserve the natural and beneficial values of the current flood plain.

To comply with this Executive Order, the policy of the Corps is to formulate projects which, to the extent possible, avoid or minimize adverse effects associated with use of the without-project flood plain, and avoid inducing development in the existing flood plain unless there is no practicable alternative. None of the remediation measures proposed as part of the DSM Project would induce development within the lakebed or floodplain. The proposed DSM Project addresses potential flood risks associated with dam failure as required under the Executive Order. The proposed DSM Project, if implemented, would maintain the level of flood protection provided by the Isabella Dam Project existing prior to the present IRRM restriction. Therefore, the proposed DSM Project is in compliance with this Executive Order.

Executive Order 11990, Protection of Wetlands

Full Compliance. This order directs the Corps to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in implementing Civil Works projects. Approximately .33 acres of emergent wetland habitat would be lost downstream of the

Auxiliary Dam due to the construction of the relocated Borel Canal outlet and the remediation measures at the Auxiliary Dam, as well as the preparation and use of Staging Area A3. The loss of this habitat will be mitigated as prescribed in Final HEP evaluation recommendations (see Appendix C of this FEIS). Construction of the proposed DSM Project would not adversely affect any other wetlands in the project vicinity.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Full Compliance. This order requires that Federal agencies identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Anticipated impacts from the proposed DSM Project were reviewed to determine whether low-income or minority neighborhoods would be disproportionately affected by the proposed action. No impacts, associated with social equity or environmental justice, are anticipated from the proposed DSM Project. Although the proposed action could require the relocation of local residents at the nearby Lakeside Village Mobile Home Park and other residences near the existing dams during construction, the impact of not taking action to remediate the dams would significantly endanger the health and welfare of these residents and a substantially greater population at risk downstream of the dams. The Corps has determined that there is a significant likelihood of dam failure from an earthquake and/or extreme storm event, and therefore is proposing appropriate action to protect public safety.

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, October 5, 2009

Full Compliance. Executive Order 13514 requires federal agencies to set a 2020 GHG 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. The Corps is requiring lower emission (higher tiered) producing equipment for use in construction and electric batch plants and rock crushers.

5.1.2 State Requirements

State Water Resources Control Board, Division of Water Quality, and the California Regional Quality Control Board, Central Valley Region

Full Compliance. The State Water Resources Control Board and the CVRWQCB review activities that affect water quality in the Central Valley. The boards administer the requirements mandated by State and Federal law (Clean Water Act). The CVRWQCB establishes water quality standards and reviews individual projects for compliance with the standards. The Corps will submit a 401 certification application (including a 404(b)(1) Evaluation) to the CVRWQCB. The 404(b)(1) Water Quality Evaluation prepared by the Corps for the Preferred Alternative is included in Appendix B of this FEIS.

California Department of Fish and Game, Region 4

Full Compliance. Generally, the Department of Fish and Game (CDFG) administers the State laws providing protection of fish and wildlife resources. The CDFG administers the California Endangered Species Act of 1984. This act requires that non-Federal lead agencies prepare biological assessments if a project adversely affects one or more State-listed endangered species. Federal agencies are not subject to the State Endangered Species Act. There are no local agencies having discretionary authority that are involved in implementing the proposed DSM Project.

State Mining and Geology Board

Full Compliance. The State Mining and Geology Board oversees the implementation of relevant State laws and regulations. One of the laws within its jurisdiction is the Surface Mining and Reclamation Act of 1975 (Public Resources Code, Div. 2, Chapter 9, Sec. 1710, et seq.). The Surface Mining and Reclamation Act requires that an entity seeking to conduct a surface-mining operation obtain a permit from and submit a reclamation plan to the lead agency overseeing that operation. To be adequate, the reclamation plan must contain all categories of information specified in the Surface Mining and Reclamation Act. This State requirement does not apply to the DSM Project because it is proposed by a Federal agency on Federal lands.

State Lands Commission

Full Compliance. In addition to such State-owned lands as parks and State highways, the State Lands Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the State and the beds of navigable rivers, sloughs, and lakes (Public Resources Code, Section 6301). State ownership extends to lands lying below the ordinary high-water mark of tidal waterways and below the low-water mark of nontidal waterways (Civil Code, Section 830). The area between the ordinary high and low water on nontidal waterways is subject to a "public trust easement". Projects such as bridges, transmission lines, and pipelines fall into this category. A proposed project cannot use these State lands unless a lease is first obtained from the State Lands Commission. The Commission also issues separate permits for dredging. For the proposed DSM Project, no lands of the State have been identified that require State Lands Commission's review and approval.

California Department of Transportation (Caltrans), District 6

Partial Compliance. Caltrans is responsible for ensuring the safety and integrity of the State of California's highway system. Under California law, any relocation or realignment of a State highway must be approved by the California Transportation Commission. Any necessary permits for construction would be obtained from Caltrans.

At the time of the publication of this FEIS, the Corps is involved in ongoing discussions with Caltrans and has not yet received a plan from them for these realignments. Therefore, the issue of the design and final alignments for highway relocations is not yet ripe for decision. The Corps will prepare a supplemental NEPA document, tiered from the FEIS, on highway relocations in 2013.

5.1.3 Local Plans and Policies

This section discusses the degree to which individual project components comply with locally adopted plans and policies. Evaluating the level of compliance with locally adopted plans can be complicated due to the following: (1) the intentionally broad and unspecific goals articulated in local general plans, (2) the potential of a Federal project to influence the location, density, and rate of development in ways that differ from existing local plans and policies, and (3) the currency of local plans. The proposed DSM Project is located within the jurisdiction of the Kern County General Plan and the Kern River Valley Specific Plan. The Corps anticipates and would insure to the extent practicable that the proposed DSM Project complies with the provisions of all relevant local plans.

Air Pollution Control Districts

The project construction falls under the jurisdiction of the EKAPCD. The District determines whether project emission levels significantly affect air quality, based on Federal standards established by USEPA, and the California Air Resources Board. The District would first issue a permit to construct, followed by a permit to operate, which would be evaluated to determine whether all facilities have been constructed in accordance with the authority to construct permit.

Public Works and Transportation Departments

All proposed project activity involving the placement of encroachments within, under, or over County or City road rights-of-way must be covered by an encroachment permit. For the proposed DSM Project, the Corps would require the selected construction contractor(s) to consult with all appropriate local agencies as necessary to obtain the encroachment permits.

5.2 LIST OF AGENCIES CONSULTED

The Sequoia National Forest – Kern River District of the USFS has served officially as the Cooperating Agency in the preparation of this EIS. Other agencies and organizations that have collaborated and/or participated in this process include the following:

- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service.
- U.S. Department of Agriculture.
- U.S. Bureau of Land Management
- Central Valley Regional Water Quality Control Board.
- Kern County Water Agency.
- Water Association of Kern County.
- Kern River Water master.
- Buena Vista Water Storage District.
- Kern Delta Water District.

- North Kern Water Storage District.
- Tulare Lake Basin Water Storage District.
- Southern California Edison.
- Kern County Board of Supervisors.
- Kern River Valley Chamber of Commerce.
- Kern River Valley Revitalization.
- Kern River Preserve.
- Kernville Chamber of Commerce.
- City of Bakersfield.
- Sierra Club.
- Tule River Indian Reservation.
- Santa Rosa Rancheria – Tachi Yokuts.
- Bishop Paiute Tribe.
- Tübatulabals of Kern Valley.
- Kern Valley Indian Council.
- Kawaiisu Tribe.
- Kern River Paiute Council.
- Monache Intertribal Association.

A complete list of those agencies, organizations, individuals, and other stakeholders that have participated in this process, is provided in Appendix A of the DEIS.

5.3 PUBLIC INVOLVEMENT

This section updates the public involvement efforts and opportunities associated with: (a) the alternative formulation process and preparation of the DEIS released on March 23, 2012; (b) the 60-day public and agency review of the DEIS the closed on May 22, 2012; and (c) continuing opportunities for participation following the release of the FEIS anticipated by the end of October 2012.

5.3.1 Scoping

The scoping process for the DSM Project began on February 5, 2010, with the publication of the Notice of Intent (NOI) in the Federal Register., The NOI provided formal notification to the public and agencies that an EIS would be prepared by Corps, Sacramento District for the Isabella Lake DSM Project to correct seismic, static, and hydrologic issues associated with the structures that make up the Isabella Lake Dam in the Kern River Valley. The USEPA provided the only written comment to the Corps in response to the publication of the NOI.

In May 2010, two Initial Public Meetings were held, one in Kernville, and another in Bakersfield. These meetings were conducted to brief the public on the deficiencies identified in the Isabella Lake DSM Project and to report on the ongoing investigations and activities being conducted at the facility, to outline the process going forward, and to provide an opportunity to submit questions and general comments on the Isabella Lake DSM Project. Fact sheets about the project and comment forms were distributed. Summaries of these meetings and the materials presented by the Corps are contained in the *Initial Public Scoping Meetings, Scoping Report, Isabella Lake DSM Project,* dated August 2010 (Corps 2010g).

A second set of Public Informational Meetings were held on December 14 and 15, 2010, this time in Lake Isabella and Bakersfield. The Corps provided an update on the status of the Isabella Lake DSM Project, including the dam safety investigations and the preliminary risk reduction measures under consideration in formulating remediation alternatives. There was also a discussion of the environmental review process and the environmental studies being prepared in support of the project. Again, the public was given an opportunity during the meetings to provide input regarding issues of concern and to ask questions of the panel. Fact sheets about the project and comment forms were distributed. Summaries of these two information meetings and the materials presented by the Corps are contained in the *Preliminary Public Participation Report, Isabella Lake DSM Project,* dated January 2011 (Corps 2011b).

Three Public Scoping Meetings were held May 17-19, 2011, in Kernville, Lake Isabella, and Bakersfield to present the Alternative Risk Management Plans (RMPs) being considered and evaluated in the EIS, and to seek input on the issues, resource concerns, alternatives and potential impacts that should be considered in the EIS. At the meetings, the Corps described the Alternative RMPs that are being evaluated that address seismic, seepage and hydrologic deficiencies at Isabella's Main and Auxiliary Dams. The potential environmental impacts associated with these alternatives are evaluated in this Draft EIS. Summaries of these three meetings and the materials presented by the Corps are presented in the Public Scoping Report, *Isabella Lake DSM Project,* dated September 2011 (Corps 2011c). An abridged version of this report is provided as Appendix A of the DEIS and should be consulted for a more complete description of the public involvement process to date for the proposed DSM project.

More than 400 people attended the seven public meetings, including members of the public, elected officials, and representatives from public agencies, waterways, and electric power and flood control. All seven public meetings were held in an open house forum. Displays were set up to provide information on issues, impacts, agency roles, and opportunities for public involvement and for questions and answers. For more information on these public meetings please see Appendix A of the DEIS.

5.3.2 Ongoing Participation

The DEIS was released for public and agency review on March 23, 2012, with the review period lasting 60 days until May 22, 2012. An overview of the public and agency review of the DEIS, primary comments received by the Corps during the 60-day review period,

and Corps responses to the primary comments is the focus of the next chapter of this FEIS (Chapter 6, Public and Agency Review of the DEIS). Also, Appendix A of this FEIS summarizes all comments received during the DEIS review period and the Corps' responses.

The Corps anticipates that this FEIS will be filed with USEPA and released for public distribution by the end of October 2012. The Corps also anticipates that a Record of Decision will be issued following a 30-day waiting period after release of this FEIS.

Ongoing public interest in the DSM Project continues to be high. And as was discussed in Section 1.9 of the DEIS (Issues to be Resolved), and in Section 1.4 of the FEIS (Update on Issues to be Resolved), there are a number follow-on planning and compliance actions envisioned to be undertaken during 2013 that will provide opportunities for additional public and agency involvement. On this basis, the Corps will continue to maintain communication with stakeholders, including government entities and officials, tribal groups, water users, media, and those who have signed up at public meetings or otherwise asked to be included in the contact list as the project proceeds. The Corps will also continue to maintain the public website on Isabella Lake and the DSM project, http://www.spk.usace.army.mil/projects/civil/Lake_Isabella_Dam/Index.html, and will continue to post monthly situation reports and other materials summarizing Corps activities in support of the Isabella Lake DSM Project.

CHAPTER 6

PUBLIC AND AGENCY REVIEW OF DEIS

CHAPTER 6.
PUBLIC AND AGENCY REVIEW OF DEIS

6.1 INTRODUCTION

This section provides an overview of the public and agency review of the DEIS, the issues identified during the public comment period, and the Corps' responses to those recurring comments that were of concern to many commentors. Appendix A of this FEIS presents a table that summarizes all comments received during the public review period and the Corps' response to each.

6.2 REVIEW OF THE DEIS

A Notice of Availability for the DEIS was published in the Federal Register on March 23, 2012 initiating a 45-day public comment period. Due to public interest, the comment period was extended to 60 days to May 22, 2012. Additional comments received after that date were also accepted and considered by the Corps. The Corps publicized the availability of the document and public hearing through press and media releases. Approximately 300 CDs and 65 hardcopies were distributed by the Corps directly to interested parties and agencies and through distribution points in the project vicinity including local libraries, the Forest Service office, and at the public hearings. The document was also made available to the public online and can still be accessed at: http://www.spk.usace.army.mil/Missions/CivilWorks/IsabellaDam.aspx.

Three formal public hearings were conducted by the Corps during the comment period on April 17, 2012 in Kernville; April 18, 2012 in Lake Isabella; and April 19, 2012 in Bakersfield. There were 92 persons in attendance in Kernville, 144 in Lake Isabella, and 40 in Bakersfield. The three hearings had the same format, beginning with an open house and poster session with informal discussions, followed by a PowerPoint presentation by the Corps. This was followed by the formal receipt of verbal comments on the DEIS from the public, recorded by a court reporter. Following that, the formal receipt of transcribed comments was closed, and the Corps representatives answered informal questions in an open house setting.

Because interest in the project remains high, and the Corps has continued to meet and communicate with agency and local groups regarding the project and the refinements under the Preferred Alternative. Also, the Corps distributes a detailed Situation Report monthly and regularly posts updates on the webpage referenced above.

6.3 PUBLIC COMMENT SUMMARY

During the DEIS public review period, a total of 435 comments were received from the public in the following manner:

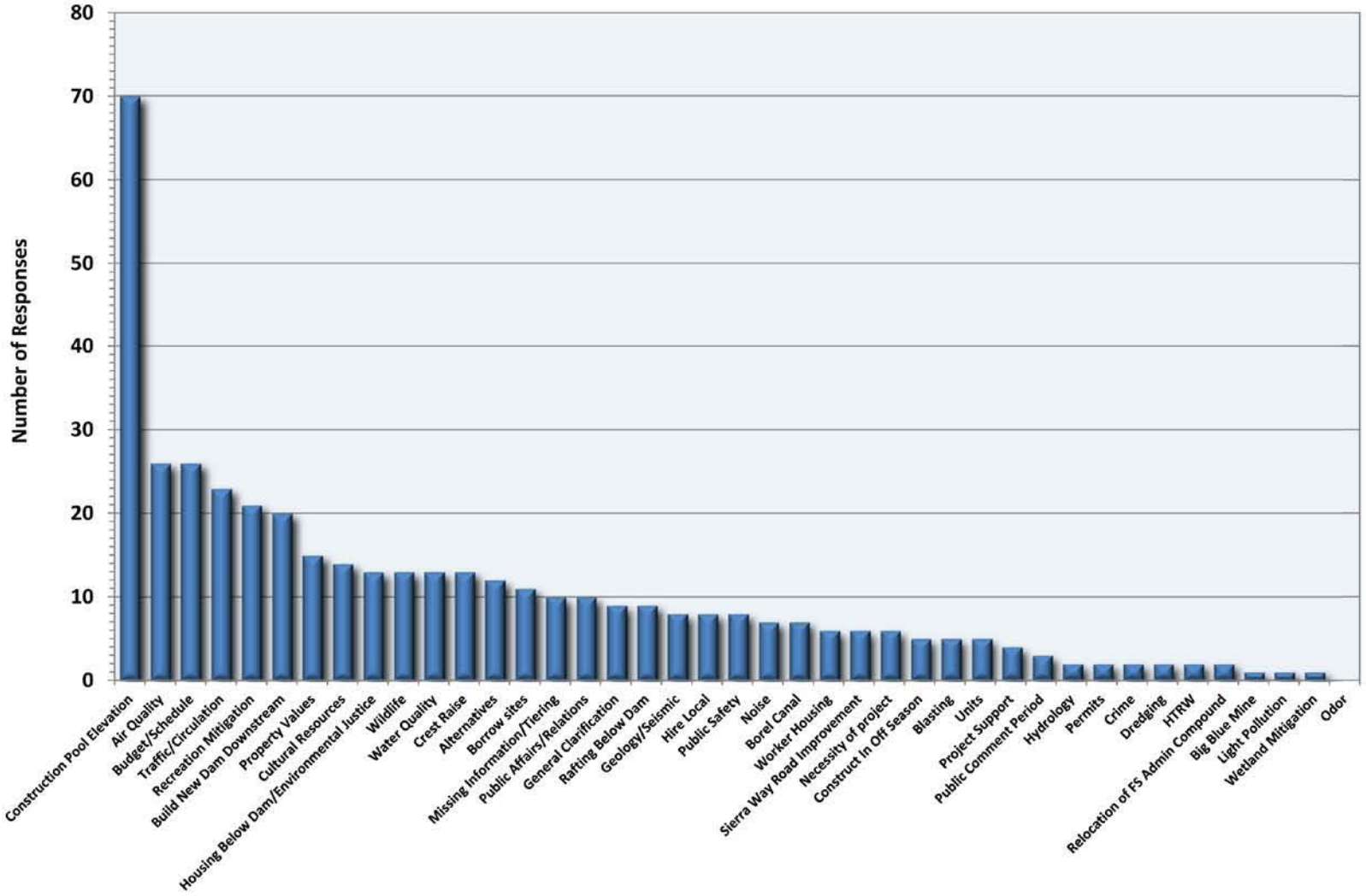
- 145 different parties commented, including 3 Federal agencies, 1 State of California agency, 12 local agencies and organizations, and 129 private citizens.

- 87 submissions were received by e-mail.
- 28 submissions were by written comment at the public meetings or by letter.
- 23 people presented verbal comments at the public hearing in Lake Isabella.
- 18 people presented verbal comments at the public hearing in Kernville.
- 3 people presented verbal comments at the public hearing in Bakersfield.

Table 6-1-FEIS displays the number of comments received, organized by the primary issues categories.

A summary of the primary issues and the individuals commenting on those issues are included below. A full list of all comments and Corps responses is provided in Appendix A. The original letters, e-mails, and the transcripts of the public hearings are not included in this FEIS document; however, they are available upon request from the Corps.

Table 6-1-FEIS
Number of Comments Received by Issue



6.4 SUMMARY OF CORPS RESPONSES TO PRIMARY ISSUES OF CONCERN TO MANY COMMENTORS

Issue 1:

"Lowering the lake elevation levels will affect recreation opportunities and damage the local economy."

This comment was received from the following stakeholders:

Cory Andrews	Kimberley Cushman	Barbara Hinkey	Gerard Nadeau
Jordan Andrews	Rita D'Angelo	Rex Hinkey	Joneal Nelson
Lovie Andrews	Gerald Davidson	Eva Hollmann	Adrienne Noble
Tamera Andrews	Megan Davie	Mitzi Hyer	Ian Reed
Ivy Bedard	Susan Day	Karen Johnson	Fred Roach
Peter Bonello	An De Vooght	Kelly Lehman	Richard Rowe
Cheryl Borthick	Rachelle Duitsmam	Robin Lyons	T. Schwartz
Jesse Britton	Dusty Engel	Brian McEvilly	Duane Stephens
Charles Brust	Sebra Engel	Bill McGrath	Stewards of Sequoia
Michael Buchanan	Mike Foreman	Codey McMurray	Charlie Stubbs
Deb Chase	Kelly Geygan	Kenny McMurray	Amanda Tesmond
Joseph Ciriello	Mary Goodman	Courtney Miller	Spencer Thompson
Carl Claras	Gene Hacker	Eldon Miller	Keith and Carla Thorn
William Cooley	Laura Hart	Greg Monteleon	Sue Vose
Josh Conway	Craig Hayes	Kay Monteleon	Max Wenzel
Brian Cushman	Dale Heard	Fleet Morrow	Carl Wormood

Corps Response:

Under the Preferred Alternative refinements, the construction pool elevation (approximate elevation 2,543-feet NAVD88; 72,237 acre-feet) has been limited to a single four-to-six month window between October 2020 and March 2021. This takes advantage of the natural low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This minimizes impacts to recreation, water quality, fisheries, and socioeconomics, and further reduces the impacts over the entire construction period. The majority of the time the lake would remain under its current operation with the pool restriction (elevation 2,589.26-feet NAVD 88; 361,250 acre-feet). Recreation would still be permitted on the lake during construction. The Corps is working with the U.S. Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation Plan resulting from this process would be presented in 2013. The refinements to the project since publication of the Draft EIS are included in the Final EIS, Chapter 2.

Issue 2:

"Analysis of a downstream dam alternative should be considered and is the public's Preferred Alternative."

This comment was received from the following stakeholders:

Ivy Bedard	Kimberley Cushman	Barbara Hinkey	Courtney Miller
Jesse Britton	Rachelle Duitsmam	Mitzi Hyer	Eldon Miller
Deb Chase	Mike Foreman	Karen Johnson	Fred Roach
Carl Claras	Dale Heard	Robin Lyons	Amanda Tesmond
Eileen Codling	Leslie Heard	Kenny McMurray	Lynne Trimble

Corps Response:
A downstream replacement dam at the Auxiliary Dam site was evaluated, but not selected based on increased cost, larger demand for materials, a longer construction schedule, and increased air quality concerns based on the additional earthwork. See DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.

Issue 3:

"Impacts on rafting below the dam are not addressed in the Draft EIS; would like a written plan to ensure adequate rafting flows during the rafting season."

This comment was received from the following stakeholders:

Samantha Collins	Barbara Hinkey	Chuck Richards	Bob Volpert
Beverly Demetriff	William McGinnis	Clay Smith	Peter Wiechers
Brett Duxbury			

Corps Response:
The storage and release of flood water in the flood reduction space of Isabella Lake is under the control of the Water Management Section of the Corps. However, the Corps has no influence over the operation of the reservoir outside of flood operations. During construction, the release of water would be dependent on inflow, irrigation needs, and downstream storage capacity. A Recreation Plan is anticipated for 2013 to further explore and identify options for mitigation to offset adverse effects on recreation including the needs for recreational flows in the lower Kern River (See Section 1.4.2 of the FEIS). Rafting companies that operate above the reservoir would continue operations as normal and be unaffected directly by changes due to the DSM Project. Rafting companies that operate on the lower Kern River would be informed of the impacts and accommodations in the Recreation Plan. Additional discussion on downstream rafting and kayaking can be found in Section 3.12 of the DEIS and Section 3.10 of the FEIS.

Issue 4:

"Reduced reservoir levels will expose dust and increase fugitive dust; increased construction traffic will affect air quality."

This comment was received from the following stakeholders:

Ronald Benoit	Judy Dempsey	Barbara Hinkey	Robert Rusby
Cheryl Borthick	EKAPCD	Donna Jackson	Sherry Van Matre
Deb Chase	Donald Fink	Morrow Fleet	Pat Turnham
Joseph Ciriello	Laura Hart	Joneal Nelson	US EPA
Josh Conway			

Corps Response:

Under the Preferred Alternative refinements, the construction pool elevation (approximate elevation 2,543-feet NAVD88; 72,237 acre-feet) has been limited to a single four-to-six month window between October 2020 and March 2021. This takes advantage of the natural low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This reduces the potential for dust impacts described in the DEIS from lake lowering. For the majority of the construction period, the lake will remain under its current operation with the pool restriction (elevation 2,589.26-feet NAVD 88 with 361,250 acre-feet). Potential impacts from windblown dust can be effectively reduced to less than significant levels through use of best management practices that will be required. These are described in Section 3.3.3 of this FEIS and Section 3.5.4 of the DEIS.

Fugitive dust point sources have been further reduced with the elimination of the South Fork Delta borrow area. The elimination of the South Fork Delta borrow area also substantially reduces construction-related truck traffic along Hwy 178 and associated diesel emissions.

Subsequent to the release of the DEIS the Corps has prepared a revised Air Quality Analysis (Corps 2012c and Appendix F of this FEIS) and a revised Health Risk Assessment (Corps 2012d; and Appendix E of this FEIS) based on the refinements of the Preferred Alternative. Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods and thresholds. The results of these analyses show a reduction in anticipated air quality impacts based on the Preferred Alternative refinement. The results are summarized in Section 3.3.3 of this FEIS.

Issue 5:

"The project will go over budget and take longer than planned."

This comment was received from the following stakeholders:

Karley Corrales	Mike Foreman	Courtney Miller	Robert Rusby
Kimberley Cushman	Mary Goodman	John Ornosky	Stewards of Sequoia
Judy Dempsey	Laura Hart	Jon Ream	Keith and Carla Thorn

Corps Response:
The Corps is currently finalizing the cost and schedule for design and construction. Once this is completed the Corps would have a more accurate reflection of the total project cost; however, there are always unknowns associated with construction, and when those arise the Corps would minimize the impacts of those risks. There are no guarantees in regards to funding. However with the continued support with the community and the "High Risk" ranking of the dam, the Corps would continue to express the need for funding. The Corps understands the concern for the duration of construction and the Corps is doing everything possible to shorten those completion dates. The Corps would continue to refine the schedule to ensure efficiency in construction.

Issue 6.

"The project will negatively affect property values."

This comment was received from the following stakeholders and organizations:

John Arnazzi	Mary Goodman	Joneal Nelson	Sierra Club
Cheryl Borthick	Laura Hart	Mark Nelson	Pat Turnham
Deb Chase	Barbara Hinkey	John Ornosky	Sue Vose
Rita D'Angelo	Eva Hollmann	Robert Rusby	Gerald Wenstrand

Corps Response:
Concern noted. Assessment of potential project impacts to the local economy found both short- and long-term benefits associated with construction-related spending in the Kern River Valley and unrestricted reservoir operations upon completion of the project. Refinements under the Preferred Alternative would reduce many of the anticipated construction-related impacts, but negative short-term impacts on property values may occur during construction. Long-term economic improvement resulting from recreation, higher lake levels, employment opportunities, and lower safety risk would likely result in improved property values. These project benefits may serve to provide greater long-term economic stability to the Kern River Valley. Economic stability is a major factor in determination of regional property values. See Section 3.15.3 of DEIS and Section 3.13.2 of the FEIS.

Issue 7:

"The relocation process needs to begin as soon as the project is approved so that the process does not get dragged out. Improved communication needs to occur over relocation plans and requirements."

This comment was received from the following stakeholders:

Ronald Benoit	Carol Fink	Ken and Cyndie Hoffman	Sierra Club
Joseph Ciriello	Mary Goodman	Richard Rowe	US EPA
Rita D'Angelo	Barbara Hinkey	Robert Rusby	Gerald Wenstrand

Corps Response:
When the Corps receives the anticipated project approval and funding, the Corps would be able to provide more detail on property acquisition requirements. At that point information would be gathered from all affected individuals and the Corps can discuss options and assist affected individuals in applying for relocation benefits. Until the Corps has an approved project and funding, the Corps cannot acquire or discuss offers with potentially affected land owners.

Issue 8:

"Recreation opportunities will be lost by the use of the Auxiliary Dam Recreation Area as a borrow area. If used, how will the lost opportunities be mitigated?"

This comment was received from the following stakeholders:

Ronald Benoit	Juliann and Raymond D'Ascenzo	Barbara Hinkey	Spencer Thompson
Mark Buth	Desert Mountain Resource Conservation and Development Council	Joneal Nelson	USDA Forest Service
Joseph Ciriello		Marsha Smith	Sue Vose
Rita D'Angelo		Stewards of Sequoia	
		Tom Teofilo	

Corps Response:
The Auxiliary Dam Recreation Area is planned to primarily be a temporary staging area (Staging Area A1; See Figure 2-1-FEIS) that would be returned for recreation use after the project is complete. It is also a secondary on-site borrow source for filter sand on the Main and Auxiliary Dams should the Emergency Spillway excavation not be able to provide sufficient quantities. Other camping areas around the lake would not be affected by the project, and the U.S. Forest Service would continue to be the managing agency for these areas. A Recreation Plan is anticipated for 2013 to further explore and identify options for mitigation to offset adverse effects on recreation. The plan would involve public participation and concerns over the negative impacts of the project, would be addressed.

Issue 9:

"Dredging the reservoir for borrow material would increase capacity from sediment build up and would reduce overall impacts."

This comment was received from the following stakeholders:

Ronald Benoit
Mark Buth
Eva Hollmann
Desert Mountain Resource Conservation and Development Council
Robert Rusby
Sierra Club
Stewards of Sequoia

Corps Response:
Borrow investigations have shown that materials in the lake bottom are not cost effective for filter and drain materials and would introduce other environmental concerns, such as water quality effects associated with lake lowering, and increased fugitive dust concerns.

Issue 10:

"There are concerns over the effect of the project on traffic in the valley. Will the highways be relocated?"

This comment was received from the following stakeholders:

Ronald Benoit
California Department of Fish and Game
Joseph Ciriello
Juliann and Raymond D'Ascenzo
Lori Davis
Susan Day
Mary Goodman
Craig Hayes
Barbara Hinkey
Rex Keeling
Joneal Nelson
Robert Rusby
Eric Sertic
Ron Smith
Wally Stewart
Jose Torres
Sue Vose

Corps Response:
The South Fork Delta sand borrow area has been eliminated as a sand source for the Preferred Alternative. Sand will now be manufactured at the dam site utilizing waste materials generated from the emergency spillway excavation. This refinement has eliminated the largest contributor to short-term construction-related traffic and circulation impacts along Hwy 178 within the Kern River Valley. The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays only. Highway trucks will be required to meet all standards; therefore there should be no impacts to roads except for the everyday wear and tear that they are designed for.

It is anticipated that an increase in construction-related traffic associated with the realignments would occur along both highways but that this increase would not exceed existing roadway and intersection capacities. The proposed realignment of Highway 155 would result in increased capacity for this roadway prior to the start of the work on the

dams based on the addition of an uphill climbing lane, structure widening, and reconstruction of the roadway to current Caltrans standards. The potential impacts from the highway realignments will be analyzed and further addressed in a follow-on tiered NEPA action (See Section 1.4.6 of this FEIS). The Corps will continue to work with Caltrans up to and during construction for additional opportunities to minimize short-term traffic and circulation impacts.

CHAPTER 7

REFERENCES

CHAPTER 7.
REFERENCES

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APPENDIX A

RESPONSES TO DEIS COMMENTS

APPENDIX A
RESPONSES TO DEIS COMMENTS

This appendix provides responses to public and agency comments on the DEIS, as received during the DEIS public comment period. The following pages include a full matrix of all comments received and the Corps' response. Original letters, e-mails, and the transcripts of the public hearings are not included below; however, they are available upon request from the Corps.

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Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
1.	Anderson, Ernie	Alternatives	Electronic	Why do so many fixes need to occur? Explore an alternative involving grouting sandy interval beneath the Auxiliary Dam. Why were evaluations not separated in two categories: mitigation for flood and mitigation for earthquake?	Grouting of the sandy layer was evaluated by the team for liquefaction mitigation; however, it was not carried forward as it could leave permeable zones through and around the treatment zones. Flood and seismic mitigation measures were evaluated separately, but later combined where similarities were present.
2.	Anderson, Ernie	Geology/Seismic	Kernville Hearing/ Electronic	The fault is noted as being vertical, which is a concern since most faults are at an approximately 60 degree incline. Has this been addressed? Questions the assignment of M7.5 as maximum credible magnitude.	The Kern Canyon fault is assessed as being subvertical; primarily due to geomorphic expression (i.e. fault plane intersecting varying surficial terrain displays generally straight lines). The reason for this is believed to be the existing subvertical zone of weakness from the older strike-slip motion of the Kern Canyon fault. Strike slip offset on the Kern Canyon fault is approximately 12 km in the Lake Isabella/Kernville area, but recent investigations including fault trenching show that essentially all recent offset is vertical. The current stress regime is also extensional, which is consistent with normal faulting. The maximum credible earthquake is assessed to be an exceedingly unlikely event, but possible (therefore credible). It was determined using relationships from Wells and Coppersmith (1994).
3.	Andrews, Cory	Construction Pool Elevation	Written	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
4.	Andrews, Jordan	Budget/Schedule	Written	Start construction during the winter.	Construction only during the off-season will greatly lengthen the schedule, cost, and would prolong impacts.
5.	Andrews, Jordan	Construction Pool Elevation	Written	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
6.	Andrews, Lovie	Construct in Off Season	Written	Start construction during the winter.	Construction will be all year round to expedite the length of the construction period and to construct the modifications as soon as possible to reduce the dam safety risk. However, the construction pool elevation (approximate elevation 2,543-feet NAVD88; 72,237 acre-feet) has been limited to a four-to-six-month window from October 2020 through March 2021. This takes advantage of the seasonal low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This minimizes impacts in the DEIS and further reduces the impacts over the entire construction period. Majority of the time the lake will remain under its current operation with the pool restriction (elevation 2,589.26-ft NAVD 88; 360,000 acre-feet) except for the period identified above.
7.	Andrews, Lovie	Construction Pool Elevation	Written	Draining the lake would affect recreation users, which would hurt local economy	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
8.	Andrews, Tamera	Construct in Off Season	Written	Start construction during the winter.	Construction will be all year round to expedite the length of the construction period and to construct the modifications as soon as possible to reduce the dam safety risk. However, the construction pool elevation (approximate elevation 2,543-feet NAVD88; 72,237 acre-feet) has been limited to a four to six month window from October 2020 and March 2021. This takes advantage of the seasonal low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This minimizes impacts in the DEIS and further reduces the impacts over the entire construction period. The majority of the time the lake will remain under its current operation with the pool restriction (elevation 2,589.26-feet NAVD 88) except for the period identified above.
9.	Andrews, Tamera	Construction Pool Elevation	Written	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
10.	Arnazzi, John	Property Values	Kernville Hearing	Have property values have been considered? Is there has been any compensation being discussed?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6. Individual appraisals for affected property owners will be conducted on each parcel to determine fair market value when the

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
					project is approved and funded.
11.	Audubon	Sierra Way Road Improvement	Written	Sierra Way Road should be improved as part of the project, due to the importance of the road to regular traffic and its importance as an emergency route.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps to address the issue at Sierra Way through a cost-shared partner.
12.	Bedard, Ivy (thru Kimberley Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
13.	Bedard, Ivy (thru Kimberley Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
14.	Benoit, Ronald	Air Quality	Lake Isabella Hearing/ Written	Low lake levels will degrade air quality, which is a concern. Is there an air pollution monitoring system? Could dredging be implemented to reduce air quality?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4. Potential dredged materials have been determined to not be suitable or cost effective for filter and drain materials.
15.	Benoit, Ronald	Dredging	Written	Dredging the lake would reduce air quality impacts at the lower pool elevation.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 9.
16.	Benoit, Ronald	Worker Housing	Lake Isabella Hearing/ Written	Suggests that the Corps build a lodge to house the workers. Additionally suggests bringing FEMA structures to BLM land to establish worker housing, and leave property there after construction for public use.	Comment noted. Economic modeling conducted in preparation of the DEIS determined that the portion of the projected project workforce anticipated to reside in the Kern River Valley during the construction period would represent less than one percent of the combined Kern River Valley population, and 1.7 percent of the 2010 Lake Isabella population alone. Given the abundant home sale and rental opportunities currently available in the Kern River Valley, the need to project additional federal funding into dedicated worker housing was eliminated from further consideration.
17.	Benoit, Ronald	Public Comment Period	Written	Request that the Corps allow for a period of 60 days for public comment on supplemental documents.	Comment noted. The District Engineer will consider and act on requests for time extensions to review and comment on NEPA documents based on timeliness of distribution of the document, prior agency involvement in the proposed action, and the action's scope and complexity.
18.	Benoit, Ronald	Borrow sites	Lake Isabella Hearing	Will Engineer Point be removed from the lake?	Engineers Point will not be used for borrow materials. Engineers Point would be a location to place excess materials, thus increasing its size.
19.	Benoit, Ronald	Water Quality	Lake Isabella Hearing/ Written	Will the lowered lake levels result in the lake turning over and causing a fish kill? Would cofferdam construction and removal lead to toxic conditions and fish kills?	Historical monitoring data indicates that the lake is mixed for most months of the year despite reservoir pool levels changing. There is almost constant mixing due to wind and wave action, especially in shallower areas near the auxiliary dam. The Corps recognizes a lowered lake level may cause some unwanted effects such as lowered dissolved oxygen and higher temperatures. This can occur under natural drawdown. By adhering to the historical reservoir operating guidance and implementing best management practices, the Corps will reduce the risk of fish kills and degradation of water quality. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, water quality monitoring will take place to assist in preventing negative impacts including fish kills. Updates to the preferred alternative's construction schedule have resulted in a decreased period of time for the lowered pool and minimized project impacts. The anticipated timeframe for the lowered pool is a period of seven months from September 2020 to March 2021. The current restricted pool elevation is set at 2,589.76 feet and the construction pool elevation will be set at approximately 2,543 feet. Based on historical reservoir elevation values, the reservoir typically reaches elevations below 2,550 feet. This decreased timeframe of 6 months will help minimize impacts to water quality due to construction related reservoir operations (discharges). However, potential impacts from a sustained lowered pool and associated impact offset measures are being evaluated. The Corps does not foresee reservoir releases significantly affecting water quality. The Corps will continue to seek opportunities to minimize potential degradation of water quality during

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					construction of the coffer dam. Prior to in-water work, plans will be created to outline proper best management practices. Examples of potential BMPs include turbidity curtains, sediment basins, and various erosion and sediment controls.
20.	Benoit, Ronald	Housing below dam/environmental justice	Lake Isabella Hearing/ Written	What will come of the Housing below the dam? Can it be used to house workers?	Housing below the dam cannot be used for workers. Any housing acquired for project purposed will be demolished. Low income and elderly housing will be addressed in relocation benefits.
21.	Benoit, Ronald	Noise	Lake Isabella Hearing	What are the impacts of noise pollution?	Section 3.8 - Noise and Vibration, in the DEIS presents a discussion of the regulatory setting for noise and vibration, the affected environment, and the potential noise- and vibration-related impacts from the proposed Action Alternatives and support actions. Additional analysis regarding Noise and Vibration can be found in the FEIS, Section 3.6.
22.	Benoit, Ronald	Recreation Impacts	Written	Additional campgrounds should be established to mitigate those lost. Breaks should occur in construction activity over weekends and planned events (Fishing Derby, etc.)	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
23.	Benoit, Ronald	Public Safety	Lake Isabella Hearing	How will the public be alerted if there is a safety concern?	The Corps will notify Kern County, and then Kern County would notify the population through various means (TV, radio, reverse 911, sirens in Lake Isabella, etc.).
24.	Benoit, Ronald	Cost	Lake Isabella Hearing	What is the cost comparison of the different alternatives?	The costs between alternatives (Life Safety and DSAC) range between 10 to 20 percent. The Replacement Dam has the highest cost and nearly 40% greater than the other alternatives.
25.	Benoit, Ronald	Traffic/Circulation	Lake Isabella Hearing	Traffic will increase in the valley, which is a concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
26.	Benoit, Ronald	Hire Local	Lake Isabella Hearing	How many people will be working on the dam and will there be local workers?	The workforce will vary depending on the phase of construction; however, the rough estimate of a typical work crew would likely be from 100-150 workers. The Corps will hire a prime contractor on the national level and the contractor will be responsible for hiring the work force.
27.	Benoit, Ronald	Crest Raise	Lake Isabella Hearing/ Written	Will the increased storage be sold to downstream users? Recommends implementation of the 4-foot raise instead of 16-foot alternative	There is no plan to sell storage to downstream users. The 16-foot dam raise would be constructed for the purpose of flood control only (to pass extreme and rare flood events (e.g. 1 in 4,700 percent chance in any given year) and not for water conservation storage.
28.	Benoit, Ronald	Blasting	Lake Isabella & Kernville Hearings/ Written	Will warning be given prior to blasting? Will Highway 155 be closed due to blasting? Will air quality be a concern as a result of blasting?	Warnings will be given during the blasting period. Signage will be placed near the location of the site and sirens will be used just prior to the each blast. Blasts near the downstream end of the spillway will require intermittent and temporary closures.
29.	Berkshire, Abe	Air Quality	Lake Isabella Hearing	Has a special concern over air quality due to damaged lung.	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all effected individuals and discuss and assist them in applying for relocation benefits.
30.	Blanton, Bill	Traffic/Circulation	Lake Isabella Hearing	Could the Corps build a causeway across the lake to alleviate some of the traffic concerns and the seasonal flooding of the Sierra Way Road bridge?	Comment noted. Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.
31.	Blanton, Bill	Recreation Impacts	Electronic	Could the Corps implement media advertising of the lake to offset recreation effects?	While the Corps cannot advertise for the lake using tax dollars, public information and outreach are expected to be an integral part of the project, to include media outreach informing visitors of the status of the lake throughout construction.

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32.	BLM	Cultural Resources	Electronic	Cultural resources in the Keyesville area were not adequately addressed. The Corps needs to consult with tribes. BLM is concerned that EIS states impacts to cultural resources have not been fully identified and yet also states the project is unlikely to contribute to cumulative impacts. The Corps needs to include further cumulative impact analysis.	The preferred alternative will not affect Keyesville, therefore, we consider that section of the DEIS to be adequate. Information regarding CA-KER-692 was added to the appropriate section of the DEIS. The project will only relocate Highway 155 to the north near the Pioneer Point Campground, not further west towards Keyesville or CA-KER-25. The Highway 155 Bridge will not be replaced. Based on input from the BLM our engineers have found an alternative by which the Highway 155 bridge deck over the Kern River could be widened in place with the addition of a passing lane. Requested information beginning on the third sentence of Sue Porter's comments is beyond the scope of an EIS and/or the Corps' responsibility. Corps policy from our Planning Guidance Notebook, ER-1105-2-100, C-4(B)(d)(2)(e) states that "The Feasibility Report and NEPA document shall 'briefly describe' identified and predicted historic properties which would be impacted by the alternative plans." However, consideration of these particular comments will be included in a new survey of the APE. The final APE will be completely resurveyed. In August 2012 the Corps is meeting with the Tübatulabel Indian Tribe for Government to Government consultation. In August, 2012, the Corps met with other interested Tribes in Dirk Charley's future tribal meetings. The only known site in the probable APE is CA-KER-12. The paragraph regarding cumulative impacts has been reworded.
33.	Bonello, Peter	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
34.	Borthick, Cheryl	Construction Pool Elevation	Electronic	Lowering lake levels will harm recreation and increase fugitive dust.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
35.	Borthick, Cheryl	Worker Housing	Electronic	Will worker housing take up recreation lodging? Could a camp site be built to house workers?	Comment noted. Economic modeling conducted in preparation of the DEIS determined that the portion of the projected project workforce anticipated to reside in the Kern River Valley during the construction period would represent less than one percent of the combined Kern River Valley population, and 1.7 percent of the 2010 Lake Isabella population alone. Given the abundant home sale and rental opportunities currently available in the Kern River Valley, the use of lodging dedicated to recreational users was considered less than significant.
36.	Borthick, Cheryl	Property Values	Electronic	Property values will decrease due to the project.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
37.	Borthick, Cheryl	Air Quality	Electronic	Air quality impacts were not addressed for the Kernville area.	Kernville is located in the Mohave Desert Air Basin (MDAB). The Eastern Kern Air Pollution Control district (EKAPCD) has regulatory authority over the air emissions within the MDAB from the proposed Isabella DSM Project. Short-term construction-related air quality impacts were assessed for the DEIS in accordance with EKAPCD recommended methods. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
38.	Borthick, Cheryl	Hire Local	Electronic	Hire local workers.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
39.	Borthick, Cheryl	Recreation Impacts	Electronic	The project will have negative impacts on recreation.	The Recreation Plan will involve public participation, and concerns over the negative impacts of the project on recreation are to be addressed in this plan.
40.	Britton, Jesse (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
41.	Britton, Jesse (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the

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					project since publication of the DEIS are included in the FEIS, Chapter 2.
42.	Brust, Charles	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
43.	Buchanan, Michael	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
44.	Burkhart, Robert on behalf of Kernville COC	Worker Housing	Kernville Hearing	The issue of where workers will stay during construction has not been addressed in the DEIS.	Approximately 50% of construction workers would likely utilize home and apartment rentals and home sales within the Kern River Valley area. The other approximately 50% of construction workers would likely commute from the Bakersfield metropolitan area.
45.	Buth, Mark	Borrow sites	Electronic	Recreation will be lost if the Auxiliary Dam campground is used as a borrow area. Could dredge material be used instead?	Dredging materials from the lake will not be cost effective. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8 and Issue 9.
46.	Carter Escadero, Heidi	Air Quality	Lake Isabella Hearing	Work should temporarily stop when air quality becomes degraded.	Concur. This is particularly important for all construction related activities involving clearing, grading, earth moving, and excavation during periods of winds greater than 20 miles per hour (averaged over on hour).
47.	Carter Escadero, Heidi	Public Comment Period	Lake Isabella Hearing	The public should be able to comment during construction.	Comment noted.
48.	CDFG	Wildlife	Written	Southwestern willow flycatcher/western yellow-billed cuckoo: supports elimination of south fork delta borrow site; hardhead: suggest surveys downstream of dam; wildlife species: pre project surveys for western pond turtle, pallid bat, and Yuma myotis so that project impacts and appropriate mitigation can be addressed; rare plane species: pre-project surveys; Tracy's eriastrum: pre-project surveys and avoidance of all areas species is found; Nesting migratory birds: Surveys; Federal ESA: If surveys detect a federally listed species or their habitat, survey results should be submitted to proper USFWS office.	Concur. The South Fork Delta borrow area has been eliminated. Per Endangered Species Act section 7 consultation requirements for federal agencies, a Biological Assessment was performed for the preferred alternative and submitted to USFWS for a Biological Opinion. The Biological Opinion is included in Appendix C to the FEIS.
49.	CDFG	Traffic/Circulation	Written	Relocation of Highways 155 and 178 are not addressed in the DEIS.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
50.	CDFG	Water Quality	Written	There is a concern about sediment discharge downstream of dam. CDFG recommends conducting baselines studies of the Kern River above, within, and below the lake. Continuous water quality monitoring should occur during construction. Project Impacts and mitigation measures addressing downstream effects should be presented in the DEIS. CDFG recommends releasing water from the dam slowly to prevent detrimental sediment discharges and/or remove accumulated sediment behind the dams before construction.	There are water quality studies currently being conducted at the inflows, outflows, and within the lake. Also, water quality monitoring is planned for construction at the Main Dam, Auxiliary Dam, and other areas that may have issues during construction that have not yet been determined. See the FEIS for information on the Lake Isabella water quality monitoring efforts. With exception of the construction lowered pool, from September 2020 to March 2021, the reservoir will be operated under the historical reservoir operating guidance. The preferred alternative does not require unusual discharge from the dam. The Corps does not intend to discharge sediment downstream and will follow environmental regulatory requirements. The Corps will continue to evaluate appropriate impact reduction measures to minimize potential sediment discharges during construction through the use of proper best management practices (BMPs). Examples of potential BMPs include turbidity curtains, sediment basins, and various erosion and sediment controls. Additional sediments will not be exposed or released downstream. A SWPPP plan is being developed for the project and will included extensive monitoring. The primary

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					work areas are downstream of the dams and above the normal high water pool; however a plan for work near and in the reservoir area will be developed during design. The project will also be covered under a NPDES Discharge Permit for Construction related activities. A SWPPP will be developed by a qualified SWPPP developer and will be approved by the State Water Resources Control Board. The SWPPP will outline site management of storm water and sediment prior to construction commencement.
51.	Chapman, John Henry	Hire Local	Lake Isabella Hearing	Local workers should be hired first.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
52.	Chase, Deb (thru North Fork and French Gulch Marinas)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
53.	Chase, Deb (thru North Fork and French Gulch Marinas)	Property Values	Electronic	The project will affect property values.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
54.	Chase, Deb (thru North Fork and French Gulch Marinas)	Air Quality	Electronic	Fugitive dust emissions are a concern during construction.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
55.	Chase, Deb (thru North Fork and French Gulch Marinas)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
56.	Chase, Deb (thru North Fork and French Gulch Marinas)	Hire Local	Electronic	Hire local workers.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
57.	Chase, Deb (thru North Fork and French Gulch Marinas)	Wildlife	Electronic	The project will have impacts on wildlife.	The Isabella Lake DSM Project will not (with appropriate avoidance, minimization, and mitigation measures) adversely affect any federally listed, State listed, or USFS sensitive species, or adversely modify or destroy critical habitat necessary for federally listed species. All measures necessary to minimize impacts to fish and wildlife will be presented in the Final Coordination Act Report and the Biological Opinion produced by the USFWS.
58.	Ciriello, Joseph	Noise	Electronic	Construction should only occur during normal working hours.	Construction activities are planned to primarily occur during normal working hours including Saturdays. Saturday work would be limited to onsite activities only (no deliveries). The tunnel excavation and construction (below ground work) could also take place at night to reduce construction safety risk.
59.	Ciriello, Joseph	General Clarification	Electronic	The Corps should coordinate with the Kern Water Master to take into account downstream users.	Coordination with the Kern River Water Master will be a priority throughout construction.
60.	Ciriello, Joseph	Air Quality	Electronic	Dust mitigation should be a high priority.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
61.	Ciriello, Joseph	Hire Local	Electronic	Local workers should be hired first.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
62.	Ciriello, Joseph	Traffic/Circulation	Electronic	Trucks should only operate during normal off peak times to minimize impacts on traffic.	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.

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63.	Ciriello, Joseph	Construction Pool Elevation	Electronic	Normal cycle of water storage and use needs to be taken into account. Lowering the construction pool is not feasible.	The normal cycle of water storage and use needs was taken into account when developing the plans and construction schedule for the project. The construction pool elevation (approximate EL approximately 2,543-ft NAVD 88; 72,237 acre-feet) has been limited to a four-to-six-month window from October 2020 through March 2021. This takes advantage of the seasonal low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This minimizes impacts in the DEIS and further reduces the impacts over the entire construction period. Majority of the time the lake will remain under its current operation with the pool restriction (EL 2589.26-ft NAVD 88) except for the period identified above. The Corps will continue to work with the Water Master to minimize impacts. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
64.	Ciriello, Joseph	Recreation Impacts	Electronic	Local representatives should be present when recreation plan is discussed. A new campground should be developed if the Auxiliary Dam campsite is closed. Project work should respect normal recreation opportunities.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8.
65.	Ciriello, Joseph	Public Affairs/Relations	Electronic	Everyone and all groups interested in the valley should work with the Corps. A dam task force should be created to allow the community to have "one voice" when dealing with the Corps.	The Corps encourages and will work with all members of the public. The Corps will continue to keep the community informed about the project and ongoing construction/milestones.
66.	Ciriello, Joseph	Housing Below Dam/Environmental Justice	Electronic	People living below the dam must be relocated before construction begins for their own well-being.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
67.	City of Bakersfield	Borel Canal	Written	Supports the removal of the Borel Canal.	The option to remove the canal upstream is still under consideration for future operations.
68.	Claras, Carl	Build New Dam Downstream	Electronic	The Corps should consider building a second dam downstream to reduce need for lowered lake levels.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
69.	Claras, Carl	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1.DEIS The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
70.	Codling, Eileen	Build New Dam Downstream	Written	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
71.	Codling, Eileen	Budget/Schedule	Written	A private contractor should complete construction; there are concerns over the money spent and remaining money available.	A private contractor will be used for the construction contracts. The design will be conducted by Corps personnel, with assistance from Architect and Engineer contractors where needed.
72.	Collins, Samantha	Rafting Below Dam	Electronic	Impacts on rafting below the dam are not addressed. The Corps needs to create a written plan that ensures adequate rafting flows during rafting season.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
73.	Conway, Josh	Air Quality	Lake Isabella Hearing	Fugitive dust emissions are a concern during construction.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
74.	Conway, Josh	Construction Pool Elevation	Lake Isabella Hearing	Lowered pool will hurt the local economy	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.

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75.	Conway, Josh	Crest Raise	Lake Isabella Hearing	A 16 foot raise in lake level will inundate the road.	The dam raise is only to protect the dams from overtopping during extremely rare flood events (1 in 4,700 percent chance in any given year) and the road is already flooded under existing conditions at this type of an event.
76.	Conway, Josh	Blasting	Lake Isabella Hearing	Blasting will affect business due to noise disturbance.	The Corps understands your concern, particularly with regards to noise generated from blasting activities. The noise levels associated with blasting are generally a function of shot sizes, number of shots, depth of the blasting charges and the shot timing. All of these associations would be minimized to the greatest extent possible in order to minimize the impact to a "low to moderate" and "less than significant" for sensitive receptors such as your business in Lake Isabella. Further minimization measures necessary would be determined in a Controlled Blasting Management Plan developed in conjunction with the blasting contractor.
77.	Cook, Wade	Recreation Impacts	Lake Isabella Hearing	Project funds should go toward finding a recreation mitigation measure.	A Recreation Plan is anticipated in 2013, which is intended to address the impacts to recreation and will lay out the plan for accommodating recreation. See Section 1.4.2 of this FEIS for additional information.
78.	Cooley, William	Construction Pool Elevation	Electronic	Lowering lake will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
79.	Corrales, Karley	Budget/Schedule	Written	Too much money has been spent on research and the project is taking too long to get started.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
80.	Corrales, Karley	Construction Pool Elevation	Written	Lowering lake levels will increase trash and fish kills, and decrease recreation use.	The biggest contributing factor with regards to your concerns involves the construction pool. The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
81.	Corrales, Kresta	Construction Pool Elevation	Written	Lowering lake levels will hurt fish and birds, and increase mud and odors. The amount of time that the environment is altered is a concern.	The biggest contributing factor with regards to your concerns involves the construction pool. The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
82.	Corrales, Kresta	Budget/Schedule	Written	Construction of the project will take too long.	The Corps understands the concern for the duration of construction and the Corps is constantly doing everything possible to shorten those completion dates. The Corps will continue to refine the schedule to ensure The Corps is efficient in our construction durations.
83.	Cushman, Brian	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
84.	Cushman, Kimberley	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
85.	Cushman, Kimberley	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
86.	Cushman, Kimberley	Budget/Schedule	Written	The project will go over budget and schedule, which is a concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
87.	D'Angelo, Rita	Blasting	Electronic	General concern.	A blasting plan will be developed during design to develop the best strategy and to minimize off site impacts and closures. Blasting would primarily occur on the North side of engineers point, thus buffering noise impacts.

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88.	D'Angelo, Rita	Property Values	Electronic/ Kernville Hearing	The Project will harm property values.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
89.	D'Angelo, Rita	Water Quality	Electronic	General concern	Comment noted. Please see the updated water quality information provided in the FEIS (See Section 3.4 - Water Resources).
90.	D'Angelo, Rita	Necessity of project	Electronic	Want to know why dam safety is only a concern now, and why it has taken so long to get to this stage.	Each feature of the project was evaluated in detail to determine and develop the proper scope for improvements. The evaluation included the determination of the fault rupture potential and flood loading potential. Extensive foundation investigations and characterization were also required.
91.	D'Angelo, Rita	Housing below dam/environmental justice	Electronic	By using eminent domain, the Corps is "stealing" people's houses.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
92.	D'Angelo, Rita	Construction Pool Elevation	Electronic & Lake Isabella Hearing	Draining the lake would affect recreation users, which would hurt the local economy	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
93.	D'Angelo, Rita	Units	Kernville Hearing	Lake volume should be expressed in acre-feet instead of elevation.	The FEIS is updated to include acre-feet in addition to elevation. Updated text can be found throughout the FEIS as appropriate
94.	D'Angelo, Rita	Traffic/Circulation	Electronic	General concern	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays.
95.	D'Angelo, Rita	Recreation Impacts	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
96.	D'Angelo, Rita	Cultural Resources	Electronic	Plans involve using sacred sites as staging areas.	The Corps is unaware of any sacred sites that will be used for staging. Only one location will be used for staging that has an archeology site on it and that has had a long-standing fully developed campground on it. In November of 2011, Tribal chairwoman Donna Miranda-Begay sent us a map showing Tübatulabel villages, places, and cultural resource areas. None of them are near a staging area. We have met with the Tübatulabel Indian Tribe in August 2012 for Government to Government consultation and discussed these types of concerns.
97.	D'Angelo, Rita	Wildlife	Electronic	General concern over the wellbeing of the endangered salamander.	With regards to the federally threatened California Tiger Salamander and State threatened Tehachapi slender salamander, there is no suitable habitat or known occurrences in the proposed project area. With regards to the State threatened Kern County Slender Salamander, known occurrence and potentially suitable habitat exists within the lower Kern River and tributaries downstream of the Main Dam. The Isabella Lake DSM Project will not (with appropriate avoidance, minimization, and mitigation measures) adversely affect any federally listed, State listed, or USFS sensitive species, or adversely modify or destroy critical habitat necessary for federally listed species. All measures necessary to minimize impacts to fish and wildlife will be presented in the Final Coordination Act Report and the Biological Opinion produced by the USFWS.
98.	D'Angelo, Rita	Air Quality	Electronic	General concern	Your concerns have been noted. Please see our response to other similar comments regarding air quality, property values, water quality, economy, and noise (blasting). Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
99.	D'Ascenzo, Juliann & Raymond	Recreation Impacts	Electronic	What free camping areas will be available since the Auxiliary Dam area will be taken away?	Other areas around the lake will not be affected by the project, and the U.S. Forest Service will continue to be the managing agency for these areas. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
100.	D'Ascenzo, Juliann & Raymond	Air Quality	Electronic	Many people in the area have respiratory issues. If someone gets hospitalized, who is liable for payment of fees?	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled

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					engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
101.	D'Ascenzo, Juliann & Raymond	Traffic/Circulation	Electronic	The project will affect traffic delays in the valley, which is a concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
102.	Davidson, Gerald	Construct in Off Season	Written	Construct the project during the winter or fall.	Construction only during the off-season will greatly lengthen the schedule, cost, and would prolong impacts.
103.	Davidson, Gerald	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
104.	Davie, Megan	Construct in Off Season	Written	Construct the project during the winter or fall	Construction only during the off-season will greatly lengthen the schedule, cost, and would prolong impacts.
105.	Davie, Megan	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
106.	Davis, John	Recreation Impacts	Kernville Hearing	What mitigation will there be for local businesses hurt by construction?	Compensation for lost business is not likely. It is not known what limitations the Corps has on compensation for business lost due to construction.
107.	Davis, Lori	Air Quality	Electronic	General concern	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
108.	Davis, Lori	Cultural Resources	Electronic	General concern	See responses to Mary Goodman, Barbara Hinkey, Robert Rusby, the Sierra Club, Donna Miranda-Begay, Terri Gallion, and the Kern Valley Indian Council regarding their specific cultural resource concerns.
109.	Davis, Lori	Public Safety	Electronic	An increase in traffic could affect the ability of emergency responders to travel the canyon. Additionally, increased traffic could cause an increase in accidents.	The canyon road will not be closed. Some additional construction traffic could occur in the canyon, but no impact to emergency responders is expected.
110.	Davis, Lori	Traffic/Circulation	Electronic	Increased traffic on Highways 155 and 178 during construction is a concern.	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
111.	Davis, Lori	Missing Information/Tiering	Electronic	DEIS is incomplete.	When information for a complete analysis is lacking upfront, the Council on Environmental Quality encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need. The tiered efforts related to this project are addressed in section 1.9 - Issues to be Resolved.

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					These tiered efforts include recreation, real estate and a detailed analysis with regards to the State Route realignments. All follow-on NEPA documents will allow public review and comment before construction start.
112.	Davis, Lori	Noise	Electronic	General concern	Your concerns have been noted. Please see our response to other similar comments regarding noise impacts such as response to comments 21, 58, 76, 87, 120, 146, 172, 316, and 388.
113.	Day, Susan	Crest Raise	Electronic	Raising the dam crest could cause flooding in Kernville during a major flood event. How does a crest raise constitute a modification? It is a concern that the crest raise was not part of the initial scoping.	Raising the dam crest to the planned height does not affect flooding in Kernville. Flood events required to raise the pool to the height of the crest raise would independently cause flooding in Kernville due to the high flows on the North Fork of the Kern River. The flooding would be caused by river flows.
114.	Day, Susan	Construction Pool Elevation	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
115.	Day, Susan	Traffic/Circulation	Electronic	Will the project close highways and cause road damage?	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. On highway trucks will be required to meet all standards. Proposed blasting near the downstream end of the Emergency Spillway will require intermittent and temporary closures. These closures would be in accordance with an approved Traffic Management Plan to ensure less than significant impacts. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
116.	Day, Susan	Wildlife	Electronic	General concern	Your concerns have been noted. Please see our response to other similar comments regarding rare and endangered species, and local flora and fauna, such as response to comments 48, 57, 97, 116, 124, 161, 174, 196, 269, 285, 325, 341, and 403. Also see the analysis provided in the DEIS, section 3.10 and the FEIS, Section 3.8.
117.	Day, Susan	Air Quality	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
118.	De Vooght, An	Construction Pool Elevation	Electronic	Loss in recreation due to lowered lake levels is a concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
119.	Demetriff, Beverly	Rafting Below Dam	Electronic	There is a concern for the economic well-being of the rafting companies that operate above and below the dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
120.	Dempsey, Judy	Missing Information/Tiering	Electronic	Mitigation of noise, dust, traffic, and local road changes needs to be clearly stated in the DEIS.	Concur. The Corps has determined the need to tier off the State Route 155 and 178 realignments into a follow-on NEPA document. This more detailed full description and consequence analyses will be available for public review later in 2013. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
121.	Dempsey, Judy	Recreation Impacts	Electronic	Advertising should be done on radio, TV, etc. to promote recreation to the area as a form of recreation mitigation.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
122.	Dempsey, Judy	Budget/Schedule	Electronic	The project should begin as soon as possible.	Isabella is a high priority project and the Corps is committed to start design upon completion of the dam safety modification report, which is scheduled for completion on October 29, 2012. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.

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123.	Dempsey, Judy	Public Affairs/Relations	Electronic	Keep lines of communication with the community open during construction.	The Corps will continue to keep the community informed about the project and ongoing construction/milestones.
124.	Desert Mountain Resource Conservation and Development Council	Wildlife	Electronic	There is a concerned about the introduction of invasive plants species from equipment and materials. BMPs, such as pressure washing, could help mitigate for this. Disturbed areas should be replanted with native plant species.	Concur. The Corps is serious about our need to minimize introduction of invasive species as a result of this proposed project. Off-site washing of all equipment before entering project lands will be required. Restoration of all disturbed areas will commence during or immediately following construction completion. The Corps will work closely with USFS and Cal DFG for use of appropriate native plant species.
125.	Desert Mountain Resource Conservation and Development Council	Borrow sites	Electronic	The Corps should consider dredging the lake to collect borrow material in order to preserve other areas and offset effects of sedimentation.	The Auxiliary Dam campground area is a secondary borrow source based on the quality and location of the materials. Dredging materials from the lake will not be cost effective, and would introduce other environmental concerns such as additional impacts to water quality. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8 and Issue 9.
126.	Dew, George	Geology/Seismic	Kernville Hearing	Routing the Borel Canal on a fault line is a concern.	Control features for the tunnel would be located in sound rock and upstream of the shear zone of the fault.
127.	Dew, George	Public Safety	Kernville Hearing	How serious of a threat is dam breakage?	One of the Corps' risk informed guidelines is that an annual probability of failure greater than 1/10,000 is unacceptable. The assessed annual probability of failure of Isabella Dam is indeed greater than 1/10,000. Specific numbers as to probability of failure are not releasable to the public, per established guidance. It is emphasized that the Corps believes that dam failure is not "imminent".
128.	Duitsmam, Rachelle (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
129.	Duitsmam, Rachelle (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
130.	Dunn, Chuck	Risk Assessment	Electronic	Provide more information on assessing risk.	Concur with several of your points. These will be included in the FEIS. With regard to your other general comments, please see our response to other similar comments. While economic risk and environmental risk are important considerations when assessing risk, life safety is paramount. For more detailed information on risk assessment please see the policy document ER 1110-1-1156 which can be found at http://140.194.76.129/pulications/eng-regs/.
131.	Dunn, Chuck	Alternatives	Electronic	Why can't cement used to prevent leakage? Why does the dam need to be widened?	Cutoffs were evaluated for seepage mitigation, but a more flexible design (based on seismicity) is preferred. The dam requires widening to incorporate filter and drain materials and to increase stability. Widening also minimizes excavation of the existing dam.
132.	Dunn, Chuck	Borel Canal	Electronic	Constructing the new site for the Borel Canal along the fault is a concern. Could the canal be piped under the Auxiliary Dam and sealed with cement instead?	Earthquake performance and deformation of the dam would remain a concern for development of a seepage path
133.	Dunn, Chuck	Necessity of project	Electronic	Was a modeling process was used to determine dam risk? More understanding of the Corps' knowledge of seepage conditions should be known.	Review of instrumentation, seepage modeling/analysis, and expert elicitations (including experts outside of the Corps) were used to determine the risk and seepage concerns.
134.	Dunn, Chuck	Cost	Electronic	What is the cost associated with each alternative?	The alternatives range from $400M to $700M.
135.	Dunn, Chuck	Public Affairs/Relations	Electronic	Proper notice was not given to local residents.	The Corps has hosted numerous public meetings in 2010, and more recently in April 2012, to keep the public informed. We also have a dedicated webpage about the project.
136.	Dunn, Chuck	Hydrology	Electronic	How was the PMF calculated?	The PMF was determined per NOAA guidance and Corps policy and represents an intensive study effort over several months. In general, the PMF is developed in a series of discrete and iterative stages. Developing a calibrated rainfall/runoff model, including snowmelt computations, is the first stage. The

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					PMP is routed through this model (with adjusted parameters) to obtain the PMF. A critical step in developing a calibrated model is data collection. Data collected for the basin included Geographic Information System (GIS) data (such as Digital Elevation Model (DEM) data, watershed boundaries, and stream shape file data) as well as stream flow, precipitation, temperature, and snow water equivalent (SWE) records. Two of the historic events found during the review of the data were used to calibrate the rainfall/runoff model (that includes a snowmelt calculation component). Calibration to these significant events provided insight into the reasonableness of the values used for initial and constant loss rates, the hydrograph storage and time of concentration estimates, base flow estimates, results of the terrain pre-processing, the SWE values, and the temperature values. The subsequent steps following calibration included: (1) using the computational procedures outlined in the National Oceanic and Atmospheric Administration (NOAA) Hydrometeorological Report (HMR) No. 58/59 to develop the PMP, (2) entering the PMP into the calibrated HEC-HMS model to develop the PMF, (3) performing sensitivity tests of various parameters, and (4) finalizing the PMF.
137.	Dunn, Chuck	Geology/Seismic	Electronic	What is meant by "geologically recent past"? Putting the spillway on top of the fault is a concern.	The term "Recent" is used synonymously with "Holocene", which describes the epoch since the last major ice age. This equates to the time period between approximately 11,000 years ago to the present. The emergency spillway will not be located on top of any known active splays of the Kern Canyon Fault. Additionally, water will not reach the emergency spillway unless in extremely rare flooding events (~1/4,700). The likelihood of a flood that causes the reservoir to reach this elevation in combination with a large earthquake is exceedingly remote (~1/15 million). Additionally, there are no known safety issues with regards to the emergency spillway if an earthquake occurs while the emergency spillway is in operation.
138.	Dunn, Chuck	Missing Information/Tiering	Electronic	Why is certain information not available in the DEIS?	When information for a complete analysis is lacking upfront, the Council on Environmental Quality encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need. The tiered efforts related to this project are addressed in section 1.9 - Issues to be Resolved. These tiered efforts include recreation, real estate and a detailed analysis with regards to the State Route realignments. All follow-on NEPA documents will allow public review and comment before construction start.
139.	Duxbury, Brett	Rafting Below Dam	Kernville Hearing	Would like the Corps to coordinate with the river master to allow beatable flows in below dam during construction, even in the "offseason".	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
140.	Eastern Kern Air Pollution Control District	Air Quality	Electronic/ Bakersfield Hearing	There is a discrepancy between attainment standards and designations for ozone and PM-10. GHG thresholds need to be listed in the report. Review calculations done for the "de minimums" thresholds for the General Conformity Rule. Fugitive dust will become an issue when lake levels are lowered, mitigation must be addressed in Fugitive Dust Plan.	Concur. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis). Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
141.	Eastern Kern Air Pollution Control District	Missing Information/Tiering	Electronic	Emissions calculations need to be conducted using APCD/AQMD approved modeling software; estimates of short-term construction emissions; estimates of long term operational emissions; estimates of stationary source equipment; determination as to the need for health risk assessment; tables showing construction and operational emissions with a comparison to EKAPCD CEQA thresholds; localized impacts; consistency with existing air quality plans; CARB air basin emissions from the CARB website	Concur. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).

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142.	Eastern Kern Air Pollution Control District	Permits	Electronic	Any portable equipment on site for more than 1 year, fuel storage tanks, asphalt batch plants, concrete batch plants, aggregate crushers and aggregate screens need to be permitted by the District.	Plans and permits will be developed and coordinated during design and engineering phase of the project.
143.	Engel, Dusty	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
144.	Engel, Sebra	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
145.	EPA	Alternatives	Written	EPA recommends that the Corps minimize the use of RMP terminology, avoid discussion of rejected alternatives, improve organization in chapter 2, and include separate cross-sections and plan views for the main and auxiliary dam for each alternative.	Concur. Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
146.	EPA	Noise	Written	Consider schools and day care centers as sensitive receptors and calculate noise estimates based on exposure time.	Concur. The noise analysis in the DEIS has considered and included these parameters.
147.	EPA	Housing below dam/environmental justice	Written	Collect additional information about the mobile home park, possibly modify alternatives, and assist in relocation and compensation.	Concur. The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
148.	EPA	Air Quality	Written	Conformity: the project requires a conformity applicability analysis and conformity determination (if necessary). The EPA would prefer to see an administrative FEIS to provide opportunity to review before FEIS is issued. Emission Modeling should include model inputs and emissions associated with each equipment type. EPA recommends commitment to the use of non-road equipment retrofitted with filters approved by EPA or CARB, or new equipment meeting the standards, discussion of how the project will comply with CARB In-Use Off-Road Diesel regulation, consider use of electric vehicles, natural gas, biodiesel to reduce criteria and GHG pollution, maintain equipment to perform at CARB and/or EPA certification levels. Limit vehicle idling to no more than 5 minutes. DEIS must include detailed estimates of GHG emissions for direct and indirect emissions. Develop a fugitive dust control plan.	Updated air quality analysis has been included in the FEIS, Section 3.3 and Appendix F (Air Quality Analysis).
149.	EPA	Water Quality	Written	Consider including a washing station at all entrance/exits; increased monitoring, action levels. FEIS should include map of wetlands, 404(b)(1) analysis as an appendix, wetland mitigation plan, and site restoration plan.	The project will be covered under a NPDES Discharge Permit for Construction related activities. A SWPPP will be developed by a qualified SWPPP developer and approved by the State Water Resources Control Board. The SWPPP will outline site management of storm water and sediment prior to construction commencement. Tracking control and stabilized construction site entrances will be addressed as part of the SWPPP. Water quality monitoring will take place during construction and action levels will be based on the Corps water quality baseline study, Clean Water Act, NPDES Discharge Permit for Construction Related Activities, Tulare Lake Basin Plan, coordination with the Regional Water Quality Control Board, and other applicable regulations.

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150.	EPA	Hydrology	Written	Evaluate climate change effects on the proposed action.	The proposed project's impact of greenhouse gas emissions on climate change was evaluated in the DEIS. It is located in section 3.5 - Air Quality, in the DEIS.
151.	Fink, Carol	Housing Below Dam/Environmental Justice	Electronic	As a resident of the mobile home park below the dam, there is concern about the relocation process. The relocation process should begin as soon as the project is approved so that it does not get dragged out. Requests more communication from the Corps concerning the matter.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
152.	Fink, Donald	Housing below dam/environmental justice	Lake Isabella Hearing	How will the work be done without going through the trailer park below the dam? What about air quality effects to those living below dam?	When the Corps receives project approval and funding The Corps will gather information from all potentially affected individuals and discuss and assist them in applying for relocation benefits. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
153.	Fleet, Morrow (thru Eva M-Hollmann)	Crest Raise	Electronic	Would an increase in reservoir storage require homeowners to purchase flood insurance?	Additional flood insurance will not be required because the dam raise is only to store extremely rare flood events (1 in 4,700 percent chance in any given year).
154.	Fleet, Morrow (thru Eva M-Hollmann)	Water Quality	Electronic	Cites the 2005 fish kill as an example of what happens after low water level.	Updates to the construction schedule have decreased the time period for the low pool and minimized project impacts. The anticipated timeframe for the low pool is a period of seven months from September 2020 to March 2021. The current restricted pool elevation is set at 2,589.76 feet and the construction pool elevation will be set at approximately 2,543 feet. Based on historical reservoir elevation values, the reservoir typically reaches elevations below 2,550 feet. This decreased timeframe of 6 months will help minimize impacts to water quality due to construction related reservoir operations. However, potential impacts from a sustained lowered pool and associated off-setting measures continue to be evaluated. The Corps intends to adhere to the historical reservoir operating guidance and does not expect reservoir releases to significantly affect water quality. Monitoring will take place to assist in preventing negative impacts to water quality. During the 2005 fish kill water levels were approximately at an elevation of 2,589.26 feet. This elevation is approximately the current restricted pool elevation. Sustained high temperatures were experienced and visible algal blooms were present. Conditions could arise that increase the potential for fish kills. Some of the concerns include lowered dissolved oxygen levels, higher pH, increased turbidity, increased temperature, and higher volumes of aquatic plant life. Historical data indicates that due to the continuous mixing and surface wave action the dissolved oxygen levels can fluctuate during low pool elevations. Continued evaluation of the predicted water quality conditions and appropriate mitigation measures to minimize impacts will continue to be conducted up to construction start.
155.	Fleet, Morrow (thru Eva M-Hollmann)	Construction Pool Elevation	Electronic	Lowering lake levels will cause a loss in recreation and increased fugitive dust.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 4.
156.	Foreman, Mike	Build New Dam Downstream	Written	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
157.	Foreman, Mike	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
158.	Foreman, Mike	Budget/Schedule	Written	There is concern that the project will take longer than planned.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
159.	Freeland, Dave	Public Affairs/Relations	Kernville Hearing	How will the community be updated on the project during construction, and how will they be able to ask questions?	A public website, brochures, social media sites and quarterly mailers will be made available and updated throughout the duration of the project. The public will be able to ask e-mail questions or ask through social media.

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160.	Gallion, Terri	Crest Raise	Electronic	If the lake elevation is raised, critical bird habitat would be flooded; a crest raise is not needed.	Raising the dam crests is required to safely pass the extreme flood events without overtopping. The frequency at which the critical bird habitat would be flooded would remain unchanged.
161.	Gallion, Terri	Wildlife	Electronic	There is concern about the bird population in the South Fork Delta area.	The South Fork Delta sand borrow area has been eliminated as a sand source for the preferred alternative. Sand will now be manufactured at the dam site utilizing waste materials generated from the emergency spillway excavation.
162.	Gallion, Terri	Cultural Resources	Electronic	Cultural resources are not adequately addressed.	With the current preferred alternative only one known archeology site will be affected by the project. That will be in a staging area and not effected by project construction. Before we start with the project The Corps will resurvey all land that will be affected by the project. The Corps has not seen any reason to involve the BIA in this project as The Corps is not involving tribal land. In August of 2012 the Corps met with the Tübatulabel Indian Tribe, at their request for Government to Government consultation. The Corps is in frequent communication with Dirk Charley and has attended two of his Tribal meetings and will attend more of them as the project progresses.
163.	Geygan, Kelly	Construction Pool Elevation	Electronic	There is concern that recreation will be lost during project construction due to low lake levels.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
164.	Goodman, Mary	Cultural Resources	Electronic	What are the Corps' plans for any cultural resources found during construction?	According to the 7/27/2012 programmatic agreement The Corps will enact 36 CFR 800.13 (a)(1) Discoveries without prior planning to start a set of prescribed procedures for dealing with this contingency. This will commence within 24 mandated hours of the discovery.
165.	Goodman, Mary	Property Values	Electronic	There is concern that the project will lower property values in the region.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
166.	Goodman, Mary	Water Quality	Electronic	Will toxicity levels of the lake increase during construction?	Evaluations of the predicted water quality conditions and required off-setting measures to minimize impacts will continue up to start of construction. Proper best management practices will be in place during construction. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, water quality monitoring will take place to assist in preventing degradation of water quality. A Storm Water Pollution Prevention Plan and other environmental protection plans will be in place and approved prior to the start of construction. Please see the FEIS for updated information on the Lake Isabella water quality monitoring efforts.
167.	Goodman, Mary	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
168.	Goodman, Mary	Traffic/Circulation	Electronic	What traffic patterns will be established to minimize impacts?	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
169.	Goodman, Mary	Budget/Schedule	Electronic	What guarantees are there that the project won't run out of funding in the allotted time frame?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
170.	Goodman, Mary	Housing below dam/environmental justice	Electronic	What are the Corps' relocation plans for those living in trailer park below the auxiliary dam?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
171.	Goodman, Mary	Air Quality	Electronic	The project will cause detrimental effects to the air quality.	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather

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					information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits.
172.	Goodman, Mary	Hire Local	Electronic	Hire local workers first.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
173.	Goodman, Mary	Noise	Electronic	Noise levels will disrupt the area. What are the project's mitigation plans?	The Corps understands your concern, particularly with regards to noise generated from blasting activities. The noise levels associated with blasting are generally a function of shot sizes, number of shots, depth of the blasting charges and the shot timing. All of these associations would be minimized to the greatest extent possible in order to minimize the impact to a "low to moderate" and "less than significant" for sensitive receptors such as your business in Lake Isabella. Further minimization measures necessary would be determined in a Controlled Blasting Management Plan developed in conjunction with the blasting contractor
174.	Goodman, Mary	Wildlife	Electronic	Concerned about migratory birds and fish during construction.	The Isabella Lake DSM Project will not (with appropriate avoidance, minimization, and mitigation measures) adversely affect any federally listed, State listed, or USFS sensitive species, or adversely modify or destroy critical habitat necessary for federally listed species. All measures necessary to minimize impacts to fish and wildlife will be presented in the Final Coordination Act Report and the Biological Opinion produced by the USFWS.
175.	Hacker, Gene	Public Affairs/Relations	Kernville Hearing	Could the Corps implement an advertisement campaign to mitigate for lost recreation?	For legal purposes, we cannot advertise on behalf of local business but will inform the city of Bakersfield and surrounding areas that the reservoir will not be closed during this project and construction impacts will be minimal.
176.	Hacker, Gene	Construction Pool Elevation	Kernville Hearing	There is concern about the effects of a lowered construction pool on local business.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
177.	Hart, Laura	Blasting	Electronic	General concern.	A blasting plan will be developed during design to develop the best strategy and to minimize off site impacts and closures. Blasting would primarily occur on the north side of Engineers Point, thus buffering noise impacts.
178.	Hart, Laura	Construction Pool Elevation	Electronic	Lowering the lake levels will create a loss in recreation and increased fugitive dust.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
179.	Hart, Laura	Budget/Schedule	Electronic	Ensure that there is enough money before starting project construction.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
180.	Hart, Laura	Property Values	Electronic	There is already a decrease in property values before the project begins, so how will the project worsen values?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
181.	Hayes, Craig	Construction Pool Elevation	Lake Isabella Hearing	Lowering lake levels will harm the economy of the town.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
182.	Hayes, Craig	Traffic/Circulation	Lake Isabella Hearing	As a transit driver, there is concern about sticking to route schedule during construction. Will construction cause traffic delays?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
183.	Heard, Dale	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.

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184.	Heard, Dale	Construction Pool Elevation	Electronic	In an uproar over lowering the lake level.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
185.	Heard, Leslie	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
186.	Hinkey, Barbara	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam in order to minimize impacts.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
187.	Hinkey, Barbara	Rafting Below Dam	Electronic	Will there be a construction impact to rafting below the dam?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
188.	Hinkey, Barbara	Crest Raise	Electronic	Will the project cause flooding at the airport, golf course, and campgrounds? The dam should not be raised.	Frequency of flooding to the airport, golf course, and campgrounds would remain unchanged, even with a crest raise.
189.	Hinkey, Barbara	Public Safety	Electronic	There is concern that road closures would make it impossible for emergency response vehicles to reach the hospital from certain areas. Where will the staging areas will be located?	Some delays or closures are expected on Highway 155, but no delays or closures are planned for Sierra Highway. Additionally, it is expected that in an emergency, any temporary closures of Highway 155 would be lifted for the emergency transportation. Staging areas are defined in the EIS.
190.	Hinkey, Barbara	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy. There is specific concern about the impacts on four local marinas. There should be no campground closures besides the auxiliary dam campground. Will there be effects to the holding pond for trophy fish that are part of the fishing derby?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.The Corps is working with the U.S. Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation Plan resulting from this process would be presented in 2013.
191.	Hinkey, Barbara	Traffic/Circulation	Electronic	Road closures or restrictions would completely disrupt traffic in the valley.	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
192.	Hinkey, Barbara	Housing below dam/environmental justice	Electronic	Relocation of those living below the dam needs to be addressed as soon as possible.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
193.	Hinkey, Barbara	Cultural Resources	Electronic	Concerned that cultural sites located within the project area are in danger from the project. Would like coordination with Tribes and BIA before approval of FEIS.	With the current preferred alternative only one known archeology site will be affected by the project. That will be in a staging area and not effected by project construction. Before we start with the project The Corps will resurvey all land that will be affected by the project. The Corps has not seen any reason to involve the BIA in this project as The Corps is not involving tribal land. In August of 2012 The Corps is meeting with the Tübatulabel Indian Tribe, at their request, for Government to Government consultation. The Corps is in frequent communication with Dirk Charley, and has attended two of his Tribal meetings and will attend more of them as the project progresses.

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194.	Hinkey, Barbara	Air Quality	Electronic	There is concern about senior citizens living in the area and their ability to cope with degraded air quality. How will dust affect wildlife in the area?	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
195.	Hinkey, Barbara	Relocation of FS Admin Compound	Electronic	A specific relocation plan was not discussed in the DEIS.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
196.	Hinkey, Barbara	Wildlife	Electronic	Increased pool levels due to crest raise will destroy wetlands and harm endangered species in the South Fork area.	The dam raise is only to store extremely rare flood events (1 in 4700 percent chance in any given year). Any impacts to listed species and/or critical habitat would occur as a result of natural runoff onto the South Fork Kern River floodplain and not as a result of routine Isabella reservoir operations.
197.	Hinkey, Barbara	Property Values	Electronic	There is concern that the project will decrease property values, as well as hurt those in the real estate business.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
198.	Hinkey, Rex	Construction Pool Elevation	Electronic	Lowering the lake levels will affect recreation and the economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1.
199.	Hoffman, Ken & Cyndie	Housing below dam/environmental justice	Electronic	As the owners of the mobile home park below dam, we would like to have the Corps come in and buy the property as soon as possible. We do not want to see a repeat of what has happened at Lake Success, where the mobile home park owners have lost business due to Corps projects.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
200.	Hollmann, Eva	Construction Pool Elevation	Electronic	How will lake levels be reestablished after construction of the cofferdam? How long will it take for the levels to come back to normal?	The cofferdam is expected to be constructed in the wet without lowering the reservoir and taking advantage of the flood control pool (lower elevations). The crest of the cofferdam will be set at the top of the restricted pool elevation, 2589.26 NAVD88. After construction of the cofferdam the reservoir will be allowed to rise to within four feet below the cofferdam (2585.26 NAVD88, 325,399 acre-feet) to allow storage of snow melt during the spring season. A plan will be put in place to fill the reservoir back to its authorized operating condition. The plan will be developed during the preconstruction engineering and design phase of the project once the tentatively recommended plan is approved. Mother nature will determine how long it will take for the levels to come back to normal. It is anticipated that it will take one to two seasons. The Corps is also working with local community groups to minimize the impacts to local events on the lake.
201.	Hollmann, Eva	Geology/Seismic	Electronic	Is more information available regarding the seismic studies that took place?	Detailed seismic studies and studies on fault rupture were conducted to understand the site conditions and loading. Additional data will be added to the EIS for background.
202.	Hollmann, Eva	Borrow sites	Electronic	Could the lake be dredged to collect borrow material in order to preserve other areas and offset effects of sedimentation?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 9.
203.	Hollmann, Eva	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
204.	Hollmann, Eva	Necessity of project	Electronic	There is concern that the proposed spillway is over-engineered. What has changed in the last 50 years to	The existing spillway and project was not designed for the range of anticipated flood loads from the drainage basin. 50 plus years of data and a few large events including the December 1966 storm

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				warrant such an increase?	provided a better understanding of the flood load potential. Given the high risk downstream the dams cannot be overtopped.
205.	Hollmann, Eva	Recreation Impacts	Electronic	Feels that there is misinformation and lack of understanding of recreation in the DEIS. A consulting body of local citizens should be involved in the process.	The Corps encourages and will work with all members of the public. We appreciate the recommendation and will work to ensure the community is informed about the project and ongoing construction/milestones. The Recreation Plan will involve public participation, and concerns over the negative impacts of the Project on recreation are to be addressed in this plan.
206.	Hollmann, Eva	Property Values	Electronic	Property values will decrease due to the project.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
207.	Hyer, Mitzi (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
208.	Hyer, Mitzi (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
209.	Jackson, Donna	Air Quality	Electronic	Fugitive dust emissions are a concern during construction.	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
210.	Jackson, Donna	Project Support	Electronic	General support for the project	We appreciate the support and will work to continue to ensure the community is informed about the project and ongoing construction/milestones.
211.	Johnson, Karen	Build New Dam Downstream	Electronic	Building a new dam should be considered in order to minimize impacts.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
212.	Johnson, Karen	Construction Pool Elevation	Electronic	General concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
213.	Jones, Thelma	Geology/Seismic	Lake Isabella Hearing	There is concern that sand material in the dam will wash away.	Sand (filter) material will be protected by the outer drain and buttress.
214.	Keeling, Rex	Traffic/Circulation	Kernville Hearing	There is concern about construction vehicles use of the highway into the valley.	Approximately 50% of construction workers would likely commute from the Bakersfield metropolitan area. The Corps will encourage the selected contractor to utilize mass transit alternatives for commuter workers. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
215.	Kern Co	Sierra Way Road Improvement	Written	Recommends that Sierra Way is improved as part of project; the road routinely becomes impassable as a result of flooding. Suggests raising the bridge to allow increased flow.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.

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216.	Kern Co Water Agency	Alternatives	Written	Supports RMP Numbers 2-7	Comment noted.
217.	Kern Valley Indian Council	Cultural Resources	Electronic	Wants a tribal monitor on site during all ground disturbing activity.	The Corps will welcome tribal monitors on site at the discretion of the Construction Foreman and the Safety Officer. That being said, the Federal Government does not pay for monitors. All tribal monitors will do so on their own time and at their own expense.
218.	Kleck, Wallace	Geology/Seismic	Written	There is concern about geology around the eastern abutment of the auxiliary dam since it is tied into an alluvial fan. Would like to see further examination of this segment of the project.	The deposition of this deposit was sampled, evaluated, and characterized in detail. The fan is the primary contributor to the seepage and seismic risk (other than fault rupture).
219.	Lehman, Kelly	Budget/Schedule	Electronic	The project should be completed in less than eight years.	The complexities of the project make a 1 year construction period unfeasible. However, as The Corps refines the construction schedule The Corps is doing everything possible to accelerate the project completion.
220.	Lehman, Kelly	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
221.	Lynn, Michele	Budget/Schedule	Electronic	Why will the project take 4 to 8 years? It should be completed in 1 year.	The complexities of the project make a 1 year construction period unfeasible. However, as the Corps refines the construction schedule The Corps is doing everything possible to accelerate the project completion.
222.	Lyons, Robin (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
223.	Lyons, Robin (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
224.	McEvilly, Brian	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. The Corps is working with the U.S. Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation Plan resulting from this process would be presented in 2013.
225.	McGinnis, William	Rafting Below Dam	Electronic	Impacts on rafting below the dam are not addressed; would like a written plan to be implemented to ensure adequate rafting flows during rafting season.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
226.	McGrath, Bill	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS The Corps is working with the US Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation plan resulting from this process would be presented in FY13.
227.	McKenzie, Meredith	Alternatives	Electronic	Claims study is inadequate since a full analysis of the alternative to remove the dam has not been done.	The dam removal alternative was not considered viable because of the resulting annual flood damages and lives at risk downstream; the loss of irrigation and power generation; and the cost of removal and waste generation. In general, the overall cost of the dam removal alternative, including the cost of mitigating for impacts, would be up to five times greater than the action alternatives brought forward for further analyses.

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228.	McMurray, Codey	Construct in Off Season	Written	Construct project during the winter.	Construction only during the off-season will greatly lengthen the schedule, cost, and would prolong impacts.
229.	McMurray, Codey	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
230.	McMurray, Kenny	Build New Dam Downstream	Written	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
231.	McMurray, Kenny	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
232.	Miller, Courtney	Build New Dam Downstream	Written	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
233.	Miller, Courtney	Construction Pool Elevation	Written	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
234.	Miller, Courtney	Budget/Schedule	Written	There is concern that the project will take longer and cost more than planned.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
235.	Miller, Eldon (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
236.	Miller, Eldon (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
237.	Miranda-Begay, Donna	Cultural Resources	Lake Isabella Hearing	Tübatulabal tribe would like Tribal Consultations, would like artifacts recovered, and has tribal monitors available for project construction.	The Corps will welcome tribal monitors on site at the discretion of the Construction Foreman and the Safety Officer. That being said, the Federal Government does not pay for monitors. All tribal monitors will do so on their own time and at their own expense. Federal law, 36 CFR 79 requires that all artifacts that are not subject to NAGRPA repatriation will be curated according to a prescribed set of standards. Any artifacts that meet the definitions in NAGPRA will be repatriated using the required NAGPRA repatriation process to a Federally recognized Tribe.
238.	Monteleone, Greg	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
239.	Monteleone, Kay	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
240.	Monteleone, Kay	Recreation Impacts	Electronic	Recreation concerns include concern over damage to their favorite windsurfing location and congestion resulting from less boat ramps.	This concern is noted. The Old Isabella Recreation Area will likely be impacted by an increase of visitors from closed facilities nearby (Launch 19 and Auxiliary Dam Recreation Area). The Corps and US Forest Services are investigating opportunities to reduce the impacts due to the closure of Boat Launch 19.

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241.	Nadeau, Gerard	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
242.	Nelson, Joneal	Recreation Impacts	Electronic	Will other camp sites be created if the Auxiliary Dam site is used during construction?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8.
243.	Nelson, Joneal	Public Safety	Electronic	Is the route to hospital going to be blocked during project construction?	Some delays or closures are expected on Highway 155, but no delays or closures are planned for Sierra Highway. Additionally, it is expected that in an emergency, any temporary closures of Highway 155 would be lifted for the emergency transportation.
244.	Nelson, Joneal	Budget/Schedule	Electronic	Will the length of construction rob retirees of their precious time? The project needs to get underway as soon as possible and be over quickly.	The complexities of the project make a 1 year construction period unfeasible. However, as The Corps refines the construction schedule The Corps is doing everything possible to accelerate the project completion.
245.	Nelson, Joneal	Construction Pool Elevation	Electronic	Lower lake levels will hurt water quality and recreation value, which is a concern.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. The Corps is working with the US Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation plan resulting from this process would be presented in FY13.DEIS
246.	Nelson, Joneal	Water Quality	Electronic	Will lowering the lake level have detrimental effects on water quality?	The Corps continues to evaluate potential impacts and associated water quality mitigation requirements for a lowered pool level. The anticipated timeframe for the lowered pool is a period of up to 6 months from October 2020 to March 2021. The current restricted pool elevation is set at 2,589.76 feet and the construction pool elevation will be set at approximately 2,543 feet. Based on historical reservoir elevation values, the reservoir typically reaches elevations below 2,550 feet. The timeframe was decreased to 6 months which will help minimize impacts to water quality due to construction related reservoir operations (discharges). However, potential impacts from a sustained lowered pool and associated mitigation measures continue to be evaluated. The Corps intends to adhere to the historical reservoir operating guidance indicating that during-construction reservoir releases will be similar to pre-construction. The Corps does not foresee reservoir releases significantly affecting water quality. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, monitoring will take place to assist in preventing negative impacts to water quality.
247.	Nelson, Joneal	Property Values	Electronic	Is it not worth making repairs on his house if property values are going to drop?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
248.	Nelson, Joneal	Traffic/Circulation	Electronic	Will traffic be routed around the lake during construction?	The majority of the truck traffic is planned to occur onsite for excavation, processing, and fill placement to reduce impacts. Deliveries to the site are planned to be limited to weekdays. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
249.	Nelson, Joneal	Borrow sites	Electronic	The Auxiliary Dam camping area should not be used as a borrow site.	This comment is noted and the Corps understands the concern; however, this area is need for a staging area during construction and cannot be avoided. The area is planned to be a staging area and secondary borrow source for construction and will be returned for recreation use after the project is complete.
250.	Nelson, Joneal	Worker Housing	Electronic	Will workers and equipment be housed in his backyard?	Workers will likely commute from the valley or be absorbed into the market in the Lake Isabella area. Location of workers and housing will be further evaluated in design.
251.	Nelson, Joneal	Air Quality	Electronic	Concerned about disease such as valley fever, dust pneumonia, and allergies/existing respiratory problems increasing as a result of project construction.	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled

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					engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
252.	Nelson, Joneal	Housing Below Dam/Environmental Justice	Electronic	Will the south side of the dam be beautified as part of the project?	Restoration of all disturbed areas (including dam faces) will commence during or immediately following construction completion. The Corps will work closely with USFS and Cal DFG for use of native plant species where appropriate.
253.	Nelson, Joneal	Project Support	Electronic	In favor of repairing the dam.	We appreciate the support and will work to continue to ensure the community is informed about the project and ongoing construction/milestones.
254.	Nelson, Mark	Geology/Seismic	Electronic	The seismic evaluation is invalid since no probabilistic seismic hazard analysis was presented and no senior seismic hazard analysis committee was convened.	A full, extremely detailed and reviewed probabilistic seismic hazard analysis was conducted and serves as one of the major studies that helps define the seismic risk. The SSHAC process is not applicable to the Corps, but the report was produced and reviewed by national level seismologists and seismic experts.
255.	Nelson, Mark	Air Quality	Electronic	DEIS is inadequate in addressing concerns of Valley Fever.	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits.
256.	Nelson, Mark	Crime	Electronic	DEIS fails to address the increased crime associated with large Federal projects.	Comment noted.
257.	Nelson, Mark	Traffic/Circulation	Electronic	The traffic analysis is invalid since it does not provide explicit modeled connection between traffic impacts and property values, tourism, economics, etc.	Comment noted.
258.	Nelson, Mark	Property Values	Electronic	DEIS is inadequate in addressing effects on property values.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
259.	Noble, Adrienne	Construction Pool Elevation	Written	Lowering lake will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1.DEIS
260.	Ornosky, John	Public Affairs/Relations	Electronic	Felt like one of the Corps planners was extorting residents into agreeing with alternative plan 4.	The Corps has chosen the tentatively selected plan after taking various factors into consideration, including the public's input and comments.
261.	Ornosky, John	Budget/Schedule	Electronic	Who will be responsible if project goes over schedule, and will there be compensation?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
262.	Ornosky, John	Property Values	Electronic	Has an analysis been completed to determine the effects to property values? Will there be any mitigation, such as lower property tax?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
263.	Peterkin, Kay	Budget/Schedule	Electronic	The project does not need to take 4 to 8 years. It needs to be completed in 2 to 4 years.	The complexities of the project make a 1 year construction period unfeasible. However, as the Corps refines the construction schedule The Corps is doing everything possible to accelerate the project completion.

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264.	Peterkin, Kay	Project Support	Electronic	Agrees that the dam needs to be fixed.	We appreciate the support and will work to continue to ensure the community is informed about the project and ongoing construction/milestones.
265.	Pope, Craig on behalf of Kern County Roads	Sierra Way Road Improvement	Bakersfield Hearing	Sierra Way Road becomes impassable every winter; would like to see mitigation to this road as part of the project.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.
266.	Prince, David	Crest Raise	Lake Isabella Hearing	How will land be acquired to accommodate crest raise? Will the crest raise impact the airport? Will properties have to be condemned?	The crest raise will not have any impact on properties or the airport.
267.	Prince, David	Traffic/Circulation	Lake Isabella Hearing	Will all the roads in the canyon have to be raised to accommodate higher spillway releases	The roads in the canyon will not have to be raised due to spillway releases. Under existing conditions the roads in the canyon are already damaged and unusable when you get to the elevation of the proposed emergency spillway. The proposed spillway will not begin to be utilized until a very large storm event such as a 1 in 4,700 percent chance storm in any given year. Under very large flood events there will be enough time to evacuate people out of harm's way by the time the proposed spillway begins to operate. The canyon will potentially be shut down due to public safety.
268.	Prince, David	General Clarification	Lake Isabella Hearing	If the calculations from the 40s were wrong, what makes them right now? Why can't the Auxiliary Dam be fixed by taking out soft material and replacing it? Will an independent third party be reviewing this project?	The state of the practice has developed over the last 60+ years. In addition, much more is known about the hydrology and the potential for fault rupture using updated technology. An IEPR panel (Independent External Peer Review) of experts is included for review on the DSMR and EIS.
269.	Prince, David	Wildlife	Lake Isabella Hearing	How will lost wildlife/habitat be mitigated?	The Isabella Lake DSM Project will not (with appropriate avoidance, minimization, and mitigation measures) adversely affect any federally listed, State listed, or USFS sensitive species, or adversely modify or destroy critical habitat necessary for federally listed species. All measures necessary to minimize impacts to fish and wildlife will be presented in the Final Coordination Act Report and the Biological Opinion produced by the USFWS.
270.	Ream, Jon	Crest Raise	Electronic	Would like to see the 16 foot raise implemented. Wants the job done right.	The 16-foot raise alternative is the recommended plan.
271.	Ream, Jon	Budget/Schedule	Electronic	There is a concern about the project stalling.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
272.	Ream, Jon	Water Quality	Kernville Hearing	How toxic is the material at the bottom of the lake that will be disturbed? There is also a concern about the toxicity of the south lake drainage area, which should be cleaned out.	The Corps does not intend to disturb bottom sediment during construction under the current preferred alternative. However, a decreased pool elevation could increase the potential for bottom sediment suspension. The Corps will continue to evaluate opportunities to minimize potential of disturbed sediment. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, monitoring will take place to assist in preventing negative impacts to water quality. Prior to in-water work, plans will be created to outline proper best management practices. Examples of potential BMPs include turbidity curtains, sediment basins, and various erosion and sediment controls.
273.	Ream, Jon	Recreation Impacts	Electronic	Recommends that a bike path be built around the lake to mitigate for lost recreation. BLM should give permission to construct walking trails.	The Corps is limited in the ways it might mitigate for losses. Typically, mitigation is in "like kind" services, meaning that the replacement of a facility or service should be like the facility or service being affected. A bike path is not being affected, so it is not likely that the Corps can provide this as mitigation. However, there may be ways to construct bike paths and walking trails under a different project and authorization and would require a non-Federal sponsor to help share the cost of these facilities/services. The USFS or BLM would likely need to participate as a Federal agency.
274.	Ream, Jon	Public Affairs/Relations	Lake Isabella Hearing	Suggests community starts developing their own strategy to cope with lowered lake levels.	The Corps will continue to keep the community informed about the project and ongoing construction/milestones.
275.	Ream, Jon	Air Quality	Kernville Hearing	Suggests that no burn days occur in the valley to reduce air contamination. Suggests distributing home air filters to those with a need.	Comment noted. Thank you.

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276.	Ream, Jon	Worker Housing	Electronic	A 200 to 300 bed motel should be built to house workers.	Comment noted.
277.	Reed, Ian	Construction Pool Elevation	Electronic	Concerned about lost recreation opportunities if the construction pool is lowered.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
278.	Revis, Bill	Necessity of project	Lake Isabella Hearing	Nothing is wrong with the dam.	Numerous investigations and studies have demonstrated significant dam safely concerns given the population at risk downstream. The project has been reviewed by world class experts.
279.	Richards, Chuck	Rafting Below Dam	Electronic	Impacts on rafting below the dam are not addressed; recommends development of flow plans consistent with historical flows.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
280.	Roach, Fred	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
281.	Roach, Fred	Construction Pool Elevation	Lake Isabella Hearing	The economic impact of construction is not addressed. What is the exact schedule of lake levels?	A schedule of the lake levels will be included in the FEIS. The Corps is working with the US Forest Service and local community groups to minimize the impacts to local events on the lake, campgrounds, boat launches, water quality, etc. There will increased public informational meeting that will take place once the plan is approved and construction begins.
282.	Roach, Fred	Budget/Schedule	Lake Isabella Hearing	The Corps should be able to adjust the construction schedule.	The complexities of the project make a 1 year construction period unfeasible. However, as the Corps refines the construction schedule The Corps is doing everything possible to accelerate the project completion.
283.	Roach, Fred	Recreation Impacts	Lake Isabella Hearing	How is lost recreation going to be mitigated during construction? A Recreation Plan should be prepared before an alternative is suggested.	The Recreation Plan is intended to identify measures to address lost recreation opportunities. However, an alternative must be selected first, in order to determine the specific impacts and consequences before planning solutions to the problem. Impacts and Consequences will be expressed in the Final Environmental Impact Statement; solutions are to be proposed in the Plan.
284.	Roach, Fred	Air Quality	Electronic	Air quality will become a concern when the pool elevation is lowered.	The construction pool elevation (approximately 2,543 feet NAVD88; 72,237 acre-feet) has been limited to a four-to-six-month window from October 2020 through March 2021. This takes advantage of the seasonal low reservoir elevations during the fall and winter months when it is being drawn down for flood control operation. This further minimizes environmental impacts described in the DEIS and further reduces the environmental impacts over the entire construction period. For the majority of the time the lake will remain under its current operation with the pool restriction (elevation 2,589.26-ft NAVD 88 with 360,000 acre-feet) except for the period identified above. Recreation will be allowed on the lake during construction.
285.	Roach, Fred	Wildlife	Electronic	Lowered pool levels will hurt fish populations.	Potential impacts to the existing fisheries population has been minimized with a substantial reduction in the duration of the construction pool.
286.	Roach, Fred	General Clarification	Lake Isabella Hearing	Fishing Derby is held on the weekend before Easter, which is not always in April. Please correct page 256.	Correction noted. Thank you.
287.	Roach, Fred	Units	Lake Isabella Hearing	Express lake volume in acre feet, not by elevation.	Concur. The FEIS will include acre-feet.
288.	Robinson, Bob	Traffic/Circulation	Kernville Hearing	Will the roads have to be raised/relocated as part of the dam raise?	Improvements and raises to both Highway 155 and Highway 178 are planned. Coordination with Caltrans has been initiated.
289.	Robinson, Bob	Cultural Resources	Kernville Hearing	Tribal monitors should be on site during all disturbance activities; extensive surveys should be conducted before excavation.	The Corps will welcome tribal monitors on site at the discretion of the Construction Foreman and the Safety Officer. That being said, the Federal Government does not pay for monitors. All tribal monitors will do so on their own time and at their own expense. The Corps will conduct an updated cultural resource survey of all affected land before any ground disturbing activities take place.

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290.	Rowe, Richard	Recreation Impacts	Electronic	The preferred alternative needs to be established before Recreation Plan can be completed; consider new or expanded campgrounds to replace those lost to construction. Consider adding new or expanding boat launching facilities. Improve access to recreation facilities.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
291.	Rowe, Richard	Construction Pool Elevation	Electronic	Develop an alternative that does not lower the lake level.	Alternatives have been developed to minimize impacts to the lake level. The recommended plan only includes lake level control for the features of the Borel Tunnel upstream work.
292.	Rowe, Richard	Housing below dam/environmental justice	Electronic	Meetings with those living in the trailer park should begin sooner rather than later. Statistical information on the Kern River Valley is insufficient and needs to be more detailed.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
293.	Rowe, Richard	Public Affairs/Relations	Kernville Hearing	How does one obtain a copy of the EIS?	Question was answered at the public hearing. The FEIS Notice of Availability and/or distribution of the FEIS will utilize an updated mailing list including new interested parties and persons. The Corps will place less reliance on the use of Internet for distribution within the Kern River Valley.
294.	Rowe, Richard	Light Pollution	Electronic	All nighttime lighting should be consistent with Kern County's outdoor lighting dark sky ordinance.	The contractor will be required to comply with all local, regional, and state ordinances; therefore, nighttime lighting should be consistent with Kern County's outdoor lighting dark sky ordinance.
295.	Rowe, Richard	Recreation Impacts	Electronic	Kern County is updating the bicycle master plan. Update EIS with updated information in this plan. The Corps should add bike lanes to relocated highways, consider funding Lake Isabella Bikeway feasibility study, and fund updating master plan of bike trails.	The Corps is limited in the ways it might mitigate for losses. Typically, mitigation is in "like kind" services, meaning that the replacement of a facility or service should be like the facility or service being affected. A bike path is not being affected, so it is not likely that the Corps can provide this as mitigation. However, there may be ways to construct bike paths and walking trails under a different project and authorization and would require a non-Federal sponsor to help share the cost of these facilities/services. A Recreation Plan will be prepared after the Record of Decision on the Preferred Alternative and would include Kern County's bicycle master plan.
296.	Rowe, Richard	Borel Canal	Electronic	The Corps should consider siphoning water over the Auxiliary Dam to avoid building new conduit into Borel Canal.	The head difference is too large for a siphon to be effective.
297.	Rowe, Richard	Budget/Schedule	Electronic	DEIS states construction start of October 2015, while public hearings have stated a start of October 2014.	The project will begin design efforts in 2014 and begin all relocation efforts for the Corps and Forest Service building in 2015 in order to begin spillway excavations in 2016.
298.	Rowe, Richard	Borrow sites	Electronic	The Corps should not use the South Fork area as borrow site under any scenario.	The South Lake Area has been eliminated as a borrow site.
299.	Rowe, Richard	General Clarification	Electronic	There is a concern with the wording of "CEQ encourages...tiering". The Corps has been requested to provide examples of other Corps projects that used tiering. There should be a better land ownership map in the executive summary.	The Folsom Dam Joint Federal Project is an example of a "tiered" NEPA process. A more detailed land ownership map will be made available to the public for review and comment during the Real Estate Plan NEPA document release in 2013.
300.	Rowe, Richard	Missing Information/Tiering	Electronic	The Real Estate Plan, Site Restoration Plan, Recreation Plan, Fisheries Mitigation Plan, and Fish and Wildlife Mitigation Plan should not be deferred to a later date.	Comment noted. Tiering is allowed for large and complex federal projects.
301.	Rowe, Richard	Sierra Way Road Improvement	Electronic	The Corps should improve Sierra Way to make better access to recreation facilities.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.
302.	Rowe, Richard	Wetland Mitigation	Electronic	Will wetlands below the Auxiliary Dam be impacted? The Corps should consider applying wetland mitigation at the Bob Powers Gateway Preserve.	Comment noted. Wetland mitigation (approximately 0.33 acres) will likely be address with other vegetation mitigation per recommendations presented in the USFWS Coordination Act Report. However, your comment is worth further consideration.

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303.	Rowe, Richard	Alternatives	Electronic	Current alternatives do not take into account public comments. Two additional alternatives should be added: one that would not change the lake level during construction and one that will ensure construction is completed in less than 4 years.	Comment noted.
304.	Rowe, Richard	General Clarification	Electronic	Page 1-7 has a storage of "586,100" acre-feet as opposed to 568,100 acre-feet; there is some inconsistency with main dam and auxiliary dam crest elevations (2,637.76 and 2637.26) when they should be the same. Ensure that all levels have a datum system noted. Recommend using a single datum system throughout the document.	Concur. The Corps will also include acre-feet in the FEIS.
305.	Rowe, Richard	Units	Electronic	Use of three datums throughout the document is confusing. Recommend only using one datum. Recommend referring to the acre-feet volume as well as the elevation.	Concur.
306.	Rusby, Robert	Water Quality	Electronic	There is concern about levels of arsenic in the rivers and lake.	A constituent of specific concern for Isabella Lake and related areas is arsenic. To avoid potential health risks, arsenic has been historically monitored by the USACE. The bottom of Isabella Lake has consistently had the highest arsenic levels although surface and inflow concentrations have also been high. Historically, the highest levels have been in the summer and fall months. The Tulare Lake Basin, of which Lake Isabella is part, has had continual problems with arsenic, specifically in the ground water. Because of this, there have been many studies investigating arsenic in the area. These studies have suggested that the arsenic in the groundwater is coming from minerals occurring in sedimentary rock in surrounding mountains. Please see the FEIS for more information on Arsenic monitoring. The Corps will evaluate procedures to minimize the potential of elevated arsenic values. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, monitoring will take place to assist in preventing negative impacts to water quality. Please see the FEIS with updated information on the Lake Isabella water quality monitoring efforts.
307.	Rusby, Robert	Traffic/Circulation	Electronic	How will traffic on Highways 178 and 155 be affected? What are the impacts associated with possible road relocation?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
308.	Rusby, Robert	Housing Below Dam/Environmental Justice	Electronic	The Corps should begin relocation process as soon as possible to avoid further socioeconomic impacts.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
309.	Rusby, Robert	Cultural Resources	Electronic	Has SHPO coordination been completed? Will the Nuui Cunni Center be impacted by the project?	All Section 106 consultation has been completed. The Corps has a Programmatic Agreement (PA) dated 7/27/2012 that puts the project in compliance with Section 106. A copy of the PA will be in an Appendix in the FEIS. SHPO has been actively engaged in this process. The Nuui Cunni Cultural Center will not be affected by the project at all. It is too far north.
310.	Rusby, Robert	Alternatives	Electronic	Analyze an alternative that considers dredging the lake bottom.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 9.
311.	Rusby, Robert	Budget/Schedule	Electronic	What will the exact project schedule be and what happens if Congress does not approve funding?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
312.	Rusby, Robert	General Clarification	Electronic	What is the exact start date (2014 or 2015)?	The project will begin design efforts in 2014 and begin all relocation efforts for the Corps and Forest Service building in 2015 in order to begin spillway excavations in 2016.
313.	Rusby, Robert	HTRW	Electronic	Wants to know if any hazardous materials have been identified that will be encountered or used during	Two existing Forest Service buildings scheduled for demolition may contain asbestos. If asbestos is identified within the buildings, the demolition contractor will be responsible for proper removal and

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				construction?	lawful disposal. No other hazardous, toxic, or radiological wastes have currently been identified within the proposed project area of disturbance. Contractors will comply with all applicable Federal and State laws, regulations, and requirements pertaining to hazardous materials and hazardous wastes. The Corps requires contractors to submit and comply with an environmental management plan to prevent and manage potential accidental releases of hazardous wastes.
314.	Rusby, Robert	Air Quality	Electronic	There are concerns about soils that will be exposed as lake level is drawn down. Will the soil be tested to determine air quality impacts? What measures will be implemented to minimize fugitive dust?	The duration of the proposed construction pool has been reduced and the South Fork Delta borrow area has been eliminated. The inclusion of these refinements into the preferred alternative has substantially reduced the fugitive dust factor. Potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices such as watering roadways/disturbed construction sites and restricting earth disturbing activities when sustained winds blow more than 20 miles per hour. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
315.	Rusby, Robert	Missing Information/Tiering	Electronic	The DEIS does not contain a preferred alternative. DEIS requires project hydrology, hydrologic modeling, and other studies. The recreation impacts analysis needs to be completed. View simulations should be completed to determine aesthetic impacts. The alternative risk management plan should be released before the release of the DEIS.	Comments noted. The preferred alternative will be presented in the FEIS.
316.	Rusby, Robert	Noise	Electronic	What noise will be created during construction and how it will be mitigated?	Noise and vibration impacts were discussed and evaluated in section 3.8 of the DEIS. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits.
317.	SCE	Budget/Schedule	Written	SCE would like a detailed construction schedule and electrical loads to determine impacts on hydrogeneration and electrical systems.	A detailed construction schedule is under development and will be provided during design.
318.	SCE	Permits	Written	Make sure all permits are obtained.	All required permits will be obtained in advance of beginning of construction.
319.	SCE	Alternatives	Written	AP-3 results in a loss in generation, therefore SCE would like compensation discussed under this alternative. Discussion of environmental impacts associated with the removal of the Borel Canal lakebed segments should be discussed in the DEIS.	Further coordination will be conducted between the Corps and SCE.
320.	SCE	Construction Pool Elevation	Written	If lakebed segments of the Borel Canal become exposed, there would be impacts to the environment and public safety.	The construction pool duration has been reduced in order to minimize environmental impacts for one season to complete the inlet structure for the Borel Tunnel. All Federal undertakings will comply with all environmental laws. A deviation environmental document will be prepared for the construction pool season and will disclose all environmental and public safety concerns and impacts.
321.	SCE	Cultural Resources	Written	SCE recommends that the Corps have a qualified construction monitor on site during potentially adverse activities.	There will be a qualified archeological monitor(s) onsite during ground disturbing activities.
322.	SCE	Public Safety	Written	SCE recommends installation of warning buoys/signs as Borel Canal lakebed segments become exposed.	This suggestion will be looked at in detail and appears to have strong merit.
323.	SCE	Borel Canal	Written	Removal of the Borel Canal would require additional environmental analysis and agency approvals. DEIS sections must be revised to accurately reflect SCE water rights.	Concur. Removal of the Borel Canal, if necessary, would be assessed in a follow-up NEPA document available for public comment.

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
324.	SCE	Missing Information/Tiering	Written	Include discussion of impacts on SCE power and communication facilities to be affected, including the rerouting of highways.	Concur. Although general description and assessment of the State Route realignments are discussed in the DEIS, a follow-on NEPA document detailing the consequences of the realignments will be produced in 2013 in conjunction with Caltrans.
325.	SCE	Wildlife	Written	SCE provided information on past valley elderberry longhorn beetle surveys that they have conducted.	SCE VELB surveys were included in the Corps Biological Assessment to the USFWS. The Biological Opinion will become an appendix to the FEIS.
326.	SCE	General Clarification	Written	On p 4-19, clarify that conduit and control gates are owned and operated by the Corps, not SCE. On page 4-20, state that the Corps has contractual obligations to supply water to the Borel Canal.	Comment noted. Thank you for the clarification.
327.	Schwartz	Construction Pool Elevation	Electronic	There is general concern about lost recreation opportunities if the lake levels are lowered.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
328.	Sertic, Eric	Traffic/Circulation	Lake Isabella Hearing	What is the impact of truck traffic on roads into and out of the valley? Will the project correct any problems that arise in the roads during construction?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
329.	Sierra Club	Housing Below Dam/Environmental Justice	Electronic	The Corps should not repeat what happened at Lake Success.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
330.	Sierra Club	Alternatives	Electronic	The Corps should consider an alternative that involves dredging the lake.	Dredging materials from the lake will not be cost effective, and would introduce other environmental concerns.
331.	Sierra Club	Dredging	Electronic	The Corps should consider dredging the bottom of lake.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 9.
332.	Sierra Club	Crest Raise	Electronic	The 16-foot dam raise does not make sense and is not backed with supporting data. Implementation of this alternative could lead to a future situation where the Corps chooses to raise the spillway elevation without having to do an EIS since it is a "minor" project.	The 16-foot raise alternative provides temporary attenuation of the flood for conveyance through the emergency spillway. It is the preferred solution to minimize incremental flood risk downstream.
333.	Sierra Club	Cultural Resources	Electronic	Will cultural sites potentially be inundated with project implementation?	The operating level of the lake will remain the same. Barring any unforeseen circumstances, such as extreme changes in weather patterns, the lake level will not affect any known cultural sites.
334.	Sierra Club	Borrow sites	Electronic	The South Fork delta should not be used as borrow site.	The south lake area was investigated and determined to consist of materials that would require significant processing and have a higher cost than using the materials out of the emergency spillway and Auxiliary Recreation Area. Using the South Lake Area as a borrow source contributed to traffic impacts on Highway 178. Due to this reason the South Lake Borrow Area has been eliminated as a borrow source location and impacts have been reduced.
335.	Sierra Club	Water Quality	Electronic	The DEIS does not adequately describe, analyze, and discuss water quality and the potential toxicity of reservoir sediments.	Water quality is currently being monitored to define baseline values prior to construction activities. Water quality specialists have been evaluating historical and current water quality trends in the lake. For updated discussion on water quality please see the FEIS. The Corps does not intend to disturb bottom sediment during construction under the current preferred alternative. However, a decreased pool elevation could increase the potential for bottom sediment suspension. The Corps will continue to evaluate minimization measures to minimize potential of disturbed sediment. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, monitoring will take place to assist in preventing negative impacts to water quality. Prior to in-water work, plans will be created to outline proper best management practices. Examples of potential BMPs include turbidity curtains, sediment basins, and various erosion and sediment controls.

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336.	Sierra Club	Air Quality	Electronic	The DEIS does not adequately describe, analyze, and discuss air pollution issues.	Air quality impacts were described and analyzed in section 3.5 of the DEIS. Refinements to this section resulting in refinements to Alternative Plan 4 (the preferred alternative) will provide further detail regarding the extent or reduction of air quality impacts.
337.	Sierra Club	Missing Information/Tiering	Electronic	The DEIS is a violation of NEPA since critical information is missing. This is an improper use of tiering. Information missing from the DEIS includes: LEDPA, fish and wildlife analysis, and designation of the preferred alternative.	When information for a complete analysis is lacking upfront, the Council on Environmental Quality encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need. The tiered efforts related to this project are addressed in section 1.9 - Issues to be Resolved. These tiered efforts include recreation, real estate and a detailed analysis with regards to the State Route realignments. All follow-on NEPA documents will allow public review and comment before construction start.
338.	Sierra Club	Necessity of project	Electronic	The DEIS does not adequately prove the need for dam modification. No analysis has been done to determine source of seepage, therefore it could be naturally occurring ground water.	Numerous investigations and studies have demonstrated significant dam safely concerns given the population at risk downstream. The project has been reviewed by world class experts.
339.	Sierra Club	Property Values	Electronic	The DEIS does not adequately describe, analyze, or discuss property values.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
340.	Sierra Club	Sierra Way Road Improvement	Electronic	Shares the same stance as Audubon.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.
341.	Sierra Club	Wildlife	Electronic	The DEIS does not identify and analyze impacts to rare listed and sensitive species and habitats.	The Isabella Lake DSM Project will not (with appropriate avoidance, minimization, and mitigation measures) adversely affect any federally listed, State listed, or USFS sensitive species, or adversely modify or destroy critical habitat necessary for federally listed species. All measures necessary to minimize impacts to fish and wildlife will be presented in the Final Coordination Act Report and the Biological Opinion produced by the USFWS.
342.	Sierra Club	Units	Electronic	Having more than one datum makes the DEIS confusing.	Concur. This will be corrected in the FEIS.
343.	Smith, Clay	Rafting Below Dam	Electronic	Impacts on rafting below the dam are not addressed; a written plan should be completed to ensure adequate rafting flows during rafting season.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
344.	Smith, James	Crest Raise	Bakersfield Hearing	The dam crest should not be raised.	Based on the size of the hydrologic deficiency a dam crest raise is required to prevent unacceptable incremental consequences downstream from a lower spillway
345.	Smith, James	Blasting	Bakersfield Hearing	Blasting for spillway on the fault line is a concern.	Blasting near the fault line is not an issue, except that the fractures near the fault will make blasts less effective due to energy dissipation.
346.	Smith, James	Alternatives	Bakersfield Hearing	The Auxiliary Dam should be thickened. Gunite the face of the Main Dam. The county took rock off the face of the dam and never put it back.	The size of the buttress on the Auxiliary Dam is planned to address the dam safety issues. Gunite on the face of the Main Dam is not effective in protecting against overtopping.
347.	Smith, Marsha	Recreation Impacts	Electronic	Campground mitigation needs to occur.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8.
348.	Smith, Marsha	Sierra Way Road Improvement	Electronic	Improvements should be made to Sierra Way Road.	Sierra Way was not part of the original authorization of the project and it cannot be addressed under the Dam Safety Project. However, there are other opportunities with the Corps utilizing other authorities to address the issue at Sierra Way through a cost-shared partner.
349.	Smith, Ron	Traffic/Circulation	Lake Isabella Hearing	How exactly will traffic be affected by the project? What delays or closures can be expected?	The South Fork Delta sand borrow area has been eliminated as a sand source for the preferred alternative. Sand will now be manufactured at the dam site utilizing waste materials generated from the emergency spillway excavation. This refinement has eliminated the largest contributor to short-term construction-related traffic and circulation impacts along State Route 178 within the Kern River Valley.

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
					The Corps will continue to work with Caltrans up to and during construction for additional opportunities to minimize short-term traffic and circulation impacts. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
350.	Snyder, Darrell	Borel Canal	Kernville Hearing	The Corps should remove the Borel Canal and route water to the power house along the river.	This would require a new agreement between multiple parties since the available head at the Main Dam is less than at the Borel powerhouse.
351.	Snyder, Darrell	Crest Raise	Kernville Hearing	What will happen to the property behind the dam in the event of a raise?	When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits.
352.	Stephens, Duane	Construction Pool Elevation	Electronic	A decrease in recreation will hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
353.	Stewards of Sequoia	Borel Canal	Electronic	There is a concern that lack of flow through the Borel Canal will result in stagnation on the Auxiliary Dam side.	Based on findings from the Lake Isabella water quality monitoring efforts, the reservoir continues to stay well mixed at the auxiliary dam area despite many ranges of outflows from the dam. It is anticipated that well mixed conditions will continue after any potential auxiliary dam modifications. Lake Isabella is regularly subjected to high winds which are the most likely cause of the unique mixed characteristics of the lake. Wind energy mechanically distributes most of the heat near the surface with the use of waves to mix the water. The natural mixing will be an important factor in preventing stagnation. Please see the FEIS and the 2011 Isabella Lake DSAP Monitoring Report for more discussion on lake mixing. To ensure compliance with the Clean Water Act, public laws, and other environmental regulations, monitoring will take place to assist in preventing negative impacts to water quality.
354.	Stewards of Sequoia	Alternatives	Electronic	The Corps should consider dredging to reduce the potential impacts of a 16-foot crest raise.	The 16-foot raise alternative provides temporary attenuation of the flood for conveyance through the emergency spillway. It is the preferred solution to minimize incremental flood risk downstream. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 9.
355.	Stewards of Sequoia	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the economy. This will be comparable to the USFWS ban on trout stocking.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
356.	Stewards of Sequoia	Recreation Impacts	Electronic	The project will not have long-term beneficial impacts on recreation; the recreation EIS needs to be completed before FEIS. The Corps should build new or improve existing camp sites, or build a trail around the lake for bikes and pedestrians.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
357.	Stewards of Sequoia	Water Quality	Electronic/ Lake Isabella Hearing	What impact will the lowered lake levels have on the water quality? Will it result in fish kills?	Updates to the construction schedule have resulted in a decreased period of time for the lowered pool and minimized project impacts. The anticipated timeframe for the lowered pool is a period of 7 months from September 2020 to March 2021. The current restricted pool elevation is set at 2,589.76 feet and the construction pool elevation will be set at approximately 2,543 feet. Based on historical reservoir elevation values, the reservoir typically reaches elevations below 2,550 feet. This decreased timeframe will help minimize impacts to water quality due to construction related reservoir operations. However, potential impacts from a sustained lowered pool and associated off-setting measures continue to be evaluated. Some of the potential concerns include lowered dissolved oxygen levels, higher pH, increased turbidity, increased temperature, and higher volumes of aquatic plant life. Historical data indicates that due to the continuous mixing and surface wave action the dissolved oxygen levels can fluctuate during low pool elevations. Evaluations of the predicted water quality and required off-setting measures will continue to be conducted up to prior to construction start. Monitoring will take place to assist in preventing negative impacts to water quality.

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
					By adhering to the current Water Control Manual with respect to reservoir discharges and implementing best management practices, the Corps will reduce the risk of fish kills and degradation of water quality. Water quality monitoring will take place to assist in preventing negative impacts including fish kills.
358.	Stewards of Sequoia	Budget/Schedule	Electronic/ Lake Isabella Hearing	The DEIS does not take into account any delays that may occur. The project needs to be completed as quickly as possible. Lake users may change their habits if lake is unusable for multiple years.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.
359.	Stewards of Sequoia	Air Quality	Lake Isabella Hearing	Will the project result in air quality standards not being met, which would affect vehicle access to the recreation site?	No.
360.	Stewart, Wally	Crest Raise	Lake Isabella Hearing	Will an increase in the pool elevation take some of his property and potentially reach his house?	The pool elevation will not be increased.
361.	Stewart, Wally	Traffic/Circulation	Lake Isabella Hearing	Will construction cause delays on the daily commute to/from Bakersfield?	Approximately 50% of construction workers would likely commute from the Bakersfield metropolitan area. The Corps will encourage the selected contractor to utilize mass transit alternatives for commuter workers. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
362.	Stewart, Wally	Units	Lake Isabella Hearing	Prefers use of elevation over volume when referring to lake levels.	Concur. This comparison has been made in the FEIS.
363.	Stubbs, Cathy	Construction Pool Elevation	Electronic	General concern for entire project	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. The Corps is working with the US Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation plan resulting from this process would be presented in FY13.DEIS
364.	Stubbs, Charlie	Construction Pool Elevation	Electronic	General concern for entire project	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. The Corps is working with the US Forest Service and local community groups to further minimize the impacts to local events on the lake, campgrounds, boat launches, etc. A more detailed Recreation plan resulting from this process would be presented in FY13.DEIS
365.	Sugden, Harold	Geology/Seismic	Bakersfield Hearing	Warns the Corps about the dangers of drilling through faults. Requests additional information from the Corps about factures in the bedrock.	Drilling through faults is safe, but has to be done with care to maximize recovery and sampling. Bedrock near the fault zone is intensely fractured and consists of a variable degree of weathering
366.	Sugden, Harold	Public Safety	Bakersfield Hearing	If the dam breaks, what do Bakersfield residents do? There is no evacuation plan.	Kern County has invested a large amount of time and money to develop a detailed evacuation plan, specific to dam failure. The commenter should contact Kern County for more details.
367.	Sugden, Harold	Borel Canal	Bakersfield Hearing	Supports the idea of having the Borel Canal intake in the Main Dam.	The Borel intake at the Main Dam is one of the measures at the top of the list, but it would have impact on the main dam power plant.
368.	Sugden, Harold	Borrow sites	Bakersfield Hearing	If South Fork Delta is used as borrow site, the Corps should consider barging material across the lake.	The south lake area was investigated and determined to consist of materials that would require significant processing and have a higher cost than using the materials out of the emergency spillway and Auxiliary Recreation Area. Using the South Lake Area as borrow source contributed to traffic impacts on Highway 178. Due to these reasons the South Lake Borrow Area has been eliminated as a borrow source location and impacts have been reduced. Barging materials across the Lake were evaluated early in the study; however, it was eliminated due to high cost.

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
369.	Sweet, Michelle	Necessity of project	Electronic	Why is there is a need to fix the dam when there are other alternatives?	Both dams lack proper defensive mechanisms (filters and drains) given the population at risk downstream for the full range of loading.
370.	Teofilo, Tom	Public Safety	Electronic	The Corps should remove debris from lake bottom while levels are reduced and install traffic safety devices such as street lamps during construction.	Dam safety construction funding can only be used to reduce dam safety risk.
371.	Teofilo, Tom	Public Affairs/Relations	Electronic	Desires clear and timely communication of the selected alternative; supports working with the Lake Isabella Dam Task Force.	Once our tentatively selected plan is finalized, the Corps will communicate the plan's features to the communities, and distribute information through our public website, brochures, and social media.
372.	Teofilo, Tom	Recreation Impacts	Electronic	The Corps should address what will be done in terms of recreation mitigation.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.FEIS
373.	Teofilo, Tom	Borrow sites	Electronic	Suggests using barges to transport borrow material across lake.	The south lake area was investigated and determined to consist of materials that would require significant processing and have a higher cost than using the materials out of the emergency spillway and Auxiliary Recreation Area. Using the South Lake Area as borrow source contributed to traffic impacts on Highway 178. Due to these reasons the South Lake Borrow Area has been eliminated as a borrow source location and impacts have been reduced. Barging materials across the Lake were evaluated early in the study; however, it was eliminated due to high cost.
374.	Teofilo, Tom	Traffic/Circulation	Electronic	The Corps should ensure access to his hotel is uninterrupted.	Comment noted.
375.	Teofilo, Tom	Worker Housing	Electronic	Interested in constructing worker housing for the project.	Comment noted. Economic modeling conducted in preparation of the DEIS determined that the portion of the projected project workforce anticipated to reside in the Kern River Valley during the construction period would represent less than one percent of the combined Kern River Valley population, and 1.7 percent of the 2010 Lake Isabella population alone. Given the abundant home sale and rental opportunities currently available in the Kern River Valley, the use of lodging dedicated to recreational users was considered less than significant.
376.	Tesmond, Amanda (thru Kimberly Cushman)	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
377.	Tesmond, Amanda (thru Kimberly Cushman)	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
378.	Thompson, Spencer	Borrow sites	Electronic	The Auxiliary Dam camping area should not be used as a borrow site.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8.
379.	Thompson, Spencer	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
380.	Thorn, Keith and Carla	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2. DEIS
381.	Thorn, Keith and Carla	Crest Raise	Electronic	Why is the 16-foot crest raise needed? Couldn't it lead to flooding problems on their land?	The crest raise will not have any impact on properties or airport.
382.	Thorn, Keith and Carla	Budget/Schedule	Electronic	There is concern that the project could run out of funding, similar to another project that occurred in the area. Since construction will stop when winds exceed 20 mph, the project will take even longer than planned to construct.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 5.

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383.	Thorn, Keith and Carla	Water Quality	Electronic	Would lowering the lake level cause fish kill?	Updates to the construction schedule have resulted in a decreased period of time for the lowered pool and minimized project impacts. The anticipated timeframe for the lowered pool is a period of 7 months from September 2020 to March 2021. The current restricted pool elevation is set at 2,589.76 feet and the construction pool elevation will be set at approximately 2,543 feet. Based on historical reservoir elevation values, the reservoir typically reaches elevations below 2,550 feet. This decreased timeframe will help minimize impacts to water quality due to construction related reservoir operations. However, potential impacts from a sustained lowered pool and minimization measures continue to be evaluated. Some of the potential concerns include lowered dissolved oxygen levels, higher pH, increased turbidity, increased temperature, and higher volumes of aquatic plant life. Historical data indicates that due to the continuous mixing and surface wave action the dissolved oxygen levels can fluctuate during low pool elevations. Evaluations of the predicted water quality and any required mitigation will continue to be conducted up to construction start. Monitoring will take place to assist in preventing negative impacts to water quality. By adhering to the current Water Control Manual with respect to reservoir discharges and implementing best management practices, the Corps will reduce the risk of fish kills and degradation of water quality. Water quality monitoring will take place to assist in preventing negative impacts including fish kills.
384.	Thorn, Keith and Carla	Missing Information/Tiering	Electronic	No discussion of the airport is made in the DEIS. The southern portion of the runway is underwater during high water years.	Comment noted.
385.	Tollefson, Reed	Project Support	Kernville Hearing	General support for the project, specifically for making Bakersfield safer.	Comment noted.
386.	Torres, Jose	Crime	Electronic	General concern	Comment noted.
387.	Torres, Jose	Hire Local	Electronic	Hire local workers.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
388.	Torres, Jose	Noise	Electronic	General Concern	The Corps understands your concern, particularly with regards to noise generated from blasting activities. The noise levels associated with blasting are generally a function of shot sizes, number of shots, depth of the blasting charges and the shot timing. All of these associations would be minimized to the greatest extent possible in order to minimize the impact to a "low to moderate" and "less than significant" for sensitive receptors such as your business in Lake Isabella. Further minimization measures necessary would be determined in a Controlled Blasting Management Plan developed in conjunction with the blasting contractor.
389.	Torres, Jose	Traffic/Circulation	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
390.	Trimble, Lynn	Build New Dam Downstream	Electronic	Preferred alternative is constructing a second dam below the existing dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 2. Also see DEIS Section 2.3.11 for a more detailed discussion regarding why the dam replacement alternative was considered but not studied further.
391.	Trunk	Budget/Schedule	Lake Isabella Hearing	When will they start the project after it gets approved?	The project will begin the design phase once the Dam Safety Modification Report is approved. The Dam Safety Modification Report is being submitted up to HQ on 29 October 2012. Highway and Real Estate relocations are scheduled to begin in 2014.
392.	Turnham, Pat	Budget/Schedule	Electronic	Why will the project take so long to complete?	The project is a multiphase project with a large amount of material that will have to be blasted, processed, and placed for construction of the emergency spillway and modifications at the main and auxiliary dams. The Corps understands the concern for the duration of construction. The Corps will continue to refine the schedule to ensure The Corps is efficient in our construction durations.

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393.	Turnham, Pat	Air Quality	Lake Isabella Hearing	Has soil been tested to determine what germs will be blown in the wind?	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. This assessment included potential impacts from Toxic Air Contaminants (TACs). Windblown dust may contain spores of coccidioidomycosis, or Valley Fever. Although potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices, a larger TAC concern exists from diesel-fueled engine exhaust (diesel PM). Short-term diesel PM emissions produced as a result of construction activities were found to be significant and unavoidable in and in the immediate vicinity of the construction area. When the Corps receives project approval and funding The Corps will gather information from all potential adversely affected individuals and discuss and assist them in applying for relocation benefits. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
394.	Turnham, Pat	Property Values	Lake Isabella Hearing	Will the project negatively affect property values?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
395.	USDA	Relocation of FS Admin Compound	Written	Forest Service Compound would need to be permanently relocated if spillway is built in current area.	Modifying the existing spillway was considered as an alternative, however, it was eliminated. The reasons for elimination are the following: 1) It would require additional authorization that would increase the schedule and start of construction for a very high risk (DSAC 1) Dam; 2) it would increase flooding downstream and 3) it is safer during construction to leave the existing spillway as is so there is still a way to safely routing flooding events.
396.	USDA	Cultural Resources	Written	The historical context is inadequate. The records search conducted by Basin Research is not equivalent to a cultural resource survey.	The Basin Research Document is only the result of a records and literature search; it was never intended to be a survey report. An updated cultural resources survey will be undertaken during the Plans and Specs phase. This will not include the abandoned South Fork Borrow Area but will include the realignment of Highways 155 and 178, in addition to the land for the new USFS buildings. There will be no borrow material taken from the South Fork location so surveys are not required. USACE planning guidance only requires a 10 percent sample survey or a draft agreement document during the feasibility stage of planning. The requirement for an updated comprehensive cultural resources survey is in the paragraph immediately following Table 3-77. The town of Isabella is near the northeastern tip of Engineers Point, but outside of the APE. Isabella appears to be sitting on top of a Tübatulabel ethnographic site called Kowan. The Corps has no record of an area called Solitaire. That being said, The EIS is a public document and not a compliance report. In this type of document The Corps is only required to 'briefly describe' identified and predicted historic properties which would be impacted by the alternative plans." More detailed information would be included in survey reports and mitigation documents.
397.	USDA	Cultural Resources	Written	Big Blue Mine was not addressed. A survey is required to state that there are no known cultural resources in the South Fork area. A more specific NAGPRA plan is required.	The Big Blue Mine does not need to be addressed in explicit detail as it is approximately six miles north of the APE for the recommended alternative. Any actions regarding the Big Blue Mine will be through our Operations Branch. There is no need for any write up of the South Fork since there is no proposed activity in the selected alternative plan 4. The Corps will add a short paragraph regarding the history of the Dam. Since the Dam has been determined to be ineligible for the National Register and we feel that the culture history for the project is already quite lengthy we don't see the necessity to add any great amount of detailed additional information. In 1948 with the ground breaking for Isabella Dam, the 60 year old vision of Assistant State Engineer, James D. Schuyler was realized. The location for the Dam was at a point identified by Schuyler, immediately below the junction of the north and south forks of the Kern River. The appropriations to commence with the construction were made by Congress with the passage of the Flood Control Act of 1944. However, Congress acted slowly to fully fund the project and it took until 1953 to complete construction. The $21 million price tag for the Isabella Dam was a bargain. Within thirty years it saved the Kern River Valley over $100 million in flood damages. The Lake has been wildly successful with annual visits of people to swim, fish, Water ski, picnic, and hunt (Dillon 1984).

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
398.	USDA	Budget/Schedule	Written	Corps is required to provide funding to the Forest Service to review DEIS as per the interagency agreement.	The Forest Service is a Cooperating Agency and the Corps provides funding to the them for services they perform for the Corps of Engineers
399.	USDA	Big Blue Mine	Written	DEIS does not address impacts to mine drainage into lake, arsenic contaminated soil, and mitigation.	The proposed action will not affect mine drainage since lake levels required for construction will comply with the authorized Isabella Lake Water Control Manual. Potential arsenic contamination and exposure resultant from existing Big Blue Mine sources will not change since lake levels will continue to operate and comply with the authorized Isabella Lake Water Control Manual.
400.	USDA	Recreation Impacts	Written	DEIS does not address mitigating loss of recreation, protection of infrastructure, or use after completion of project.	Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1 and Issue 8.
401.	USDA	Air Quality	Written	The general conformity determination requirement has not been met.	Concur. The general conformity determination requirement will be defined and expressed for the preferred alternative in the FEIS.
402.	USDA	Missing Information/Tiering	Written	Connected actions, such as closure of Forest Service facilities, are not addressed in DEIS.	When information for a complete analysis is lacking upfront, the Council on Environmental Quality encourages the use of incremental decision making through tiering and/or sequencing of impact analyses to ensure continued progress toward the critical path of meeting the overall project purpose and need. The tiered efforts related to this project are addressed in section 1.9 - Issues to be Resolved. These tiered efforts include recreation, real estate and a detailed analysis with regards to the State Route realignments. All follow-on NEPA documents will allow public review and comment before construction start.
403.	USDA	Wildlife	Written	DEIS is missing specialists reports addressing management indicator species, fisheries, and wildlife.	The Corps uses Habitat Evaluation Procedures (HEP) rather than Management Indicator Species. Both analyses serve the same result. With regard to other missing information, please see our previous response with regards to tiering.
404.	Van Matre, Sherry	Economic Impacts	Kernville Hearing	Will residents be compensated for lost business during construction?	Comment noted. Corps funds cannot be allocated for these purposes.
405.	Van Matre, Sherry	Construction Pool Elevation	Kernville Hearing	Will lake users still be allowed to use the lake during construction?	Yes, at this time it is planned that recreation will be allowed on the lake during the entire construction period.
406.	Van Matre, Sherry	Air Quality	Kernville Hearing	Will fugitive dust emissions be a problem during construction?	Short-term construction-related air quality impacts were assessed in accordance with the Eastern Kern Air Pollution Control District recommended methods. Potential impacts from windblown dust can be effectively reduced to less than significant through use of best management practices. Fugitive dust point sources have been further reduced with the elimination of the South Fork Delta borrow area. Additional Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 4.
407.	Van Matre, Sherry	Hire Local	Kernville Hearing	Local workers should be involved in project construction.	The contractor selected for the Isabella Lake DSM Project will be announced through regular local media outlets upon contract award. Local workers interested in hiring on to this comprehensive project should consider submitting an application directly with the selected contractor.
408.	Vetter, Beth	Alternatives	Written	Prefers Alternative Plan 4	Comment noted. Chapter 2 of the FEIS identifies Alternative Plan 4 as the Preferred Alternative.
409.	Vetter, Beth	HTRW	Written	There is a concern about asbestos in the buildings to be demolished; the Corps should notify Kern County about amount of waste coming in during construction.	Construction specifications and contract will require contractors to identify and properly and lawfully dispose of asbestos-laden building materials.
410.	Vetter, Beth	Public Affairs/Relations	Written	Suggests that the Corps contact Kern Community Foundation and Kern County Network for Children to disseminate information, print and broadcast PSAs for meetings, and make Bakersfield residents more aware of the project and consequences of a dam breach.	We appreciate the recommendation and will work to ensure that the community is informed about the project and ongoing construction/milestones.

Comment Number	Commenter	Category	Method of Submission	Comment Summary	Responses
411.	Volpert, Bob	Rafting Below Dam	Electronic	DEIS does not address potential lost rafting opportunities below dam.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
412.	Vose, Sue	Water Quality	Electronic	General concern	Comment noted. Please see the water quality information provided in the FEIS.
413.	Vose, Sue	Borrow sites	Electronic	The Auxiliary Dam camping area should not be used as a borrow site.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 8.
414.	Vose, Sue	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
415.	Vose, Sue	Traffic/Circulation	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 10.
416.	Vose, Sue	Property Values	Electronic	General concern	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 6.
417.	Wenstrand, Gerald	Property Values	Lake Isabella Hearing	What will be done for housing owners from a real estate perspective?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 7.
418.	Wenzel, Max	Construction Pool Elevation	Electronic	Draining the lake would affect recreation users, which would hurt the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.
419.	White, Chuck	Public Comment Period	Kernville Hearing	Requests that the Corps allow for an extension of time allowed for public comment.	Comment noted, and executed with an additional 15-day extension provided for review of the DEIS for a total of 60 days.
420.	Wiechers, Peter	Rafting Below Dam	Kernville Hearing	There is a concern about low flow below dam; will there be flow ramping to allow rafting?	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 3. Additional discussion on recreation can be found in Sections 1.4.2 and 3.10 of the FEIS.
421.	Wiechers, Peter	General Clarification	Electronic	Points out error in the recreation section where High Impact Recreation Areas are mentioned.	Comment noted. The High Impact Recreation Area (HIRA) document was referenced in the DEIS as it was used to help assess and confirm recreation area amenities and existing conditions. It was not used in reference as a record of revenues collected at potentially affected recreation areas. The HIRA document was not referenced in the FEIS.
422.	Woods, Jimmie	Budget/Schedule	Written	Would like to see the dam completed as quickly as possible to minimize impacts on the economy.	The Corps understands the concern for the duration of construction and the Team is constantly doing everything possible to shorten those completion dates. The Corps will continue to refine the schedule to ensure The Corps is efficient in our construction durations.
423.	Wormood, Carl	Construction Pool Elevation	Electronic	Lowering lake levels will hurt recreation and the local economy.	The Corps response to this comment is found in the FEIS Chapter 6, Section 6.4 – Summary of Corps Responses to Primary issues of Concern to Many Commenters, under Issue 1. The refinements to the project since publication of the DEIS are included in the FEIS, Chapter 2.

APPENDIX B

CLEAN WATER ACT SECTION 404(B)(1) WATER QUALITY EVALUATION

Isabella Lake Dam Safety Modification Project

Clean Water Act Section 404(b)(1) Water Quality Evaluation

September 2012

Prepared for:

US Army Corps of Engineers
Sacramento District

US Army Corps of Engineers®

Prepared by:

Tetra Tech, Inc.

TETRA TECH

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CHAPTER 1.
INTRODUCTION

This document constitutes the Statement of Findings, and review and compliance determination according to the Clean Water Act (CWA) Section 404(b)(1) guidelines (33 USC §1344(b)(1)) for the proposed work described in the Isabella Lake Sam Safety Modification Project Draft Environmental Impact Statement (DEIS; released March 2012), and Final EIS (FEIS; released October 2012), prepared by the US Army Corps of Engineers (Corps), Sacramento District, in cooperation with the US Forest Service (USFS), Sequoia National Forest, Kern River Ranger District.

Section 404 of the CWA regulates discharge of dredged material and placement of fill within waters of the United States. Section 404(b)(1) of the CWA requires that proposed actions be designed to avoid or minimize adverse impacts to aquatic resources and waters of the United States. This analysis is intended to demonstrate compliance with the CWA Section 404(b)(1) and has been prepared in accordance with 40 CFR Part 230-Section 404(b)(1) guidelines and USACE Planning Guidance Notebook, Engineering Regulation (ER) 1105-2-100.

1.1 PROJECT PURPOSE AND NEED

The Corps has determined that the Isabella Dam facilities require structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. The Corps is proposing risk reduction measures to minimize the potential for and consequences of a catastrophic downstream flooding event by remediating the significant seismic, hydrologic, and seepage deficiencies at the Isabella Main and Auxiliary Dams and spillway for safe and effective functioning at authorized capacity, while reducing the risk to the downstream public to tolerable levels. This would support the ultimate goal of having a safe facility that meets Corps risk reduction guidelines for existing dams and allows the project to provide the benefits for which it was authorized.

In 2005, the Corps determined through a screening-level risk assessment process that the Isabella Dams posed unacceptable risk. Subsequently, the project received a risk classification that is described “urgent and compelling (unsafe)” and as “critically near failure”, or “extremely high risk”. It should be noted that the project received this classification due to the “extremely high risk”, and that the project is not believed to be “critically near failure”. Failure is not believed to be

imminent. However, the large population downstream of Isabella Lake as well as significant dam safety issues at the dam, urgent action is needed to address deficiencies and reduce risk. These facilities are among the Corps' highest priorities for risk reduction, and the project does not meet Corps tolerable risk guidelines, thus remedial actions are necessary. The Corps' need for action is to reduce the likelihood and consequences of dam failure and to restore the authorized project benefits.

1.2 PROJECT LOCATION AND PRIMARY FEATURES

Isabella Lake is on the Kern River in the Sierra Nevada, in the southernmost part of the Sequoia National Forest, Kern County, California (Figure 1). It is located approximately 35 miles (50 river miles) northeast of Bakersfield, along Highway 178 and one mile upstream of the town of Lake Isabella. Isabella Lake is formed by a Main Dam on the Kern River and an Auxiliary Dam to the east in the adjacent Hot Springs Valley. The construction of the Isabella Lake dams began in March 1948, and the dams were placed in full operation in early 1953.

The project provides flood risk management benefits to the residents and business owners of the town of Lake Isabella, the Kern Valley, and Bakersfield. A private hydroelectric project owned and operated by Isabella Partners is on the downstream toe of the Main Dam. The Borel Canal passes through the Auxiliary Dam and supplies water directly to a hydroelectric plant operated by Southern California Edison (SCE) on the Kern River, six miles south of the Auxiliary Dam.

The major physical features of the Isabella Dam Project include embankments, outlet works, and a Spillway (Figure 2). The Isabella Lake dams provide for flood risk management, municipal and industrial water conservation, and recreation. More information on the location and description of the Isabella Dam Projects is located in Section 1.4 and 1.5 of the DEIS, and in Section 2.3 of the FEIS.

1.3 PROJECT AUTHORITY

The initial study for a project on the Kern River was authorized by the Flood Control Act of 1936, Pub. L. 74-738, § 6,49 Stat. 1579 (1936). Construction of Isabella Dam and Lake was authorized by the Rivers and Harbors Act of 1944, Pub. L. 78-534, § 10,58 Stat. 887,901 (1944). The project is primarily authorized for flood control, with secondary benefits from water conservation.

Figure 1 Project Area Location

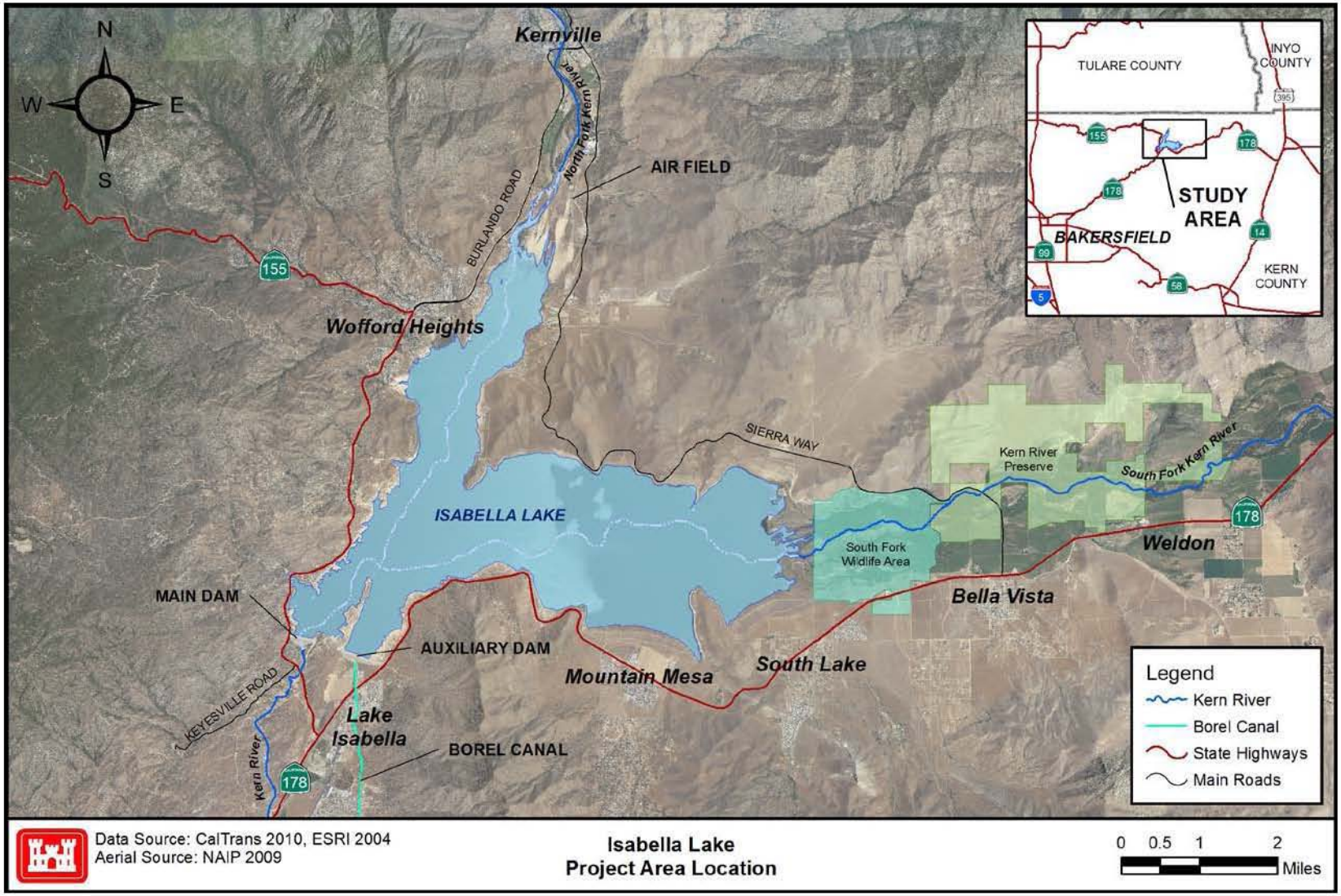
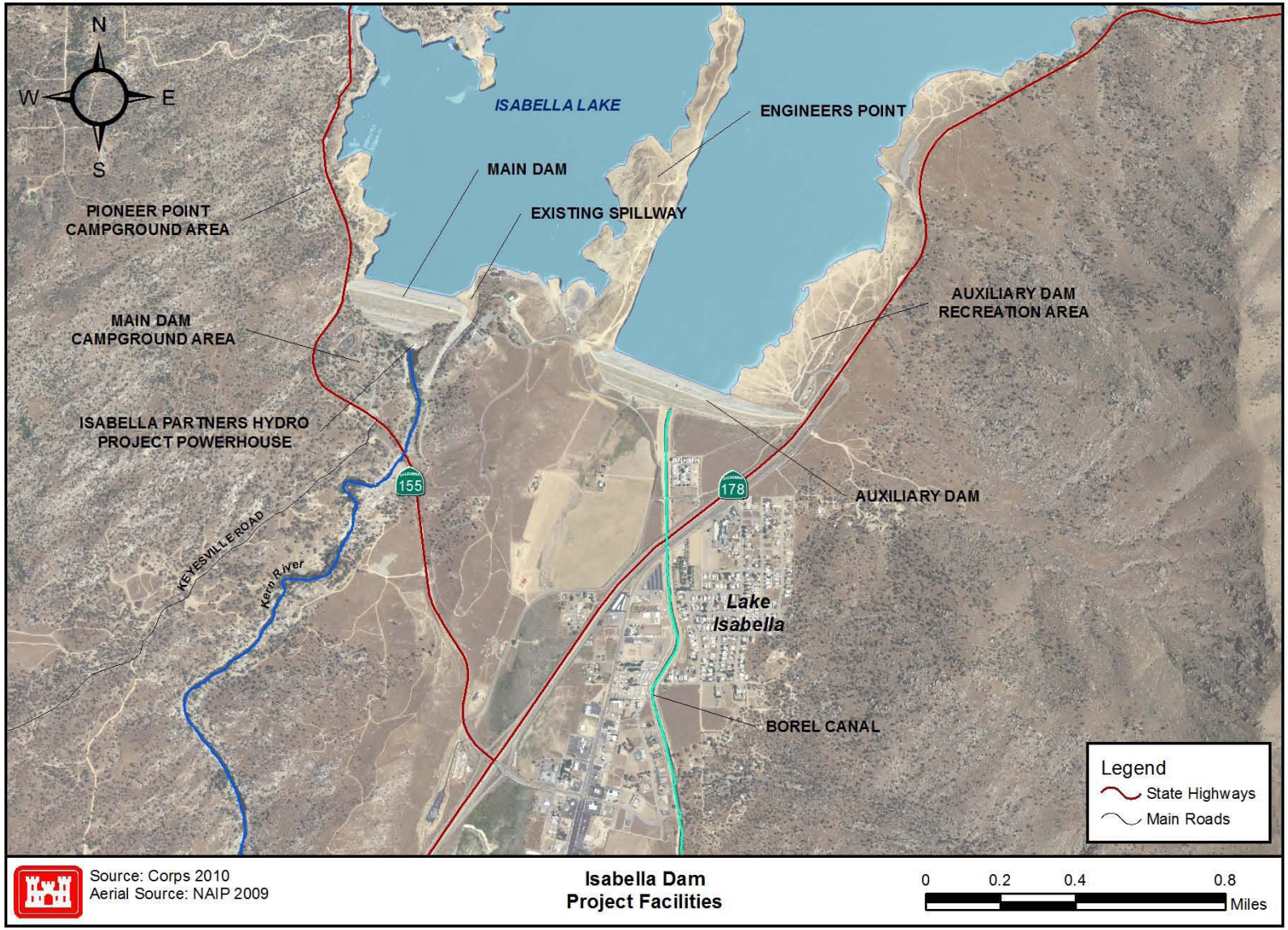


Figure 2 Isabella Dam Project Facilities



The National Dam Inspection Act of 1972 (Pub. L. 92-367, §3, 86 Stat 506 (1972)) requires the Secretary of the Army to carry out a national dam inspection program. The ER 1110-2-1156 (final 28 October 2011) prescribes the guiding principles, policy, organization, responsibilities, and procedures for implementation of risk-informed dam safety program activities and a dam safety portfolio risk management process within the Corps. The purposes of the dam safety program are to protect life, property, and the environment by ensuring that all dams are designed, constructed, operated, and maintained as safely and effectively as is reasonably practicable. Prudent stewardship of available resources is essential to preserve the existing infrastructure. When unusual circumstances threaten the integrity of a structure and the safety of the public, the Corps has the authority to take expedient actions, require personnel to evaluate the threat, and design and construct a solution.

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CHAPTER 2.
PROJECT DESCRIPTION

2.1 SELECTION OF A PREFERRED ALTERNATIVE

In Chapter 2 of the DEIS, a description was provided of the alternative formulation process by which the Corps had derived the No Action Alternative and eight Action Alternatives initially considered in the DEIS, and had eliminated three of the Action Alternatives from further detailed consideration in the DEIS. The No Action Alternative and the five Action Alternatives analyzed in detail in the DEIS are summarized as follows:

- **No Action Alternative.** The No Action Alternative would implement none of the proposed risk reduction measures, remove the Interim Risk Reduction Measures (IRRM) currently in place, and operate Isabella Lake up to the authorized gross pool elevation of 2,609.26 feet NAVD 88 (568,075 acre-feet). 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 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.
- **Alternative Base Plan.** The Alternative Base Plan would remediate the deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not remediated, would have an unacceptably high likelihood and large consequences for a catastrophic failure of one or both of the dams from seepage, seismic activity, or an extreme storm event.
- **Alternative Plan 1.** Alternative Plan 1 includes the remediation of the deficiencies covered in the Alternative Base Plan, plus additional deficiencies identified for the Main Dam.
- **Alternative Plan 2.** Alternative Plan 2 includes the remediation of the deficiencies covered in Alternative Plan 1, plus additional deficiencies identified for the Auxiliary Dam.

- **Alternative Plan 3.** Alternative Plan 3 includes the remediation of the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam, ensuring that both dams achieve the best rating regarding dam safety.
- **Alternative Plan 4.** Alternative Plan 4 includes the remediation of all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan, plus additional remediation measures identified for the Existing and Emergency Spillways, Main Dam, and Auxiliary Dam, to accommodate up to a 16-foot crest raise for the hydrologic overtopping deficiency. In addition, both State Highways 155 and 178 would need to be modified to accommodate a 16-foot crest raise.

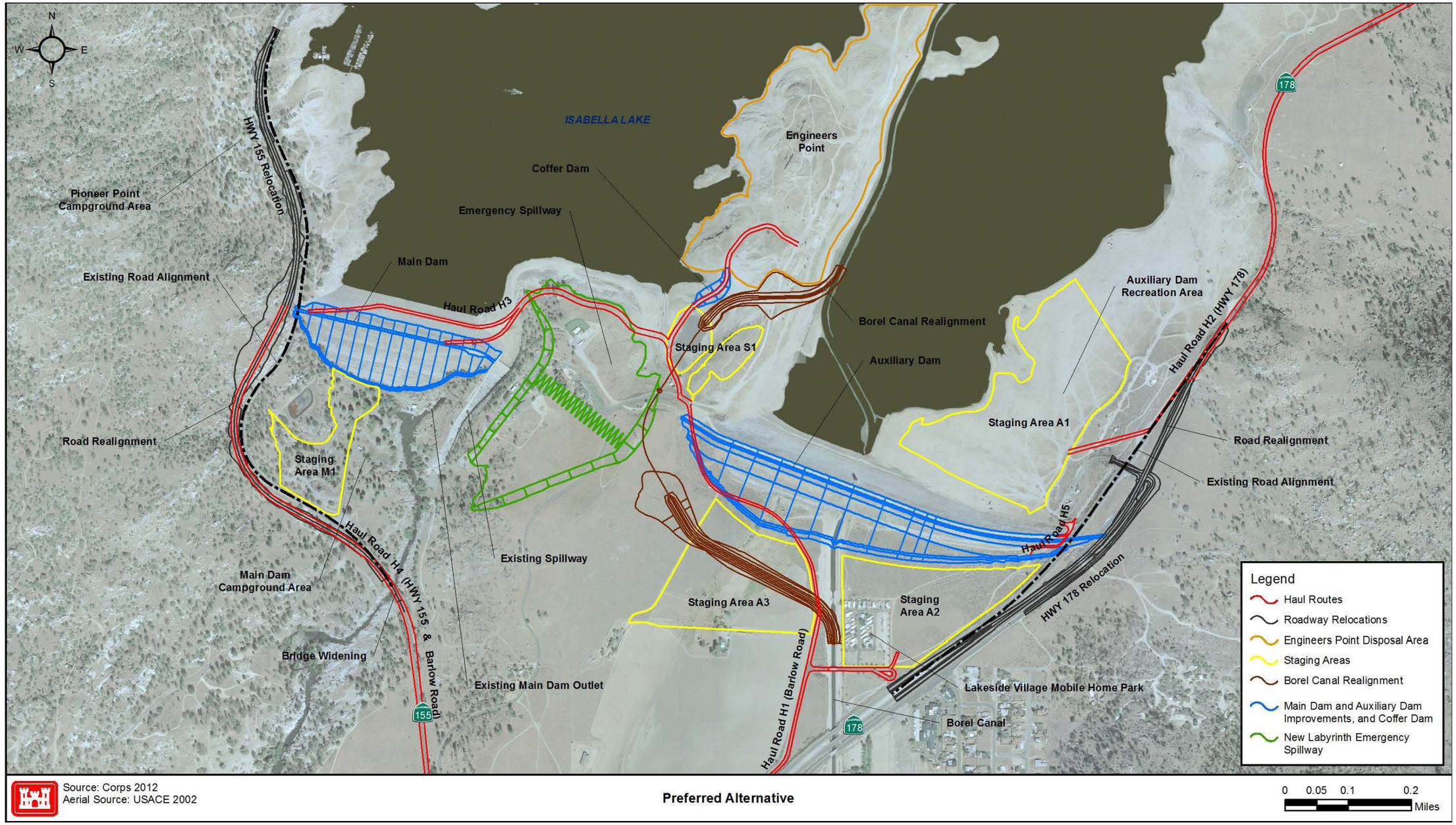
The formulation process was greatly augmented by public and agency comments received during the 60-day public review period of the DEIS. Through consideration of public and agency comments received, coupled with the ongoing rigorous and comprehensive evaluation and review procedures established by the Corps for this project, the Corps selected Alternative Plan 4 as the Preferred Alternative.

The Proposed Action is to implement the Preferred Alternative, which would remediate all of the dam safety deficiencies that are significant contributors to risk. On this basis, the discussion of the evaluation of the impacts throughout the remainder of this document will focus on the Preferred Alternative and the No Action Alternative. The Preferred Alternative will be discussed throughout this document in order to determine if it is the least environmentally damaging practicable alternative (LEDPA).

2.2 FEATURES OF THE PREFERRED ALTERNATIVE

The remediation measures planned for each structure under the Preferred Alternative are described below and illustrated in Figure 3. The Action Area that is considered for the purpose of the 404(b)(1) analysis includes the majority of the construction work activities and support actions comprising the risk reduction measures. These actions would take place at and in the proximity of the Main Dam, spillway, and Auxiliary Dam.

Figure 3 Preferred Alternative Site Plan



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2.2.1 Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the Probable Maximum Flood [PMF]). Under the Preferred Alternative the project would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

- A full height filter and drain on the downstream slope of the dam to accommodate a crest raise (expected to be approximately 16-foot) and to further protect the structure from transverse cracking and potential settlement cracking during a seismic event.
- A toe filter/drain system to capture and collect seepage.
- A crest raise (expected to be approximately 16-foot) to be able to safely pass an extreme flood event without overtopping.
- Raising the Main Dam control tower and access to the existing facility by 16 feet to match the increased dam crest elevation.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the full height filter and drain of the Main Dam would come from crushing and processing of the waste rock material excavated for the proposed Emergency Spillway. The Auxiliary Dam Recreation Area would serve as a sand stockpile/staging area and backup source of project sand, if necessary (See Figures 2 and 3).

2.2.2 Existing Spillway

The Preferred Alternative would remediate the deficiencies identified for the existing spillway. The remediation includes (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of anchors along the existing spillway wall and ogee crest for additional head during operation and to increase seismic stability; and (c) construction of an approximate 16-foot high retaining wall added to the crest along the right and left walls (closest to the Main Dam) to protect against potential erosion of the Main Dam during high outflows and to accommodate the crest raise. The concrete needed for all

remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along Hwy 178.

2.2.3 Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). It is a requirement that all Corps dams be able to safely pass the PMF, with freeboard for wind and wave run-up. Therefore, the Preferred Alternative includes the construction of a new "Emergency Spillway", approximately 900-feet-wide, that would be located approximately one-hundred feet east of the existing spillway (See Figure 2). The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of both dams, with failure of one or both dams which would cause extreme consequences downstream. This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2,637.26 feet NAVD 88 (900,000 acre-feet) current elevation of the top of dam), which is 28.0 feet higher than existing spillway. The new emergency spillway would have a labyrinth type weir with v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel.

The crest elevation of the Main and Auxiliary Dam would be raised approximately 16 feet in order to provide for passage of the PMF without overtopping and minimize the increased incremental downstream consequences from passing additional flows. The 16-foot raise will also provide approximately 4-feet of freeboard under the PMF event. Only in extreme storms would the reservoir rise to an elevation at which the Emergency Spillway would operate, with the annual probability of reaching this elevation being approximately 1 in 4,700. Outflows associated with pool elevations up to the 1 in 4,700 annual exceedance probability would be handled solely by the existing spillway. The emergency spillway would operate for frequencies at or near the current frequency of overtopping the dams in order to minimize downstream consequences. It is noted that routing of the PMF with the dams as currently constructed results in an overtopping of both dams by approximately 10 feet (non-fail condition), or a reservoir pool elevation of approximately 2,647 (NAVD 88). Under this alternative the PMF pool is estimated to be approximately 2,649 (NAVD 88), or an increased maximum pool elevation of 2 feet. This would only occur under the PMF flood event, which is estimated as having a 1 in 10,000 probability of occurrence in any given year.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. It is anticipated that excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source for construction of the modification features. The excavated materials likely would be crushed, screened and washed as needed to generate the various sands, gravels and rock required and either temporarily stockpiled or placed directly into permanent construction. The processing operation would likely be located at approved onsite location likely in vicinity of the proposed Emergency Spillway and adjacent to the Auxiliary Dam. The materials (various sized rocks) produced in the crushing operation would be stockpiled on-site in this staging area and delivered to the appropriate construction areas as needed. Any excess material will be disposed of on Engineers Point.

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be produced by the Batch Plant set up on site in the vicinity of the Emergency Spillway. Cement and fly ash would come from an off-site source.

2.2.4 Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose an unacceptably high probability of failure of the dam. Under the Preferred Alternative the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities:

- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.
- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Constructing a crest raise to be able to safely pass an extreme storm event without overtopping. The height of the raise is expected to be up to 16-foot high but may vary depending on final design.

The majority of the rock materials needed to complete the downstream buttress on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation (crushed to size) but if necessary, it could come from the Auxiliary Dam Recreation Area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on Hwy 178.

2.2.5 Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam. The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal which has the first water rights to the flows out of the North Fork of the Kern River. Since the early 1900s, the canal has been supplying water via the canal to the Southern California Edison (SCE) power plant approximately six miles downstream of the Auxiliary Dam. The SCE has a water right to receive the first 605 cubic feet per second (cfs) of the North Fork Kern River flows into Isabella Lake through the Borel Canal.

Under the Preferred Alternative the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement Borel Canal alignment would be constructed through the right abutment of the Auxiliary Dam outside of the Kern Canyon fault shear zone. The realigned canal and tunnel-conduit would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal downstream of the Auxiliary Dam.

Also with the Preferred Alternative, a temporary rock-fill coffer dam may be required (depending on reservoir elevation at the time of construction). The coffer dam is expected to be smaller than was required in the DEIS, and would be located on the west side of Engineers Point, to sufficiently dewater the area in order to construct the upstream portal and the tunnel-conduit. There is a natural high ridge in Engineers Point that will protect against rising water on the Auxiliary Dam side; therefore a cofferdam is not necessary on the Auxiliary Dam side to protect the portal and tunnel-conduit excavation and construction.

The coffer dam is expected to be constructed in the wet without lowering the lake level, to take advantage of the flood control pool (lower elevations). The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. The crest of the cofferdam would be set at the top of the restricted pool elevation 2,589.26-feet NAVD 88 (360,000 acre-feet). After construction of the coffer dam the lake would be allowed to rise to within four feet below the cofferdam crest (2,585.26-feet NAVD 88; 325,399 acre-feet) to allow for storage of snow melt during the spring season.

The Corps has determined that the lake level would have to be lowered to an approximate elevation of 2,543-ft NAVD 88 (72,237 acre-feet) for a period of four to six months during Fall 2020 to early Spring 2021, to allow time to tie in the relocated canal and tunnel-conduit into the existing canal upstream of the Auxiliary Dam. This is the portion of the proposed realignment that would be located east of the Engineers Point ridge, and therefore would be subject to lake level fluctuations on the Auxiliary Dam side. The work required during this time includes excavation for and construction of the upstream approach channel. Also required during this lowered construction pool would be the demolition of the existing Borel Canal between the new upstream tie-in and the Auxiliary Dam. Scheduling these actions during fall-winter would take advantage of the naturally occurring lower lake levels, and would be outside the summer high recreation season on the lake.

After the construction of the upstream portal and tie-in to the existing canal in the lake, the temporary coffer dam could be removed, but would likely remain in place in order to maintain access to Engineers Point. The concrete needed for the upstream portal, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix plant on Hwy 178.

2.2.6 Realignment of Highway 178

Highway 178 would be realigned to the south of the Auxiliary Dam to accommodate the 16-foot raise on the left abutment. The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 mile east of Route 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet southeast of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet northeast of the present Lake

Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location.

2.2.7 Realignment of Highway 155

Hwy 155 would also be modified to accommodate the 16-foot raise on the right abutment of the Main Dam. Two options are currently being considered for Hwy 155. The first option would include realign Hwy 155 to the west of the Main Dam. The realignment would begin upstream of the Main Dam and would shift to the west, but parallel to the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately one mile. The maximum shift of the alignment would be about 120 feet to the west. The realignment would require a modification and widening of the existing bridge across the Kern River to stay within Caltrans standard requirements. This realignment could affect some camp sites along Hwy 155 to the north of the Main Dam. The realignment would also include an uphill passing lane.

The second option for Hwy155 would not include realignment of the highway and would not change the grade and elevation of the roadway over the right abutment of the Main Dam. The second option would include a flood gate on the right abutment near existing centerline of the Main Dam. The flood gate would be used to close off the low point for extreme flood events and would prevent travel on Hwy 155 for very rare storm events. The gate structure would include a concrete gravity retaining wall adjacent to the Main Dam and a concrete support wall near the existing rock face cut. The gate would either consist of a permanent swing gate or a gate that would be stored on the abutment and erected when needed.

Currently, the preferred option for modifying Highway 155 is the realignment option. However, during the engineering design phase of the project it may be determined that another option for modifying Highway 155 (e.g. the gate) is preferred.

2.2.8 Rock Material Disposal Area on Engineers Point

The Corps has determined since the release of the DEIS that an unused rock material disposal area (approximately 54 acres) would be established on Engineers Point, to receive the unused rock material from the Emergency Spillway excavation. This disposal area would be served by an additional haul road spur connection from haul road H1, which would include the coffer dam crest. This refinement of disposing of the unused rock material from the Emergency Spillway on Engineers Point allows the Corps to forego constructing an Upstream Berm on the Auxiliary Dam,

as was proposed in the DEIS, as a means of disposing of unused rock. This refinement would reduce potential impacts on the waters of the U.S., as well as impacts on recreation, water quality, and fisheries described in the DEIS.

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CHAPTER 3.
GENERAL DESCRIPTION OF DREDGED OR FILL MATERIAL

3.1 GENERAL CHARACTERISTICS OF MATERIAL

It is anticipated that excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source for construction of the modification features for the Preferred Alternative. Excavated material would be processed for project feature use as graded aggregate and sand for drains and filters, aggregate surface course rip rap, and random fills. Any excess material would be disposed of on Engineers Point, of which a portion of this would be placed below the ordinary high water mark (OHWM). Fill substrate would be composed mostly of coarse granitic material of various size. This material would also be used to construct the coffer dam below the OHWM required for constructing the Borel Canal re-alignment through Engineers Point (See Figure 3).

The OHWM for Isabella Lake was determined during a 2011 field survey in accordance with guidance provided by the Corps Regulatory Guidance Letter: Ordinary High Water Mark Identification No. 05-05. Specific guidance used for the determination included physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, and the characteristics of the surrounding area (Corps 2005). The locations of the OHWM indicators around the lake were recorded using a Trimble 3000 GeoXH global positioning system (GPS). These data aligned well with the gross pool elevation (2,609.26 feet NAVD 88; 568,075 acre-feet) established for Isabella Lake.

The No Action Alternative would result in no changes.

3.2 QUANTITY OF MATERIAL

The total excess waste material not utilized in project feature construction and proposed for placement at Engineers Point is estimated to be 1,710,000 CY. 75% of this volume is estimated to be placed below the OHWM (1,282,500 CY). The remainder (427,500 CY) would be placed above the OHWM at Engineers Point.

3.3 SOURCE OF MATERIAL

Materials disposed below OHWM would be excess material excavated onsite from the Emergency Spillway.

CHAPTER 4.
DESCRIPTION OF THE PROPOSED DISCHARGE SITES AND DISPOSAL METHOD

4.1 LOCATION

The discharge location site for the unused rock excavated from the emergency spillway is Engineers Point. The location of the Borel Canal Realignment temporary rock-fill coffer dam will be below the OWHM of Isabella Lake connecting a western lobe of Engineers Point to Staging Area S1 (Figure 4).

4.2 SIZE

An area of approximately 54 acres would be utilized for disposal of up to 1,710,000 CY of material at Engineers Point (See Figure 4). This would include approximately 36.5 acres below OHWM and approximately 17.5 acres above OHWM. A total of 44,467 CY of material would be placed within approximately 1 acre of Isabella Lake (below the OHWM) to construct the coffer dam (See Figure 4).

4.3 TYPE OF SITE

The disposal sites include the lake bed of Isabella Lake and a previously disturbed upland borrow site for construction of the Main Dam.

4.4 TYPE OF HABITAT

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

4.4.1 Open Water

Approximately 568,000 maximum acre feet of open water habitat is located within the project area (when Isabella Lake is at full pool elevation [2,609.26 feet NAVD 88; 568,075 acre-feet]). A small amount of open water (0.05 acres) is also contained in the Borel Canal downstream of the Auxiliary Dam (See Figures 3 and 4). Open water habitat in the study area is largely unvegetated. Open water habitat provides foraging habitat for waterfowl and other wetland species.

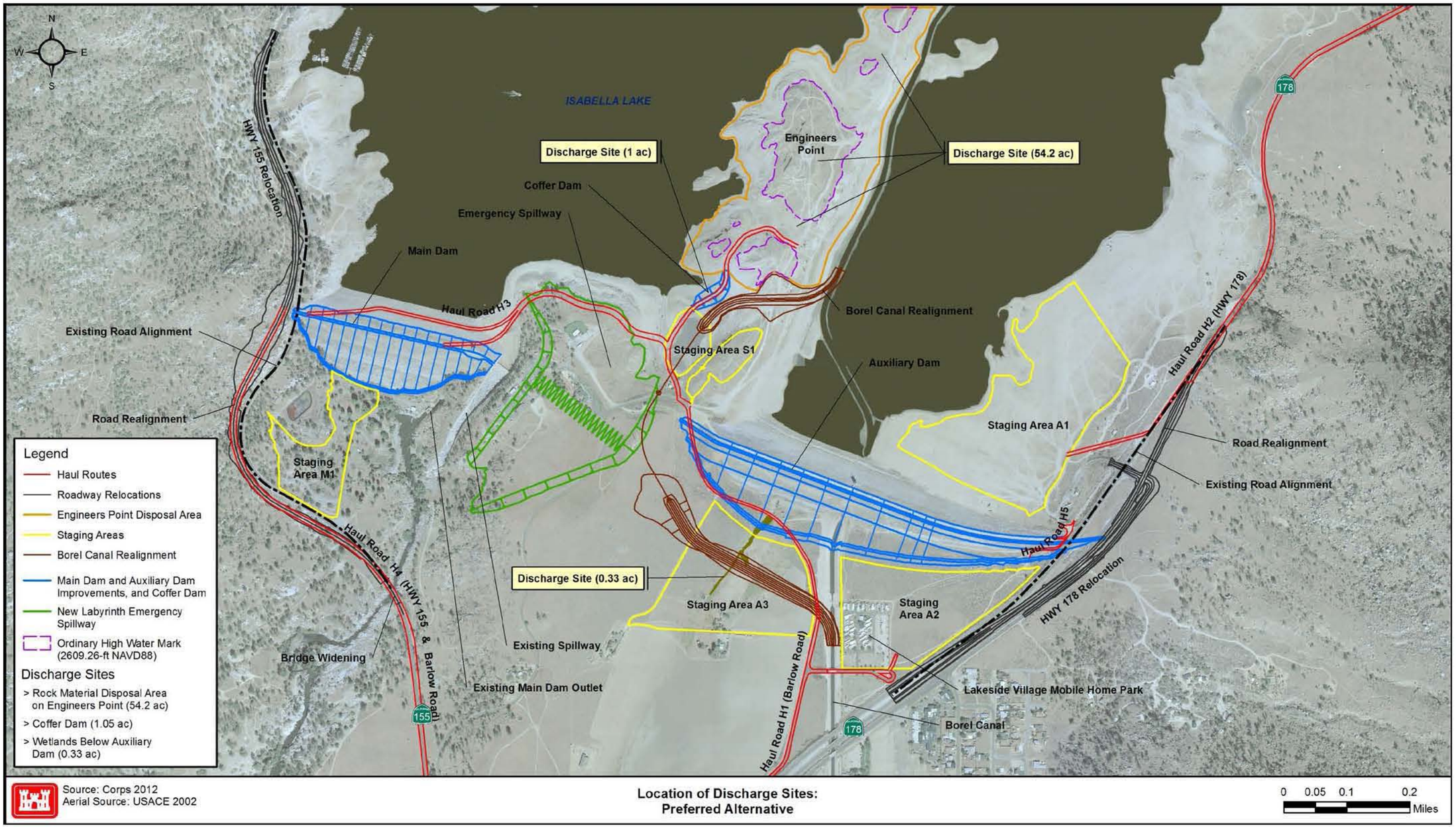
4.4.2 Wetlands

Three wetland types were found within the project area: freshwater emergent, forested/shrub, and emergent non-persistent. Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes that are present for most of the growing season in most years (Cowardin et al. 1979). Representative plants found in emergent wetlands typically include bulrushes, cattails, and rushes. There is approximately 0.12 acre of emergent wetland in the study area. Forested/Shrub wetland is characterized by woody vegetation that is more (forest-dominant) or less (shrub-dominant) than 20 feet tall (Cowardin et al. 1979). Plants found in the forested/shrub wetland include red willow, soft rush, curly dock, sturdy sedge, and Baltic rush. There is approximately 0.13 acre of freshwater forested/shrub wetland in the study area. Emergent non-persistent wetlands are dominated by plants which die back to the surface of the substrate or below the surface of the water at the end of the growing season so that, at other seasons of the year there are no obvious signs of emergent vegetation. Surface water is seasonal, usually in the growing season (Cowardin et al. 1979). Wetland plants in this area were characterized by cocklebur, soft rush, and rabbit's foot grass. There is approximately 0.078 acre of emergent non-persistent wetland in the study area.

4.4.3 Non-native Grassland

Non-native grasslands generally match the description in Holland (1986). Also referred to as California annual grasslands, these areas are dominated by vegetation consisting of dense to sparse cover of annual grasses and forbs between 0.5 to 1.5 feet tall. Germination occurs at the start of the late fall rains and growth, flowering, and seed-set occur from winter through spring. Senescence occurs in early summer. This habitat occurs on fine-textured, usually clay, soils that are moist or water-logged in the winter and very dry during the summer. Dominant species include grass and forb species, such as red brome (*Bromus madritensis* ssp. *rubens*), ripgut brome (*Bromus diandrus*), cheatgrass (*Bromus tectorum*), slender wild oats (*Avena barbata*), goosegrass (*Elusine indica*), short-pod mustard (*Hirschfeldia incana*), red-stemmed filaree (*Erodium cicutarium*), yellow star-thistle (*Centaurea solstitialis*), California poppy (*Eschscholtzia californica*), miniature lupine (*Lupinus bicolor*), and doveweed (*Croton [=Eremocarpus] setigerus*).

Figure 4 Location of Discharge Sites: Preferred Alternative



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4.4.4 Agricultural Lands

Agricultural lands include areas that are farmed for the production of food plants or animal fodder at some point during the growing season. Locally, agricultural lands are dominated by alfalfa (*Medicago sativa*), barley (*Hordeum spp*.), slender wild oats, black oats (*Avena fatua*), and other annual plants including those found in nonnative grasslands.

4.5 TIMING AND DURATION OF DISCHARGE

The construction activities that would affect the waters of the U.S. would be conducted over five-plus years, beginning in January 2017 and continuing into February 2022. Timing of construction would occur in the winter months when lake levels are low, when feasible, to minimize impacts to water quality. When lake levels are low, more material would be disposed and/or constructed in dry conditions. In addition, in the winter months the migratory bird populations in the South Fork area are absent and recreation is off-season.

4.6 DESCRIPTION OF DISPOSAL METHOD

Material disposal and construction of the coffer dam on Engineers Point below the OHWM would be timed to occur during the fall and winter months, when lake levels are low. When the coffer dam is in operation, the maximum pool would be 2,585.26 feet NAVD 88 (325,399 acre-feet); approximately four feet lower than the current deviation. The material would be disposed following a Corps approved *Rock Material Disposal Management Plan*. A portion of the Borel Canal immediately downstream of the Auxiliary Dam, containing about 0.05 acres of open water, would be abandoned and filled as part of the planned relocation of the Borel Canal (See Figure 4). The new canal section to be constructed between the downstream tunnel portal and the tie-in to the existing canal is anticipated to replace in kind the open water filled on the abandoned portion.

The No Action Alternative would not require the disposal of materials.

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CHAPTER 5.
FACTUAL DETERMINATIONS

5.1 PHYSICAL SUBSTRATE DETERMINATIONS (SECTIONS 230.11 (A) AND 230.20)

5.1.1 Comparison of Existing Substrate and Fill

The description of the current substrate within the proposed project area is taken from Section 3.4 of the DEIS.

The soils surrounding Isabella Lake are characteristic of the Kernville-Hogeye-Rock outcrop complex, composed of 50 percent Kernville soils, 20 percent Hogeye soils, 15 percent rocks, and 15 percent minor material. These soils are typically shallow at 15 to 30 inches deep to bedrock, moderately steep slope at 15 to 30 percent, and excessively drained. The soil ranges from rock outcrops to gravely coarse sandy loam. Drainage consists of coarse soils developed in alluvium weathered from igneous and metamorphic rocks. Soils in the vicinity of the project site generally show slight or slight-to- moderate potential for erosion.

Large areas of the project area have been graded and altered during the original construction of the Lake Isabella 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 native substrate excavated as part of construction of the new Emergency Spillway and would be placed at locations both above and below OHWM of Lake Isabella. Fill material placed above OHWM would be placed on Federal property.

Fill material would be various unused granitic rock material excavated from the Emergency Spillway. Some (or all) of the fill for the abandoned portion of the Borel Canal (open water) immediately downstream of the Auxiliary Dam may come from the Borel tunnel-conduit excavation and the excavation for the relocated canal (See Figure 4).

5.1.2 Changes to Disposal Area Elevation

The lake level at the boundary of the disposal area on Engineers Point as depicted in Figure 4 is approximately 2,560 feet NAVD 88 (146,172 acre-feet). At this elevation the lake has a total waterline length of approximately 181,740 lineal feet. The waterline length of the disposal area boundary shown in Figure 4 is approximately 6,626 lineal feet. On this basis, the disposal of rock material at Engineers Point would alter approximately 3.6 percent of Isabella Lake's shoreline (at the disposal boundary lake level). The area of the disposal site would locally alter substrate elevation and reduce the surface area of Isabella Lake, depending on the fill depth. However, the overall circulation, depth, current patterns, and water fluctuation of Isabella Lake would not change from the deposition of rock material.

The disposal materials deposited on land would permanently alter the natural landscape after the completion of construction.

The changes to the disposal area elevation at the location of the coffer dam may be temporary, but would likely be permanent, since the coffer dam may be retained for access to Engineers Point.

The No Action Alternative would not modify the substrate elevation or bottom contours.

5.1.3 Migration of Fill

The Preferred Alternative would involve the permanent addition of approximately 1,282,500 CY of material to Engineers Point, including 44,500 CY of material (Coffer Dam) below the OHWM of Isabella Lake. Because the lake is well regulated and because the fill material would consist of native granitic material, as long as the contractor utilizes BMPs to prevent erosion during construction activities, the proposed project would have minimal effects on erosion and accretion patterns. Mitigation measures, including BMPs are in Table 3-125 of the DEIS.

The No Action Alternative would not result in any change to erosion and accretion patterns.

5.1.4 Duration and Extent of Substrate Change

The Preferred Alternative 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 Lake Isabella.

The No Action Alternative would not modify the substrate.

5.1.5 Changes to Environmental Quality and Value

Isabella Lake 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 include previously disturbed areas that were used as borrow sources for the Main Dam construction. Placement of material at these locations would be consistent with current land use. Small areas of freshwater emergent, forested/shrub, and emergent non-persistent wetlands are found within the study area. Approximately 0.33 acres of wetlands would be impacted or filled due to construction and staging activities. Additional information on vegetation and wildlife is in Section 3.9 of the DEIS. Approximately 0.05 acres of open water located in the Borel Canal immediately downstream of the Auxiliary Dam would be filled as part of the relocation of the Borel Canal. The Corps anticipates that this loss of open water would be replaced in kind with the new canal to be constructed between the Borel tunnel and the downstream tie-in to the existing canal (See Figure 4).

The No Action Alternative would not modify the environmental quality and value.

5.1.6 Actions to Minimize Impacts

Standard erosion prevention practices would be employed such as silt fences and silt curtains to contain turbidity during rock disposal placement and other construction activities affecting Waters of the U.S. such as the Coffer Dam and the Borel Canal relocation through Staging Area A3 downstream of the Auxiliary Dam. These BMPs would minimize erosion and transport of soils and substrate. Additional information on mitigation measures, including BMPS is presented in Table 3-125 of the DEIS.

With the mitigation measures proposed to avoid and minimize impacts, the impacts of the proposed project on the physical substrate characteristics of the site would be minor.

The No Action Alternative would have no effect on the physical substrate characteristics of the site.

5.2 WATER CIRCULATION, FLUCTUATION, AND SALINITY DETERMINATIONS

5.2.1 Alteration of Current Patterns and Water Circulation

Isabella Lake is in the Kern River Valley basin, which is in the southern Sierra Nevada, at elevations ranging from 2,500 to 4,500 feet. The drainage area of the Kern River at Isabella Dam is 2,074 square miles (Corps 2009a). The Lake Isabella project regulates runoff for an area of 2,074 square miles, which consists of mountains and timbered areas. The authorized maximum storage capacity is 586,100 acre-feet at gross pool elevation (2,609.26 feet NAVD 88). The lake is fed by the North Fork and South Fork Kern River and the water is released on a regulated basis into the Kern River.

Because the Lake Isabella Dam and Isabella Lake is an already regulated system designed for flood protection, the impacts of the proposed project would have minimal impact to current circulation and drainage patterns. Surface disturbance can alter natural drainage patterns. Runoff critical to existing wetlands may be redirected elsewhere. As a result, these sensitive areas can be dewatered, compromising vegetative health and vigor. It is anticipated that changes in surface water drainage pathways would result in the potential development of new wetland areas along those new pathways.

The No Action Alternative assumes no action would be taken. Therefore, the currents, circulation and drainage patterns of Isabella Lake would remain the same.

5.2.2 Interference with Water Level Fluctuation

The maximum lake level would be lowered to a construction pool elevation of approximately 2,543 feet NAVD 88 (72,237 acre-feet), which represents over 45 feet in difference from the existing restricted pool elevation (2,589.26 feet NAVD 88; 360,000 acre-feet), for a period of four-to-six months from October 2020 through March 2021. The chosen schedule takes advantage of seasonal low reservoir elevations during the fall and winter. Otherwise, because Isabella Lake is regulated to allow a specific amount of water to be released into the Kern River, the proposed project and the No Action Alternative would not change water level fluctuation patterns.

5.2.3 Salinity Gradients Alteration

Salinity gradients would not be affected.

5.2.4 Effects on Water Quality

A description of the current water quality conditions at Isabella Lake is presented in Section 3.6 of the DEIS.

Water quality standards in the Tulare Basin Plan are not always met under existing reservoir operations. The water of Isabella Lake is 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. The Lake itself is not used for drinking water, but the Kern River downstream is a source.

Water Chemistry

Water quality standards in the Tulare Basin Plan are not always met under existing reservoir operations. Construction activities may cause additional problems in meeting the basin plan standards for DO, temperature, and pH. Additionally, a lowered pool level combined with high winds would likely result in resuspension of bedload sediments (i.e. turbidity). Algal blooms in the lake may occur during the summer months when temperature, nutrients, and turbidity levels are the highest. The consequences of these exceedances could result in blooms of potentially toxic cyanobacteria that could adversely affect fish and birds. Modeling and monitoring of water quality may be needed to manage potential adverse impacts.

Construction activities include use, storage, and transport of hazardous materials, including the use of aboveground fuel storage tanks. Also, heavy equipment and vehicles would be maintained at the construction sites, staging areas, and borrow areas. These activities have the potential for hazardous, toxic and radiological waste (HTRW) to be inadvertently released during fueling and maintenance operations, material hauling, and cement production. However, with appropriate measures such as BMPs, a Spill Prevention, Control and Countermeasures Plan (SPCC), and the SWPPP which includes designs and narratives for spill control measures, adverse impacts from inadvertent spills or releases of hazardous substances would be low, and less than significant.

Salinity

The project would not change salinity levels.

Clarity

Placement of material in the disposal area and construction/removal of the coffer dam 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.

Color

Placement of material in the disposal area and construction/removal of the coffer dam 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.

Odor

The project would not affect odor.

Taste

The project would not affect taste.

Temperature

A lowered pool level may lead to warmer temperatures in the lake as a result of the shallower waters. Construction scheduling strategies would be employed to minimize the duration of time that the pool level is reduced. The disposal and coffer dam construction/removal activities conducted in-the-wet have the potential to create 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.

Dissolved Gas Levels

Construction activities may temporarily increase turbidity levels, which could exacerbate increases in water temperature and affect DO concentrations. Nevertheless, conditions would return to or improve upon pre-construction levels once the project reaches completion.

Nutrients

Release of suspended sediments from project activities could potentially cause turbidity thresholds 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 *Storm Water Pollution Prevention Plan* (SWPPP), along with following BMPs would also prevent release of excess nutrients into the Lake.

Eutrophication

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

5.2.5 Changes to Environmental Quality and Value

The proposed project could impact the water quality of Isabella Lake during construction from the rock material disposal, construction of the coffer dam and other structures, earth moving 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, 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 Isabella Lake. Although there may be impacts to water quality during project construction, these impacts would be short term. The operation of the newly constructed project features would not affect the water quality of Isabella Lake.

5.2.6 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 presented in Section 3.6 and Table 3-125 of the DEIS. The contractor would be required to implement the proposed mitigation measures during project construction. Therefore, impacts to the water quality within Isabella Lake from project construction would be minimal.

The No Action Alternative would have no impacts on water resources related to construction. The water quality of the lake would be variable depending on inflows and operations and likely similar to current and historical data.

5.3 SUSPENDED PARTICULATE/TURBIDITY DETERMINATIONS

5.3.1 Alteration of Suspended Particulate Type and Concentration

Turbidity has only been consistently monitored at Isabella Lake since April 2009. The Auxiliary Dam portion of the lake exhibits the highest turbidity values with an average over the last two years of 8.3 NTU at the surface and 63.3 near the bottom. The Main Dam portion averages 5.7 NTU at the surface and 16.7 NTU at the bottom. At the outflows of the Main and Auxiliary Dams, the values of turbidity averaged 3 NTU and 6.3 NTU respectively over the last two years of monthly monitoring. The Tulare Basin Plan does not specify specific limits of turbidity for natural conditions, but does set limits for how much the turbidity can be increased from background conditions. These limits range from a low of 1 NTU for background turbidity of 1-5 NTU, to a high of 10% for background turbidity above 100 NTU.

During construction, there could be increased levels of turbidity as soils are exposed and during rain events, which may erode these soils into the lake. In addition, the placement of fill materials could cause a release of suspended sediments and increased turbidity into the lake. This exposed material could be eroded by wave action or storm runoff. The use of best management practices (BMPs), 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 presented in Section 3.6 of the DEIS.

5.3.2 Particulate Plumes Associated with Discharge

Temporary and local particulate plumes may occur during construction activities but the use of best management practices in association with the project SWPPP would mitigate any potential negative impacts.

5.3.3 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.

5.3.4 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 3.6.4 and Table 3-125 of the DEIS, increases in sedimentation and turbidity would be minimized and temporary.

The No Action Alternative would result in the project not being completed, which would result in no impacts to suspended sediment and turbidity.

5.4 CONTAMINANT DETERMINATIONS

The description of the current contamination condition of Isabella Lake is found in Section 3.6 of the DEIS. There is no evidence of serious contamination in Isabella Lake for organic and metal constituents. Historically, dissolved iron, manganese and arsenic have exceeded fish habitat and drinking water standards.

Construction activities include use, storage, and transport of hazardous materials, including the use of aboveground fuel storage tanks. Also, heavy equipment and vehicles would be maintained at the construction sites, staging areas, and borrow areas. These activities have the potential for hazardous, toxic and radiological waste (HTRW) to be inadvertently released during fueling and maintenance operations, material hauling, and cement production. However, with appropriate measures such as BMPs and a *Spill Prevention, Control and Countermeasures Plan* (SPCC), adverse impacts from inadvertent spills or releases of hazardous substances would be low, and less than significant. In order to ensure that there are no contaminants within the proposed fill material, BMPs listed in the Water Quality Section (Section 3.6) and Table 3-125 of the DEIS would be implemented. Provided these mitigation measures are implemented by the contractor, there would be minimal impacts to aquatic resources from contaminants.

Since no construction would occur under the No Action Alternative, there would be no HTRW impacts anticipated in the project area. However, under the No Action Alternative, one or both

dams are almost certain to fail under normal operations, especially if subjected to a strong seismic event. Potential consequences due to dam failure and catastrophic floodwater release would be adverse and significant in the downstream area affected by inundation of floodwaters including the municipality of Bakersfield, California where a number of potential HTRW sources that would be affected is substantial.

5.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

Information on aquatic ecosystem and organisms at Isabella Lake was taken from Section 3.10 of the DEIS.

5.5.1 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.

5.5.2 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. Benthic organisms could be smothered by the discharge of excavated material below the OHWM and construction of the coffer dam depending on lake level. However, benthic organisms from adjacent habitat would recolonize substrate material in the disposal areas.

5.5.3 Effects on Fish

Isabella Lake has been managed as both a coldwater and warmwater fishery since the 1950s (CDFG et al. 1999). Natural fish habitat in Isabella Lake is extremely limited due to little recruitment of large wood, lack of submersed aquatic vegetation and lack of coarse substrate.

Native species found in Isabella Lake and its vicinity include: Sacramento sucker *(Catostomus occidentalis)*, Sacramento hitch *(Lavinia exilicauda)*, San Joaquin roach *(Lavinia symmetricus)*, hardhead *(Mylopharodon conocephalus)*, Kern River rainbow trout (*Oncorhynchus mykiss gilberti*), Little Kern golden trout *(Oncorhynchus mykiss whitei)*, and Sacramento pikeminnow *(Ptychocheilus grandis).*

Non-native species found in Lake Isabella include: brown bullhead *(Ameiurus nebulosus),* carp *(Cyprinus carpio),* threadfin shad *(Dorosoma pretenense),* mosquitofish *(Gambusia affinis),* white catfish *(Ictalurus catus),* and channel catfish *(Ictalurus punctatus),* bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), green sunfish (*Lepomis cyanellus*), smallmouth bass *(Micropterus dolomieui),* spotted bass *(Micropterus punctulatus),* largemouth bass *(Micropterus salmoides),* coho *(Oncorhynchus kisutch),* rainbow trout *(Oncorhynchus mykiss),* kokanee salmon *(Oncorhynchus nerka),* Chinook salmon (*Oncorhynchus tsawytcha*), white crappie (*Promoxis annularis*), black crappie (*Promoxis nigromaculatus*), and brown trout (*Salmo trutta*).

The Preferred Alternative would result in the permanent loss of approximately 37.5 acres of potential fish habitat on Engineers Point. However, it would be the Corps' intention that the *Rock Material Disposal Management Plan* contains opportunity to actually enhance fish habitat around the perimeter of Engineers Point by judicious placement of larger rocks and boulders as an irregular revetment. 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 would be minimized through the use of BMPs and other mitigation measures proposed which are described in Section 3.10.4 and Table 3-125. Provided the proposed mitigation measures and compensatory mitigation are conducted, the proposed project would have minimal impacts on fish and aquatic wildlife habitat.

The no-action alternative would result in no losses of habitat for fish and other aquatic organisms.

5.5.4 Effects on Aquatic Food Web

Description of ecological effects is taken from Section 3.10 of the DEIS.

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. 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. 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 BMPs and other mitigation measures proposed (Section 3.10 and Table 3-125 in the DEIS) would result in minimal impacts on fish and aquatic wildlife habitat.

The no-action alternative would result in no construction related effects on fish and other aquatic organisms. The no-action alternative would not reduce the likelihood of dam failure that could result in catastrophic impacts on lake and downstream biological resources and habitats. These impacts are considered adverse and significant.

5.5.5 Effects on Special Aquatic Sites

Sanctuaries and Refuges

No sanctuaries and refuges are within the project area.

Wetlands

Wetlands were identified and delineated south of the Isabella Auxiliary Dam and west of the Borel Canal within Staging Area A3 (See Figure 4). Small areas of freshwater emergent, forested/shrub, and emergent non-persistent wetlands were found within the study area.

The Preferred Alternative would impact these wetlands in Staging Area A3. This site would serve as a location to stockpile rock material and for construction of a portion of the relocated Borel Canal conduit tunnel (See Figure 4). This area would also serve as a location for storage and staging of construction equipment and components needed for the tunnel excavation-construction and portal construction. The results of this impact would cause the loss of up to 0.33 acres of wetlands. Mitigation measures are proposed to offset these impacts and are outlined in Section 5 of the *Isabella Lake Dam Safety Modification Wetland Delineation Report* (Tetra Tech 2012).

Mud Flats

No mud flats are within the project area.

Vegetated Shallows

No vegetated shallows are within the project area.

Coral Reefs

No coral reefs are within the project area.

Riffle and Pool Complexes

No riffle and pool complexes are within the project area.

5.5.6 Threatened and Endangered Species

No known ESA-listed plant or animal species are known to occur within the action area of the proposed project. However, there are known ESA-listed plant and animal species within the vicinity. The host plant (Elderberry bush) for the Valley Elderberry Longhorn Beetle is found in the project area, however no beetles have been observed or evidence of the use of the host plant has been observed during surveys in the project area. Southwestern willow flycatcher, Western yellow-billed cuckoo, and Least Bell's vireo habitats are located in the South Fork Kern River Wildlife area (See Figure 1). These habitats would not be affected by construction activities or disposal into the Waters of the U.S. The host plants found in the vicinity of the wetland area below the Auxiliary Dam would be relocated in accordance with the Biological Opinion from the USFWS. Therefore, any potential adverse impacts to any of these species are not anticipated, or would be minimal.

The No Action Alternative would not result in direct impacts to endangered and/or threatened species. However, the no-action alternative would not reduce the likelihood of dam failure that could result in catastrophic impacts on lake and downstream biological resources and habitats for endangered and/or threatened species. These impacts are considered adverse and significant.

5.5.7 Other Wildlife

The diversity of habitats around Isabella Lake attracts a variety of wildlife species, including many residents and abundant migrants. It is estimated that over 300 species of birds use this area, with most being neotropical migrants (Audubon 2011). Common birds include passerines such as flycatchers, warblers, kinglets, chickadees, thrushes, jays, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. Other common birds are hummingbirds, woodpeckers, water birds, waders, and various raptors such as owls, buteos, and smaller accipiters (Audubon 2011). Isabella Lake and the Kern River host a variety of waterfowl, including migratory and resident waterfowl such as American coot, grebes, cormorants, gulls, and waders (Audubon 2011). Wildlife species common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted

skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley garter snake (Audubon 2011). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

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.

Water quality standards in the Tulare Basin Plan are not always met under existing reservoir operations. Construction activities may cause additional problems in meeting the basin plan standards for DO, temperature, and pH. Additionally, a lowered pool level combined with high winds would likely result in resuspension of bedload sediments (i.e. turbidity). Algal blooms in the lake commonly occur during the summer months when temperature, nutrients, and turbidity levels are the highest. The consequences of these exceedances could result in blooms of potentially toxic cyanobacteria that could adversely affect fish and birds. Additionally, direct effects of decreased DO levels and increased water temperatures could be fatal to USFS sensitive hardhead, rainbow trout and possibly largemouth bass and other sport fish if suitable cold water habitat is not available. Modeling and monitoring of water quality may be needed to manage potential adverse impacts. Based on refinements made by the Corps to the duration and timing of the construction pool, potential adverse impacts on fisheries are now considered less than significant, and therefore would not require that a Fisheries Management Plan be prepared.

The No Action Alternative would result in no direct impacts to other wildlife species.

5.5.8 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 are listed in Section 3.10.4 and Table 3-125 of the DEIS.

Adverse short-term impacts on non-listed fish and wildlife are possible due to water level drawdown during project construction, material disposal, and during coffer dam installation/removal and operation. Impacts to fish and wildlife could result from water quality effects such as increased temperature, turbidity, and pH, and reduced DO. Synergistic effects of water quality degradation could result in blooms of cyanobacteria that may become harmful to fish,

other wildlife and pets. With mitigation measures such as close monitoring and corrective actions, impacts are expected to be less than significant.

Waste granitic material placed on Engineers Point would be under water and suitable for fish habitat between approximately 1% and 75% of the time, with the majority of the waste material being suitable for fish habitat more than 50% of the time. In addition, the proposed fill material placed below OHWM would consist of larger granitic rock material, and would have only minor short-term adverse impacts and potential long-term benefits to fisheries as shelter and oxygen generation from wave action. Therefore, a mitigation ratio of less than 1:1 for compensatory mitigation is appropriate to mitigate for losses to fish habitat function of the Isabella Reservoir. Because the areas to be filled would provide suitable fish habitat for at least 50% of the time, compensation for the loss of functions of the Isabella Reservoir related to the fish habitat is not required.

In order to mitigate for the anticipated permanent loss of 0.33 acres of wetlands resulting from project feature construction, the Corps would purchase appropriate acreage compensation off-site at a wetland mitigation bank approved by the USFWS before completion of project. 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 the anticipated loss of the 0.33 acres of wetland habitat.

Under the No Action Alternative there would be no construction-related loss, degradation, or fragmentation of aquatic ecosystem habitat function and related impacts on aquatic organisms. Ongoing impacts on biological resources associated with normal operations would continue. The No Action Alternative would not reduce the likelihood of dam failure that could result in catastrophic impacts on lake and downstream aquatic resources and habitats. These impacts are considered adverse and significant.

5.6 PROPOSED DISPOSAL SITE DETERMINATIONS

5.6.1 Mixing Zone Size Determination

The proposed project would involve placement of fill material below the OHWM of Isabella Lake, which would be comprised of rock material from the excavation of the Emergency Spillway. Some placement may be conducted within open waters of Lake Isabella.

Because the fill material would be native, and appropriate BMPs, including silt fencing and/or silt curtains would be implemented the impacts to the mixing zone size would be minimal.

The No Action Alternative would result in no impacts to the mixing zone.

5.6.2 Determination of Compliance with Applicable Water Quality Standards

The fill and rock disposal 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 Preferred Alternative would not affect existing or potential drinking water supplies, nor would the No Action Alternative.

5.6.3 Potential Effects on Human Use Characteristics

Municipal and Private Water Supplies

The fill and rock disposal 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. Any materials removed for disposal off-site would be disposed of in an appropriate landfill or other upland area.

The Preferred Alternative would not affect existing or potential municipal and private water supplies, nor would the No Action Alternative.

Recreation

Information on recreation at Isabella Lake was taken from Section 3.12 of the DEIS.

Twenty-six areas in the immediate vicinity of the proposed project are developed for recreation. Developed facilities at these areas are provided by the USFS, BLM, Kern County Parks and Recreation, the California Department of Boating and Waterways, and the California Wildlife Conservation Board. These areas provide opportunities for picnicking, camping, boat-launching, swimming, marina concessions, a visitor's center, public access, parking and hiking, cycling, and

horseback riding. Currently, private concessionaires include a camping concessionaire for USFS, three marinas, and five outfitter guides.

Recreation at Isabella Lake includes a variety of water- and land-based activities, including picnicking, camping, lake boating and whitewater boating, swimming, fishing, hiking, off-road motorcycling, hunting, sightseeing, mountain biking, road cycling and horseback riding. Most water-oriented visitor use originates at permanent and portable facilities developed along the western shore of the North Fork area and the southern shore of the South Fork area, where the water surface is relatively accessible at all lake stages due to the ability of the marine docks to adjust to the lake level. These areas have been developed to respond to the large annual fluctuations in lake level elevation, which cause extensive drawdown areas to be exposed at the upstream portions of the South Fork and North Fork arms. Recreation along the remainder of the lakeshore takes place primarily at high lake stages. Portable restroom facilities are provided at several sites along lakeshore, and several unimproved areas are frequently used. Windsurfing, kite boarding, and parasailing take place in the open areas on the South Fork, such as Auxiliary Dam and Old Isabella.

Implementation of the Preferred Alternative would require closing of the popular Auxiliary Dam Recreation Area and Launch 19, and substantially limiting access to Engineers Point for the duration of the multi-year construction period. Measures to mitigate for these closures would be developed as part of a *Recreation and Fisheries Mitigation Plan* that the Corps would undertake and complete with local input well before construction begins. The development and implementation of this Plan would reduce potential adverse impacts on recreation to less-than-significant levels.

Also, this alternative includes lowering the maximum lake elevation to 2,543.76 feet NAVD 88 (74,802 acre-feet) for a period of up to four months during fall-winter 2020, to allow time to tie in the relocated canal and tunnel-conduit into the existing canal upstream of the Auxiliary Dam and for the demolition of the existing Borel Canal between the new upstream tie-in and the Auxiliary Dam. Scheduling these actions during fall-winter would take advantage of the naturally occurring lower lake levels, and would be outside the summer high recreation season on the lake. Therefore, this lowered lake elevation during fall-winter would have a minor adverse impact on water–based recreation and land-based recreation and camping during the construction period.

Under the No Action Alternative, there would be no changes in water-related recreation or recreation opportunities around the dams related to construction. The No Action Alternative would

not reduce the risk of dam failure that could result in significant impacts on recreation upstream and downstream of Isabella Lake. Without dam remediation, both dams have a high risk of failure under normal conditions and in the event of a disturbance such as an earthquake or large flood. This would result in significant adverse impacts.

Aesthetics

Implementing the Preferred Alternative requires the construction of remediation structures and associated support actions that would create noticeable changes to visual features in the project area. Most of these aesthetic impacts would be temporary, and would mainly affect only those that live adjacent to the reservoir and visitors. Because these impacts would be temporary and the site already consists of man-made structures, and with implementation of the BMPs and recommended mitigation measures summarized in Section 3.13.4 of the DEIS, short-term visual impacts would be considered moderate, and less-than significant.

Use of Engineers Point as a material disposal area would permanently alter the existing contours and visual character of this feature. In the long-term, material placed on Engineers Point would be configured to enhance recreational uses and be aesthetically pleasing. In addition, placement of fill on Engineers Point would be intended to return to original contours before it was used as a borrow site for the Main Dam construction. Therefore, long-term aesthetic impacts resulting from changes in visual features to Engineers Point are anticipated to be beneficial and less than significant. The No Action Alternative would not alter the aesthetics and therefore would have no impacts. No new construction of facilities would occur. However, the likelihood of dam failure would not be reduced and the potential catastrophic loss of one or both dams would significantly alter the visual landscape of the Isabella Lake basin, as well as the San Joaquin Valley due to major downstream flooding of the areas between Isabella Lake and Bakersfield.

5.7 DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

The potential cumulative impacts from implementation of the Preferred Alternative, when considered with other relevant actions in the general vicinity of Isabella Lake, have been assessed and are discussed in Chapter 4 of the DEIS.

Because some of the other planned actions in the Isabella Lake area described in Section 4.3 of the DEIS would involve construction, minor adverse cumulative aquatic resources impacts in the

region could occur. Construction would cause surface disturbances by removing vegetation cover, displacing and compacting soils, and altering soil structure and chemistry. The result is exposed and denuded surfaces that increase runoff rates and erosion and deliver sediment and contaminants to nearby waterways. Sedimentation in waterways can cause changes in water chemistry, as well as geomorphic adjustments that could have negative impacts on stream function. The expectation is that the cumulative actions would not violate water quality standards and that the Corps would obtain the necessary permits and licenses and would prepare and implement the necessary management plans, BMPs, and stipulations intended to minimize adverse construction impacts on water resources. Consequently, adverse impacts on aquatic resources are anticipated to be minor and would be limited to the construction periods.

It can be expected that there would continue to be an expansion of local and regional communities, which could increase the domestic or agricultural demand for water. The expansion of developed land would result in the loss of vegetation and the altering of soil and ground surface properties. Corresponding impacts on aquatic resources are similar to those described above for construction. However, these impacts would be more permanent, because areas would be developed and would not be temporarily altered by construction. Also, an increase in the domestic or agricultural demand for water could reduce surface or groundwater supplies.

Because the potential impacts on vegetation, soil, and water supplies from implementing the Preferred Alternative would be temporary, the Preferred Alternative is expected to make a minor contribution to long-term cumulative adverse impacts on water quality and quantity.

5.8 DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

Secondary effects (or impacts) are “effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material” (40 CFR 230.11(h)(1)). Therefore, secondary effects are limited to other actions in the aquatic environment that are indirectly related to implementation of the action, such as erosion or downstream sedimentation, or compensatory mitigation.

Implementation of the Preferred Alternative could result in the potential secondary impacts such as the unintentional placement of fill material outside of the proposed project area, and an increase in contaminants from construction vehicles and equipment. These actions could result in additional

adverse impacts to water quality, erosion and accretion patterns, aquatic and other wildlife habitat, recreation, aesthetics and air quality. To help minimize impacts associated with the placement of fill material outside the proposed project area, the Corps could add a special contract condition requiring 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.

CHAPTER 6.
FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

6.1 ADAPTATION OF THE SECTION 404(B)(1) GUIDANCE TO THIS EVALUATION

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

6.2 EVALUATION OF AVAILABILITY OF PRACTICABLE ALTERNATIVES TO THE PROPOSED DISCHARGE SITE WHICH WOULD HAVE LESS IMPACT ON THE AQUATIC ECOSYSTEM

No practicable alternative exists which meets the study objectives that does not involve discharge of fill and rock materials into waters of the U.S. On the basis of this evaluation, Alternative Plan 4 (Preferred Alternative) has been identified as the LEPDA as described in this document, and in the Isabella Lake Dam Safety Modification Project DEIS (released March 2012) and FEIS (released October 2012).

6.3 COMPLIANCE WITH APPLICABLE STATE WATER QUALITY STANDARDS AND COMPLIANCE WITH APPLICABLE TOXIC EFFLUENT STANDARD OR PROHIBITION UNDER SECTION 307 OF THE CLEAN WATER ACT

The discharges of fill and rock materials would 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 would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

6.4 COMPLIANCE WITH ENDANGERED SPECIES ACT (ESA) OF 1973

The placement of fill and rock materials in the project area would 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.

6.5 EVALUATION OF EXTENT OF DEGRADATION OF THE WATERS OF THE UNITED STATES – SIGNIFICANT ADVERSE EFFECTS ON HUMAN HEALTH AND WELFARE

The placement of fill and rock materials would 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 would not be adversely affected. No significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values would occur.

6.6 APPROPRIATE AND PRACTICABLE STEPS TAKEN TO MINIMIZE POTENTIAL ADVERSE IMPACTS OF EXCAVATION AND DISCHARGE ON THE AQUATIC SYSTEM

Appropriate steps to minimize potential adverse impacts of the discharge on aquatic systems would be implemented.

On the basis of the guidelines, the proposed disposal site for the discharge of fill and rock materials 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.

CHAPTER 7.
REFERENCES

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APPENDIX C

BIOLOGICAL REPORTS

FISH AND WILDLIFE COORDINATION ACT REPORT (CAR)

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-0079

OCT 10 2012

Alicia E. Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95825-2922

Dear Ms. Kirchner:

The U.S. Army Corps of Engineers has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the Lake Isabella Dam Safety Modification Project. The proposed dam modifications would occur at Lake Isabella, in Kern County, California. The enclosed report constitutes the U.S. Fish and Wildlife Service's final FWCA report for the proposed project.

If you have any questions regarding this report, please contact Harry Kahler at (916) 414-6612.

Sincerely,

Daniel Welsh
Assistant Field Supervisor

Enclosure

cc:
Mitchell Stewart, COE, Sacramento, CA
Marci Jackson, COE, Sacramento, CA
Regional Manager, CDFG, Fresno, CA
Central Valley Flood Protection Board, Sacramento, CA

FISH AND WILDLIFE COORDINATION ACT REPORT
LAKE ISABELLA DAM SAFETY MODIFICATION PROJECT
October 2012

This is the Fish and Wildlife Service's (Service) Fish and Wildlife Coordination Act report on the effects of the proposed Lake Isabella Dam Safety Modification (Lake Isabella DSM) Project 40 miles northeast of Bakersfield, 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

Lake Isabella Dam was placed into operation in 1953, but is currently unable to hold the amount of water for which it was authorized due to an interim risk reduction measure (IRRM) reducing the lake elevation from the authorized gross pool of 2605.5 feet to 2585.5 feet. Investigations and analysis of the Auxiliary and Main Dam deficiencies were culminated with the release of the October 2009 report entitled "Potential Failure Mode Assessment - Isabella Main and Auxiliary Dams." Based on current engineering knowledge, U.S. Army Corps of Engineers (Corps) determined that the Lake Isabella Main Dam, Spillway, and Auxiliary Dam have a high risk of failure due to significant seismic, seepage, and hydrologic issues. The project likely has the highest annualized life loss risk of any dam in the Corps' nationwide inventory, and has considerable public and congressional interest. The Corps has determined remediation of the dam's safety deficiencies is necessary.

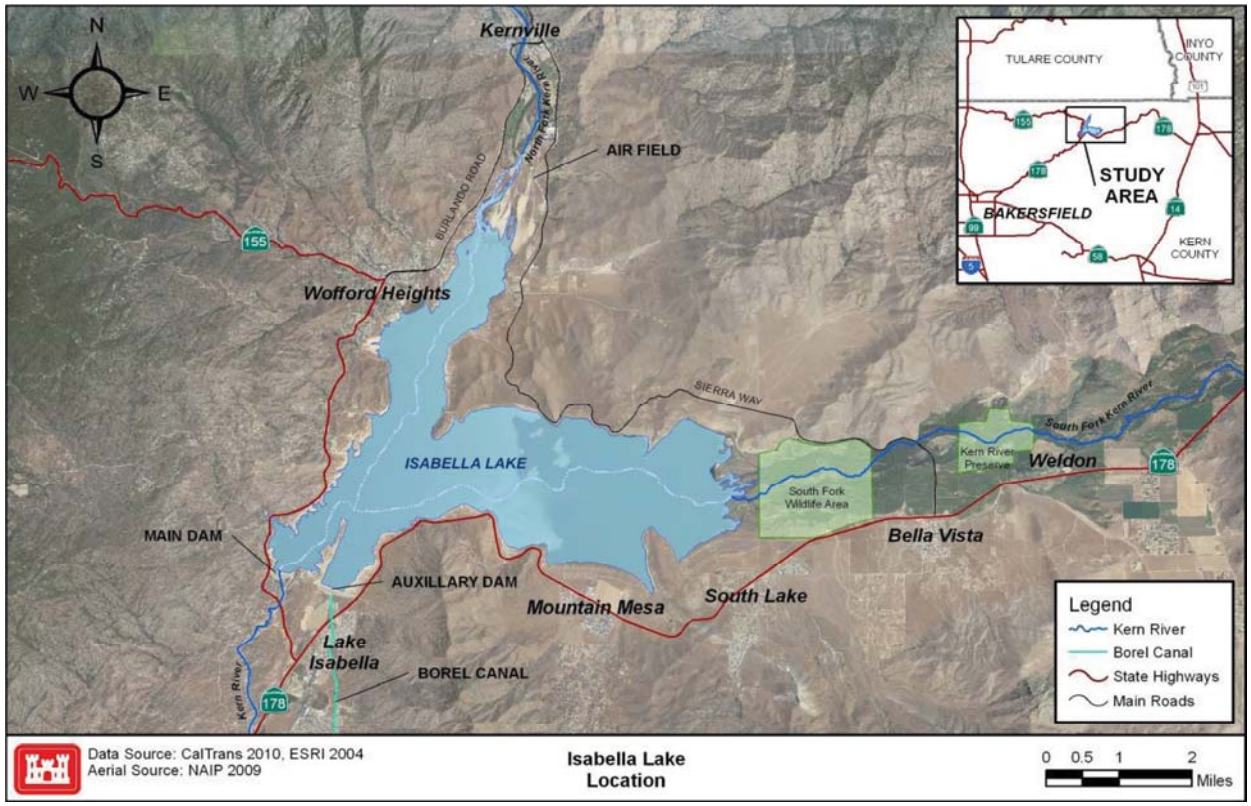

Figure 1: Map of the Lake Isabella Area

PROJECT DESCRIPTION

Lake Isabella is located between the towns of Kernville and Lake Isabella in Kern County, California, northeast of Bakersfield. The remediation options being investigated by the Corps are listed below. The Corp's preferred alternative is Alternative Plan 4, which we evaluated in detail in this report.

ALTERNATIVES EVALUATED

No Action Alternative

Under the No Action Alternative, there would be no Federal participation in remedial improvements to the Lake Isabella Main Dam, Spillway, or Auxiliary Dam. Lake Isabella Dam would continue to be operated in accordance with the established Water Control Plan and Flood Control Diagram. In accordance with Draft Engineering Regulations, the lake capacity (gross pool elevation) would be returned to, and the dam would be operated at, the pre-Interim Risk Reduction Measures (IRRM) elevation of 2,605.5 feet. However, under the No Action Alternative, the Corps believes one or both dams would be almost certain to fail under normal operations in the near-term without intervention. The potential environmental, economic, and human consequences of a dam failure would be extremely high.

Making the IRRM Permanent

A seepage study conducted in 2005-2006 by the Corps found that the Auxiliary Dam was being subjected to higher foundation pressures than originally believed from earlier studies, and the study concluded that the pressures in the foundation had reached levels that could lead to potential dam safety concerns. Therefore, an emergency deviation from the water control plan was implemented on April 27, 2006, to reduce the foundation pressures and provide an acceptable factor of safety. The deviation consisted of reducing the previous lake capacity (gross pool level) from 2,609.26 feet (NAVD88) to a restricted elevation not to exceed 2,589.26 feet (NAVD88) during the flood-control off-season, from April through September of each year, as an IRRM until a more permanent solution could be implemented. This restricted elevation reduced the maximum storage capacity of the lake by 37 percent.

In addition to the restricted elevation, the IRRM included the following measures, still in effect:

- New inundation map and evacuation plan for the downstream affected area;
- Additional dam safety training to applicable personnel;
- Increased inspection and monitoring of the dams;
- Installation and operation of early warning sirens;
- Installation and use of remote-control cameras;
- Improved communications;
- Increased emergency response equipment and supplies; and
- Frequent and ongoing communication with the public.

Under this alternative, the current IRRM restricted elevation of 2,589.26 feet or some variant would be maintained as the permanent gross pool level of Lake Isabella, and the other measures listed above would be continued for the foreseeable future. The gross pool elevations of Lake

Isabella recorded between 1955 and 2006 indicate that on average the lake elevation reaches or is higher than the restricted level about 1 out of 3 years. With the IRRM made permanent, the same operational conditions in effect since 2006, dam operation would control the level of Lake Isabella so as not to exceed the restricted level in any year.

Alternative Base Plan

Under this alternative, only deficiencies that are potentially life-threatening and would likely result in catastrophic failure of the dams during a large seismic or extreme storm event would be remediated against. This alternative represents the minimal risk management plan that would still provide an adequate level of safety for the project. All remediation measures under this alternative would be completed to modern construction and design standards. The remediation measures planned for each structure under this Alternative Base Plan are described in the following paragraphs.

Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the Probable Maximum Flood (PMF)). Under the Alternative Base Plan, the Main Dam would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

- Constructing a filter and drain near the crest of the dam to help protect from potential settlement cracking during a seismic event.
- Retaining the existing bifurcated outlet structure and the privately owned power generating station downstream of the Main Dam.
- Constructing a 4-foot crest raise, and replacing the core near the crest, to be able to safely pass an extreme flood event without overtopping.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the filter and drain near the crest of the Main Dam would come from two proposed "borrow" sources. One source would be the Auxiliary Dam Recreation Area which is on-site, and, if needed, an off-site source that would be in the South Fork Kern River delta just downstream of the South Fork Wildlife Area. The concrete needed for the Main Dam remediation measures would be supplied by a ready-mix plant located in the South Lake area along State Route (SR) 178.

Existing Spillway

Included in this alternative would be remediation of the deficiencies identified for the existing spillway. The remediations include: (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of rock anchors along the right wall to increase seismic stability; and (c) construction of a 4-foot high retaining wall added to the crest along the right wall (closest to the Main Dam) to protect

against potential erosion of the Main Dam during high outflows. The concrete needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along SR 178.

Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass extreme storm events (such as the PMF). Therefore, this alternative includes the construction of a new "Emergency Spillway" that will be located about 100 feet east of the existing spillway. The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of the dams.

This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2,620.76 feet (11.5 feet higher than existing spillway) for outflows associated with storm events greater than a 1-in-400-year frequency. Outflows associated with more frequent storm events would be handled by the existing spillway. The new spillway would have a labyrinth type weir with four v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. It is anticipated that a *Controlled Blasting Management Plan* would be developed by the Corps or the designated contractor prior to the start of construction.

It is anticipated that excavated materials from the proposed Emergency Spillway channel would be used as the main borrow material source to construct the modification features in the Alternative Base Plan. The excavated materials would be crushed, screened, and washed as needed to generate the various sands, gravels and rock required. The materials produced in the crushing operation would be stockpiled on-site in the vicinity of the Emergency Spillway and delivered to the appropriate construction areas as needed. The concrete needed to construct the baffles and apron of the Labyrinth Weir would be supplied from the ready-mix plant located in the South Lake area along SR 178.

Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose a high risk of potential failure of the dam. Under the Alternative Base Plan, the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities:

- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.

- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Constructing a 4-foot crest raise to be able to safely pass an extreme storm event without overtopping.
- Constructing a rock fill berm on the upstream side, to increase seismic stability of the dam.

The majority of the rock materials needed to complete the downstream buttress and upstream berm on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam would come from one or both of the proposed borrow sources: the Auxiliary Dam Recreation Area and/or the South Fork Kern River delta area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on SR 178.

Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam. The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal, which has the first water rights to the flows out of the North Fork Kern River. Since the early 1900s, the canal has been supplying water to the Southern California Edison (SCE) power plant approximately 6 miles downstream of the Auxiliary Dam. The SCE has an agreement with the Corps to receive the first 605 cubic feet per second of the North Fork Kern River flows into Isabella Lake through the Borel Canal.

Under the Alternative Base Plan the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement 12- foot diameter Borel Canal alignment would be constructed through the right abutment of the Auxiliary Dam. The new tunnel would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal (Figure 2).

The rock materials needed to complete the new tunnel, portals, and connections would come from the excavation of the tunnel and proposed Emergency Spillway. The concrete needed for the upstream portal, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix plant on SR 178.

Also with this alternative, a temporary rock-fill coffer dam would be required upstream of the Auxiliary Dam in the area where the right abutment joins Engineers Point. This temporary coffer dam would be required in order to sufficiently dewater the area needed for construction of the upstream portal of the new tunnel. The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. After the construction of the upstream portal and tie-in to the existing canal in the reservoir is complete, the temporary coffer dam would be removed and the materials would be used to construct the proposed upstream berm on the Auxiliary Dam.

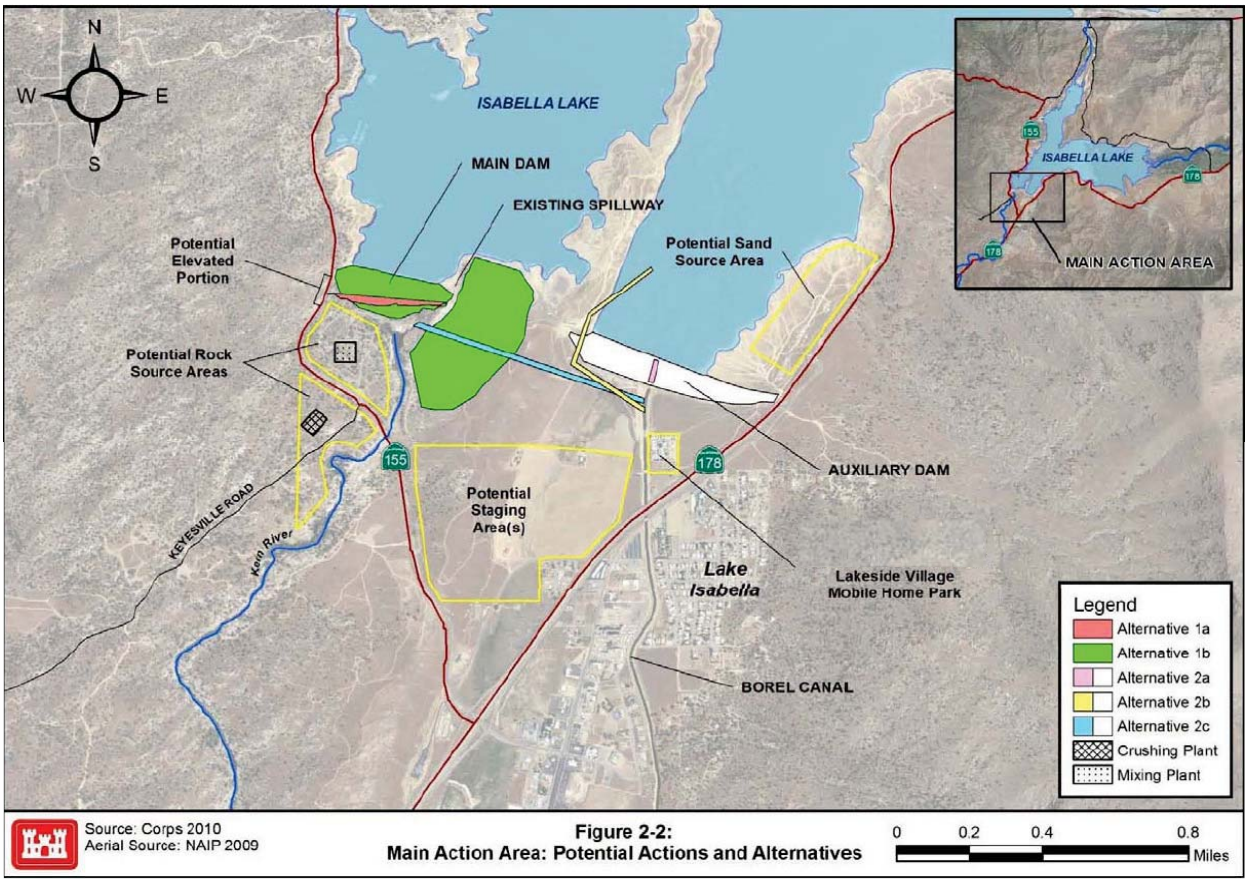

Figure 2: Map of Potential Main Dam and Auxiliary Dam/Borel Canal Alternatives

Alternative Plan 1

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under the Alternative Base Plan would be included, plus additional remediation measures identified for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Constructing a full-height filter and drain (rather than a filter only near the crest as is described under the Alternative Base Plan) on the downstream slope of the dam to further protect the structure from potential settlement cracking and seepage during and following a seismic event.
- Constructing a toe filter/drain system to capture and collect seepage.
- Constructing a Roller-Compacted Concrete (RCC) Overlay on the center portion of the Main Dam to provide an additional emergency spillway to control any overtopping of the dam from a very large and extremely rare storm event (such as the PMF). The RCC overlay would be constructed over the full-height filter and drain on the downstream face of the dam.

The 800-foot wide RCC Overlay would be constructed from the toe up in 2-foot sections (or rises), and would likely incorporate a 10-foot high fuse plug at the top of the overlay, at the same level as the Main Dam crest. The concrete would be placed using a concrete pump with a concrete mixture of fine and coarse aggregates and water from on-site sources (e.g., the two sand

borrow areas, Emergency Spillway excavation, and lake), with cement and fly ash from sources near Barstow, California. The needed concrete would be prepared in a temporary (and portable) on-site Batch Plant set up in the Emergency Spillway excavation area. The approximate quantity of RCC concrete required would be 125,000 cubic yards.

Alternative Plan 2

Under this alternative, all of the deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures for the Auxiliary Dam. These additional remediation measures for the Auxiliary Dam would include the following:

- Adding a larger downstream buttress to the dam (top width of 100 feet, instead of 80 feet as under Alternative Base Plan and Alternative Plan 1), and a more extensive filter and drain system than was proposed for the Alternative Base Plan and Alternative Plan 1, to improve fault rupture, seismic stability, and seepage control.
- Providing a complete in-situ treatment of the deeper alluvial soil foundation (instead of only shallow treatment as under Alternative Base Plan and Alternative Plan 1) under the downstream slope with a bentonite and concrete slurry to further insure stability of the dam during a seismic event.

The additional rock materials needed to complete the larger downstream buttress on the Auxiliary Dam would come from the excavation of the Emergency Spillway. The sand material required to construct the larger filter on the downstream slope of the Auxiliary Dam would come from the two borrow sources (if enough material is not generated from the Emergency Spillway): Auxiliary Dam Recreation Area and South Fork Kern River delta area. The concrete and bentonite needed for the additional Auxiliary Dam remediation measures, such as the deep in-situ soil treatment would be supplied from the ready-mix plant on SR 178, and from a plant in the Barstow area, respectively.

Alternative Plan 3

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under Alternative Plan 2 would be included, plus additional remediation measures for the Main Dam. The additional remediation measures for the Main Dam would include the following:

- Adding a steel lining to the Main Dam Control Tower to better withstand an extreme seismic loading.
- Adding concrete fill to the downstream side of the Main Dam Exit Portal Structure to increase seismic stability.

Also under this alternative, instead of relocating the Borel Canal conduit through the right abutment of the Auxiliary Dam (as is the case for the Alternative Base Plan and Alternative Plans 1, 2 and 4), a new Borel Canal conduit would be constructed. This conduit would connect a new trifurcated structure (currently bifurcated) at the Main Dam outlet works to the existing Borel Canal alignment downstream of the Auxiliary Dam (Figure 2). The conduit would connect via a 10-foot diameter tunnel passing under the existing and proposed spillways. The existing Borel Canal conduit through the Auxiliary Dam would be deactivated, sealed and abandoned.

The existing Borel Canal upstream of the Auxiliary Dam would no longer be needed for water delivery and the existing canal that traverses Isabella Lake would be removed.

Since this alternative does not require an upstream connection to the Borel Canal, the construction of a temporary coffer dam is not needed.

The rock materials needed to complete the new tunnel-conduit and connections from the Main Dam outlet would come from the tunnel excavation and/or the excavation of the Emergency Spillway. The concrete needed for the trifurcated structure at the Main Dam Outlet, the tunnel lining, and the downstream portal and connection to the existing Borel Canal would be supplied from the ready-mix concrete plant on SR 178.

Alternative Plan 4

This alternative is the preferred alternative and has been modified from the March 2012 Draft Environmental Impact Statement. Modifications reflect eliminating the South Fork delta area as a secondary sand borrow site, and utilizing a smaller coffer dam for the new Borel Canal conduit.

Under this alternative, all of the seismic, hydrologic, and seepage deficiencies remediated under Alternative Plan 1 would be included, plus additional remediation measures for the Main Dam, Existing and Emergency Spillways, and the Auxiliary Dam. In order to accommodate the increased crest raises detailed in Alternative Plan 4, a realignment of SR 178 and SR 155 is detailed. The remediation measures planned for each structure under this alternative are described in the following paragraphs and shown in Figure 3.

Main Dam

- Constructing an approximate 16-foot crest raise (instead of 4-foot in the Base Alternative Plan).
- Raise the Main Dam control tower and access to the existing facility 16-feet to match the increased dam crest elevation. Access to the raised tower would be provided by retaining walls and backfill material of the Main Dam.
- With Alternative Plan 4, the RCC overlay that is described in Alternative Plan 1 would not be constructed.

The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the full height filter and drain of the Main Dam would come from the excavation of the proposed Emergency Spillway and the Auxiliary Dam Recreation Area (if sufficient material is not able to be produced from the Emergency Spillway excavation).

Existing Spillway

- Addition of anchors along the ogee crest (as well as the anchors along the right wall), for additional head during operation and to increase seismic stability.

- Construction of an approximate 16-foot high retaining wall (instead of 4-feet) added to the crest along the right and left walls to protect against potential erosion of the Main Dam during high outflows and to accommodate the crest raise.

The concrete needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along Hwy 178.

Emergency Spillway

- The 900-feet-wide Emergency Spillway would begin to function around elevation 2,637.26 feet (instead of the 2,620.76 in the Alternative Base Plan because of the 16-foot crest raise), which is 28.0 feet higher than the existing spillway. The annual probability of the reservoir rising to the elevation that the Emergency Spillway would operate is approximately 1-in-4,700.
- The labyrinth type weir would have numerous v-shaped concrete baffles (instead of just 4 outlined in the Alternative Base Plan) and a concrete apron.

It is anticipated that excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source to construct the modification features for Alternative Plan 4. The excavated materials likely would be crushed, screened and washed as needed to generate the various sands, gravels and rock required and either temporarily stockpiled or placed directly into permanent construction. The processing operation would likely be located at approved onsite location, likely in vicinity of the proposed Emergency Spillway and adjacent to the Auxiliary Dam. Any excess material will be disposed of on Engineers Point or at the upstream toe of the Auxiliary Dam.

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be produced by a batch plant set up on site in the vicinity of the Emergency Spillway. Cement and flyash would come from an off-site source.

Auxiliary Dam

- Constructing an approximate 16-foot crest raise (instead of just a 4-foot raise as outlined in the Alternative Base Plan).
- Construction of the rock fill berm on the upstream side may not be needed. If it is decided the berm would be beneficial to the project, it will be constructed as outline in the Alternative Base Plan.

The majority of the rock materials needed to complete the downstream buttress and upstream berm on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation (crushed to size) but if necessary, it could come from the Auxiliary Dam Recreation Area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on SR 178.

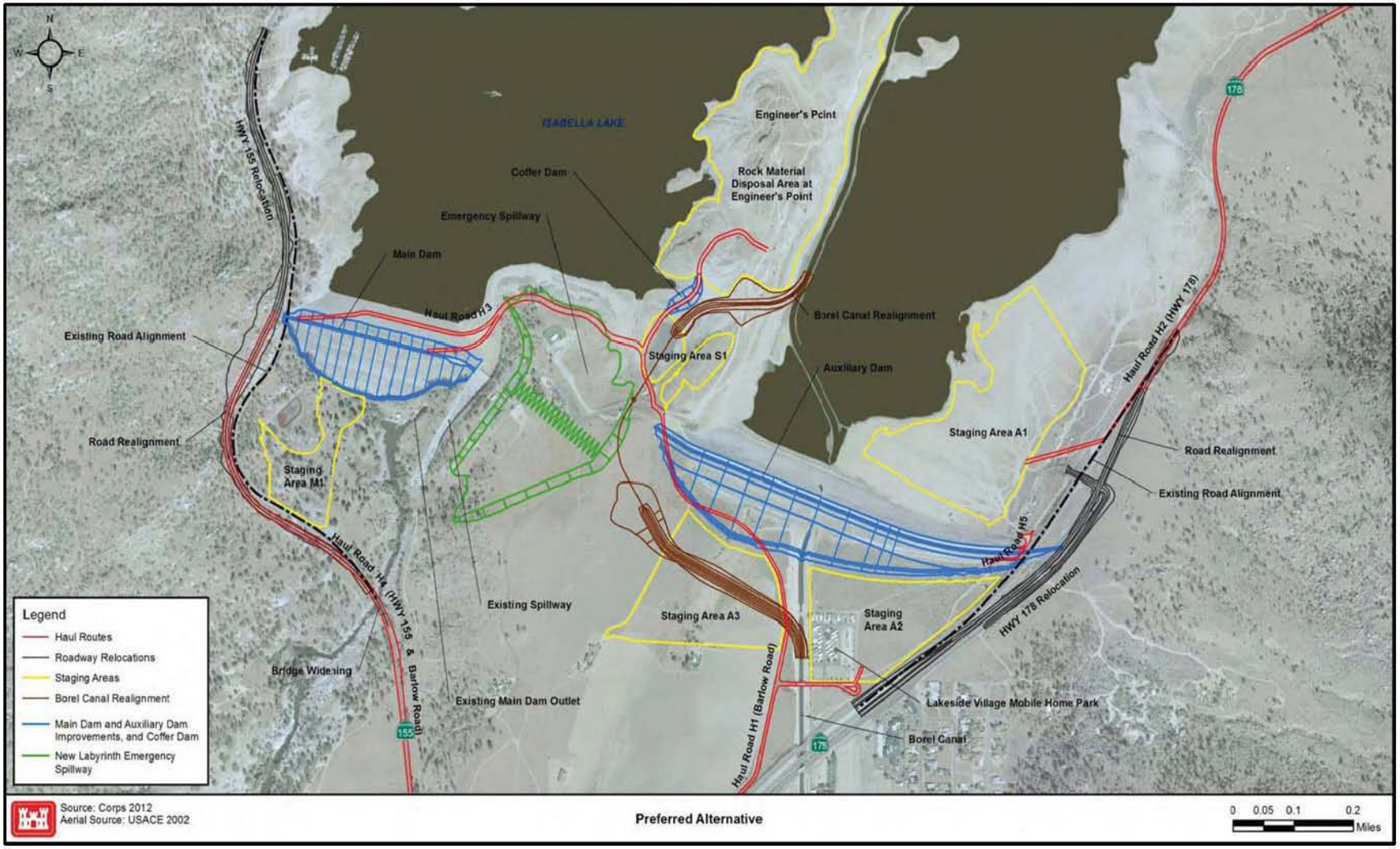

Figure 3: Map of Alternative 4 Site Plan

Borel Canal

Under this alternative, all of the deficiencies remediated under the Alternative Base Plan would be included. There are no additional modifications added to Alternative Plan 4, but there is two water delivery options outlined. One option would be to continue to utilize the upstream canal in the reservoir during periods of low reservoir elevation. Another option would tie into the main branch of the reservoir and eliminate the use of the upstream canal. This option would eliminate the operation and maintenance responsibilities from the Corps associated with the upstream canal. However, this option would require a re-negotiation of the existing contract between the Corps and Southern California Edison. The Final EIS assumes that the first option that utilizes the upstream canal will be selected until a renegotiation of the contract is completed.

Realignment of State Route 178

SR 178 would be realigned to the south of the Auxiliary Dam to accommodate the 16-foot raise on the left abutment. The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 mile east of SR 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet south of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet east of the present Lake Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location.

Realignment of State Route 155

SR 155 would also be modified to accommodate the 16-foot raise on the right abutment of the Main Dam. Two alternatives are currently being considered for SR 155. The first option would include realigning SR 155 to the west of the Main Dam. The realignment would begin upstream of the Main Dam and would shift to the west, but parallel to the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately l.1 miles. The maximum shift of the alignment would be about 120 feet to the west. The realignment would require a modification and widening of the existing bridge across the Kern River to stay within Caltrans standard requirements. The realignment would also include an uphill passing lane.

The second option for SR 155 would not include realignment of the highway and would not change the grade and elevation of the roadway over the right abutment of the Main Dam. The second option would include a flood gate on the right abutment near the existing centerline of the Main Dam. The flood gate would be used to close off the low point for extreme flood events and would prevent travel on SR 155 for those rare events. The gate structure would include a concrete gravity retaining wall adjacent to the Main Dam and a concrete support wall near the existing rock face cut. The gate would either consist of a permanent swing gate or a gate that would be stored on the abutment and erected when needed. Access to this gate during extreme flood events may be limited, which could have a significant impact on the reliable operation of the gate.

Currently, the preferred option for modifying Highway 155 is the realignment option. However, if during the engineering design phase of the project it is determined that another option for modifying Highway 155 is preferred, supplemental NEPA documentation would be prepared as necessary.

BIOLOGICAL RESOURCES

The North and South Forks of the Kern River flow through the project area, are impounded by Lake Isabella Dam, and are then released out of the Main Dam in one downstream channel. The project area contains valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub, riparian woodland, wetland, open water, and barren/ruderal cover-types, as well as developed areas. The proposed project area includes all Corps and United States Forest Service lands surrounding the reservoir and dams, including portions of the North and South Fork Kern River delta regions next to Lake Isabella, a reach of the lower Kern River immediately downstream of the Main Dam, and a portion of Hot Spring Valley immediately downstream of the Auxiliary Dam. Included in this area are private lands adjacent to Lake Isabella and the Kern River, and lands owned by the Bureau of Land Management, the California Department of Fish and Game, and Audubon California.

Vegetation

Lake Isabella hosts a great diversity of plant communities. This diversity is largely due to the convergence of four geographic regions: Sierra Nevada Mountains, Great Central Valley, Southwestern California, and Mojave Desert, with each providing unique physiographic and biologic characteristics (Hickman 1993). General plant communities in or near the project area are classified according to Sawyer et al. (2009) and include valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, agricultural lands, and open water (Figure 4).

Valley Grasslands

The valley grassland cover-type is dominated by red brome grass, Mediterranean grass, and Arabian schismus, along with other nonnative species growing in the herbaceous layer (Sawyer et al. 2009). Other species that are common include California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle. Emergent shrubs may be present at low cover. Herbs in this stand are usually less than 2.5 feet tall, and cover is intermittent to continuous (Sawyer et al. 2009).

The valley grassland cover-type is restricted to a small ridgeline between and downstream of the Main and Auxiliary Dams (refer to Figure 4). This area has been highly disturbed in the past by human activities, including cattle ranching and off-road vehicle use.

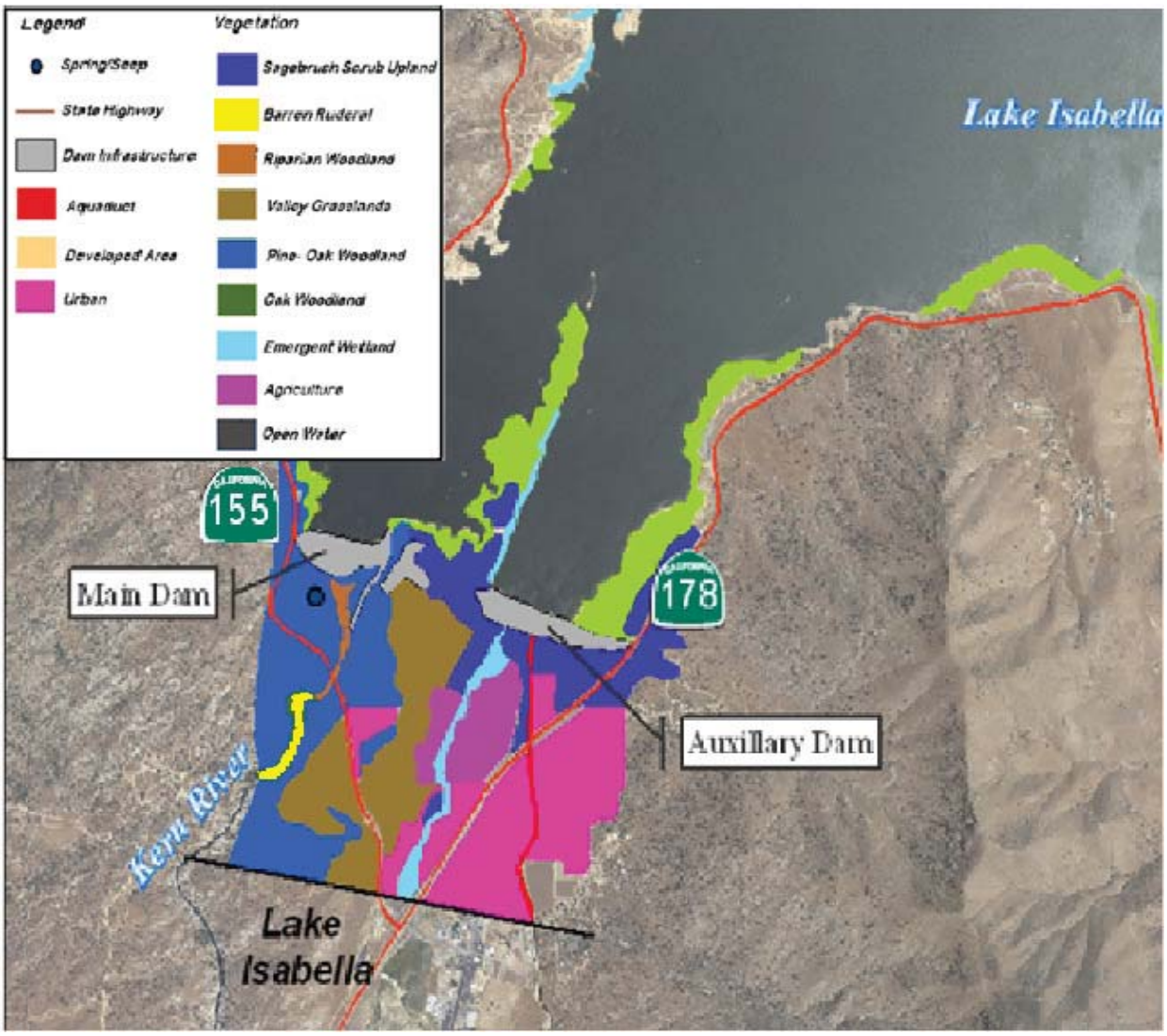

Figure 4: Vegetative Cover-Types in the Project Area

Oak Woodland

The oak woodland cover-type is dominated in the tree canopy by interior live oak, California buckeye, Pacific madrone, tan oak, gray pine, canyon live oak, blue oak, or California black oak (Sawyer et al. 2009). Tree canopy of the oak woodland area is usually less than 65 feet high and forms either intermittent or continuous cover in canyons or basins, or in open areas, a savanna-like canopy (Sawyer et al. 2009). The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover-type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained and is common throughout the Sierra Nevada foothills (Sawyer et al. 2009).

Oak woodland in the proposed project area is restricted to a thin patchy band on either side of the lower Kern River, downstream of the Main Dam and is abundant in one of the proposed borrow areas west of SR 155 (Figure 4). In the first area, clusters of interior live oaks grow, primarily with gray pine, immediately above the ordinary high-water elevation of the lower Kern River.

Buffered stream flows due to modulation by the Main and Auxiliary Dams (Pope et al. 2004), and the presence of well-drained soils and steep stream banks that abruptly transition to upland conditions all likely contribute to this cover-type becoming established so near the streambed. In the proposed borrow site, oak woodland is in an open area mixed with sagebrush-scrub and valley grassland vegetation.

Pine-Oak Woodland

The pine-oak woodland cover-type is dominated by gray pine with interior live oak, blue oak, canyon live oak, California buckeye, western juniper, and Coulter pine (Sawyer et al. 2009). Tree canopy is typically less than 65 feet high and is open to intermittent (Sawyer et al. 2009). Shrubs are common or infrequent and include a mix of such species as rubber rabbitbrush, black mustard, California buckwheat, Russian thistle, Mormon tea, California scrub oak, yerba santa, flatspine bur ragweed, chaparral yucca, and common mullen. The herbaceous layer is sparse or grassy and hosts species such as Italian rye grass, foxtail chess, and common fiddleneck. This cover-type is present on streamside terraces, valleys, slopes, and ridges where soils are shallow, often stony, infertile, moderately to excessively drained, and at elevations between 990 and 6,990 feet (Sawyer et al. 2009). This cover-type commonly occupies rough foothill slopes intermixed with stands of chaparral (Allen-Diaz et al. 2007; Sawyer 2007).

Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the Main Dam, in the Main Dam Campground. This patch has been partially altered by the establishment of the campground and the water discharge facility for the Main Dam. Construction of dam infrastructure, access roads, campsites, parking areas, and a small constructed reservoir have all diminished the extent of native habitat in this area. Human disturbance has allowed for the introduction and establishment of various invasive plant species. Planting of ornamental species, mainly Aleppo pine, has also reduced the quality of native habitat.

Sagebrush-Scrub Upland

The sagebrush-scrub upland cover-type is dominated by rubber rabbitbrush with other species, including big sagebrush, yellow rabbitbrush, Mormon tea, California buckwheat, western juniper, and antelope bitterbrush as well as emergent junipers or pine at low cover (Sawyer et al. 2009). The shrub canopy is typically less than 10 feet high and is open to continuous (Sawyer et al. 2009). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as several species of bromes, California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle (Sawyer and Keeler-Wolf 1995). This cover-type is found in all topographic settings, especially in disturbed settings. Soils are well-drained sand and gravel at elevations ranging between 0 and 10,500 feet (Sawyer et al. 2009). Locally, stands are usually associated with broad intermittent watercourses, road cuts, and other clearings.

As with the pine-oak woodland cover-type, sagebrush-scrub upland dominates much of the upland area surrounding Lake Isabella. However, in the proposed project area, it is found only in patches between the Main and Auxiliary Dams and in upland areas next to the Auxiliary Dam (refer to Figure 4). These areas are frequently disturbed by vehicles and machinery.

Riparian Woodland

The riparian woodland cover-type is dominated by Goodding's willow, Fremont cottonwood, and red willow. Also common in some areas are boxelder, California buckeye, incense cedar, western sycamore, Oregon ash, black walnut, white alder, arroyo willow, shining willow, Pacific willow, narrowleaf willow, yellow willow, and black elderberry (Sawyer et al. 2009). Tree canopy height is often greater than 100 feet and is open to continuous. Common shrubs include mule-fat, coyote brush, and redosier dogwood, which form an open to continuous layer (Sawyer et al. 2009). The herbaceous layer is variable and is often dominated by primary colonizers, such as rough cocklebur, stinging nettle, goosegrass, common rush, common knotweed, common plantain, and cress. The riparian woodland cover-type is usually present along terraces or large rivers, canyons, and rocky floodplains of small intermittent streams, seeps, and springs. Specific species composition is most likely determined by frequency and severity of disturbance by inundation (Sawyer et al. 2009).

The riparian woodland cover-type is common in the proposed project area along the North and South Fork of the Kern River and is distributed across recent floodplains and in areas subject to inundation. The broad floodplain along the South Fork Kern River region gently slopes up from Lake Isabella, causing it to be frequently inundated and creating conditions ideal for the riparian woodland cover-type. As a result, extensive stands are found throughout the riparian zone of the South Fork Wildlife Area, one of the most extensive riparian woodlands remaining in California (USFS 2010). The North Fork Kern River, although physically constrained by its location in a relatively incised floodplain in a narrow canyon, hosts linear distributions of the cover-type as well. Periodic inundation, particularly in the South Fork Wildlife Area, is thought to be necessary for the regeneration of Goodding's willow and long-term maintenance of the riparian forest in general. These characteristics function to maintain diverse species composition and forest structure essential for federally listed species, such as southwestern willow flycatcher and least Bell's vireo (Jones & Stokes 2003, 2004, 2006, 2008; Whitfield and Henneman 2009).

Emergent Wetland

The emergent wetland cover-type is found throughout the proposed project area in the North and South Fork Kern River delta areas, on gently sloping lake shorelines with available soil moisture, in natural springs, and in areas of seepage downstream of the dam. Herbaceous vegetation in these areas is primarily non-native and is mainly composed of rough cocklebur, goosegrass, common rush, stinging nettle, common knotweed, common plantain, and various cress species and are also present in these areas. Also present, though less prevalent in these areas, are other emergent marsh species such as Baltic rush, red willow, and western dock with patches of tamarisk and giant cane.

In the proposed project area the emergent wetland cover-type is found along the shore line of Engineers Point which is a potential borrow site and in an area downstream of Lake Isabella Auxiliary Dam that is thought to be fed by a spring or seep in the dam, which may be in the new dam footprint or used as a staging area.

Agricultural Lands

Agricultural lands are present downstream of the proposed project area and are characterized by planted crops and actively grazed lands. Little to no native vegetation is present on these sites although they are located adjacent to the emergent wetland areas. Plant species present in this area are unknown because the area occurs on private land and has not been surveyed, but from a distance appear to be predominantly nonnative grasses, with no shrub or tree cover.

Open Water

Open water habitat is present within the project area at Lake Isabella which averages about 11,000 surface acres when the dam is fully operational and is one of the largest reservoirs in California (USFS 2010). It is fringed mostly by sagebrush-scrub upland and, near the confluences with the North and South Forks of the Kern River, riparian woodland vegetation communities.

Wildlife

Lake Isabella and much of the Kern River are located in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the proposed project area and support extensive areas of riparian, open water, and wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub upland. Urban and rural lands also surround Lake Isabella. This diversity of habitats attracts a variety of wildlife species, including many residents and abundant migrants.

The extensive riparian areas found in the deltas of the North and South Fork Kern Rivers are the most substantial habitat for wildlife found in the proposed project area. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands. In particular, the South Fork Wildlife Area has been identified as one of the largest intact patches of riparian habitat remaining in California. It is estimated that over 300 species of birds use this area, with most being neotropical migrants that nest and forage during summer and overwinter in Central and South America (Audubon 2010). Common birds include passerines, such as warblers, kinglets, chickadees, thrushes, jays, hummingbirds, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. In addition, other common birds are woodpeckers, flycatchers, water birds, waders, and various raptors, such as owls, buteos, and smaller accipiters (Audubon 2010). Other wildlife common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley gartersnake (Audubon 2010). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

Various waterbirds are also present in association with Lake Isabella. Species that utilize the lake include migratory and resident waterfowl, American coot, grebes, cormorants, gulls, and waders (Audubon 2010).

Although limited upland areas fall within the proposed project area, this generalized habitat is ubiquitous in the area surrounding Lake Isabella. Most wildlife species in upland areas are

native and adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (Audubon 2010). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats.

Fish

The open water of Lake Isabella hosts a variety of aquatic species, although many are nonnative. A mixture of native and introduced fish species inhabit Lake Isabella and the Kern River and could occur in the proposed project area. Native species are Sacramento pikeminnow, Sacramento sucker, hardhead, and Kern River rainbow trout (SCE 1991). A variety of species have been introduced into the area to provide both food and sport fish. These are hatchery-reared rainbow trout, brown trout, carp, smallmouth bass, largemouth bass, white crappie, black crappie, bluegill, white catfish, channel catfish, and brown bullhead (SCE 1991). Threadfin shad were also introduced into Lake Isabella as a forage fish (Audubon 2010).

Endangered Species

The Lake Isabella DSM project is located within two United States Geological Survey 7.5-minute quadrangles (quads): Lake Isabella North; and Lake Isabella South. A list of federally listed species that have been identified within these quads, including candidate species for listing, is attached as Appendix A.

The Corps has completed a formal Section 7 consultation under the Endangered Species Act with the Service. A copy of the Service's biological opinion is attached as Appendix B. Measures to minimize the effect on the valley elderberry longhorn beetle include protecting four elderberry shrubs, ranging from 51 to 115 feet from the project construction footprint, with fencing and signage. Minimization measures also include transplanting five elderberry shrubs to the nearby Sprague Ranch portion of the Kern River Preserve. Additional elderberry and associated native seedlings also will be planted at the Sprague Ranch in accordance with the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle,* July 9, 1999. The California Department of Fish and Game should be contacted regarding State-listed species under the California Endangered Species Act.

FUTURE WITHOUT THE PROJECT

Vegetation- No significant change in woody or herbaceous vegetation is expected on the lands within the project areas. Vegetation around the dam is expected to be maintained as it is currently. Habitat types are expected to mature slightly over the life of the project (50 years) providing some improvement for species utilizing areas around the dams.

Wildlife- Since only minimal changes are expected in vegetation, wildlife populations in the study area are expected to persist as they are currently, with normal year-to-year fluctuations of individual species.

Fish- Future conditions are expected to remain the same for fish species. As with current conditions, populations would fluctuate, depending on the level of the lake variations in water temperature, rainfall, contaminants, and natural population cycles.

FUTURE WITH PROJECT

In this report, the Corp's preferred alternative is evaluated (Alternative Plane 4).

Vegetation- Construction of the project would result in the permanent loss of 75.65 acres of sagebrush-scrub upland, 31.02 acres of pine-oak woodland, 0.30 acre of emergent wetland, 13.56 acres of agricultural lands, and 17.85 acres of valley grasslands. These losses will be attributed to the increased footprint of the dam and its accompanying structures as well as the staging and haul routes necessary to complete construction.

Wildlife- The proposed construction activities would have permanent and temporary impacts on wildlife abundance in the immediate area of construction. The loss of pine-oak woodland, emergent wetland, and sagebrush-scrub upland will permanently reduce the utility of the habitats for some wildlife species.

Fish- The construction of the dam requires the lowering of the lake's water level of around 30 feet. This would likely cause the water temperature to rise in the lake increasing the likelihood of harmful algal blooms which could result in massive fish kills.

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

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

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

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

Six fish and/or wildlife habitats were identified in the project area that had potential for impacts from the project: valley grassland, pine-oak woodland, sagebrush-scrub upland, emergent wetland, open water, and agricultural lands. The resource categories, evaluation species, and mitigation planning goal for the habitats impacted by the project are summarized in Table 1.

The evaluation species for the valley grassland cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Valley grassland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species as well, which are an important food source for many raptors. This cover-type is limited to a small ridgeline between and downstream

[1] Note: Evaluation species used for Resource Category determinations may or may not be the same evaluation species used in a HEP application, if one is conducted.

Table 1. Resource categories, evaluation species, and mitigation planning goals for the habitats possibly impacted by the proposed Lake Isabella Dam Safety Modification Project Kern County, California.

COVER-TYPE	EVALUATION SPECIES	RESOURCE CATEGORY	MITIGATION GOAL
Valley Grassland	Raptor Guild	3	No net loss of habitat while minimizing loss of in-kind value.
Pine-Oak Woodland	Raptor Guild	2	No net loss of in-kind habitat value or acreage.
Sagebrush-Scrub upland	Breeding Birds	3	No net loss of habitat while minimizing loss of in-kind value.
Emergent Wetland	Amphibian Species	2	No net loss of in-kind habitat value or acreage.
Open Water	Sport Fish	4	Minimize loss of habitat value
Agricultural Lands	Raptor Guild	4	Minimize loss of habitat value

of the Main and Auxiliary Dams in areas which were impacted during construction of the dams. Therefore, the Service designates the valley grassland cover-type in the project area as Resource Category 3. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species chosen for the pine-oak woodland cover-type is breeding birds. Breeding birds were selected because of: (a) their ecological roles (prey, predator, scavenger, etc.), (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and, (c) their importance for nonconsumptive human uses (i.e., bird watching) , and, (d) this habitat provides required nesting, foraging, and cover habitat for many breeding bird species. Although pine-oak woodland dominates much of the upland area surrounding Lake Isabella, in the proposed project area, it is found only downstream of the Main Dam, in the Main Dam Campground in close proximity to the Kern River. Consequently, the pine-oak woodland areas within the project area have specific value in providing perch and nesting sites for birds in close proximity to valuable foraging. Therefore, the Service designates the pine-oak woodland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is "no net loss of habitat value while minimizing loss of in-kind habitat value."

The evaluation species for the sagebrush-scrub upland cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service's responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Sagebrush-scrub upland provides important forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species which are an important food source for many raptors. Although sagebrush-scrub upland dominates much of the area surrounding Lake Isabella, in the proposed project area, it is found only in patches between the Main and Auxiliary Dams and in upland areas next to the Auxiliary Dam, both of which were impacted during dam construction. Therefore, the Service designates the sagebrush-scrub upland cover-type in the project area as Resource Category 3. Our associated mitigation

planning goal for these areas is “no net loss of habitat value while minimizing loss of in-kind habitat value.”

The evaluation species chosen for the emergent wetland cover-type are amphibian species. Amphibians were selected because: (a) this habitat provides cover, forage, and breeding for amphibians, (b) amphibians have an important role as prey in the food chain for birds, fish, reptiles, and mammals, and (c) amphibians are very sensitive to changes in the environment and are therefore good indicators of environmental health. In general, emergent wetland habitat is valuable for a multitude of wildlife species, which include birds, mammals, reptiles, and amphibians. In the project area this cover-type is only located in a small area downstream of the Auxiliary Dam located near the new dam footprint. Due to its high value and relative scarcity, the Service designates the emergent wetland cover-type in the project area as Resource Category 2. Our associated mitigation planning goal for these areas is “no net loss of habitat value while minimizing loss of in-kind habitat value.”

The evaluation species chosen for the open water cover-type are freshwater sport fish. The open water habitat is comprised of Lake Isabella. These species were chosen because of their consumptive and recreational value to humans and their importance as a prey item for many species of raptors and wading birds. This area has been highly impacted by recreational activities and contains mostly hatchery reared sport fish. Therefore, the Service designates the open water cover-type as Resource Category 4. Our associated mitigation planning goal for these areas is “minimize loss of in-kind value.”

The evaluation species for the agricultural lands cover-type is the raptor guild which utilizes these areas for foraging. Raptors were selected because of: (a) their key role as predators in the ecosystem, (b) the Service’s responsibility for their protection and management under the Migratory Bird Treaty Act, and (c) their overall high non-consumptive value to humans (i.e., bird watching). Agricultural land provides forage, cover and breeding habitat for a number of small mammals, passerine birds, and reptile species as well, which are an important food source for many raptors. This cover-type is limited to a small area downstream of the Auxiliary Dam adjacent the emergent wetland areas and have been highly impacted by years of active farming and grazing. Therefore, the Service designates the agricultural lands cover-type in the project area as Resource Category 4. Our associated mitigation planning goal for these areas is “minimize loss of in-kind value.”

All action alternatives would require the lowering of the water level of Lake Isabella to a construction pool of 2,530 feet which could result in potential effects to the fish and wildlife species inhabiting the area. The lowering of the pool has, in the past, resulted in an increase in water temperature leading to harmful bacteria and algal blooms. These blooms could grow unchecked, deoxygenating the water and causing mass fish mortality as well as negative impacts to species feeding on the fish and drinking the water. Lake Isabella provides habitat for numerous species of birds, amphibians, and insects, as well as food and water resources for mammals and reptiles, all which could be negatively impacted by a harmful algal bloom.

The upstream habitat (delta areas), particularly on the South Fork Kern River, are highly valuable to numerous species including the federally endangered southwestern willow flycatcher and the yellow-billed cuckoo, a candidate species for listing under the Endangered Species Act. Due to the importance of these upstream areas, the Service suggests the Corps focus design on

alternatives which minimize to the extent possible the duration of inundation of the South Fork delta area and other upstream habitat.

Based on our initial review, the proposed project would result in the permanent loss of habitat acreage and value for species inhabiting valley grassland, pine-oak woodland, sagebrush-scrub upland, agricultural lands, and emergent wetland. Temporary losses of habitat value would occur for species utilizing valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, agricultural lands, emergent wetland, and open water habitat in proximity to both the Main and Auxiliary Dams at the proposed construction and staging areas. Wildlife species utilizing these areas would be displaced during construction activities and there would be a temporary loss of habitat values.

The Service completed an application of HEP for the project (Appendix B) and the compensation needs for the project are summarized in Table 2. The compensation area would be located at the Sprague Ranch conservation area following the completion of the project. HEP was not utilized for the open water, valley grasslands, or agricultural cover-types because these areas were only temporarily impacted and/or provided little utility to wildlife species. The seeding of these areas with native grasses following the completion of construction would minimize project impacts on the valley grassland and agricultural cover-types and the re-establishment of the gross pool at Lake Isabella would restore the open water habitat.

Table 2. Net change in Average Annual Habitat Units (AAHUs) and compensation need for the habitats affected by the Lake Isabella DSM Project, Alternative Plan 4.

Cover-Type (All sites)	Area Affected (acres)	AAHUs Without Project	AAHUs With Project	Net Change in AAHUs	Compensation Ratio*	Compensation Acres Needed
Sagebrush-Scrub Upland	75.65	0.06	-0.66	-0.72	1.46 : 1.00	110.45 ac
Emergent Wetland	0.30	0.04	-0.02	-0.06	1.00 : 1.00	0.30 ac
Pine-Oak Woodland	31.02	0.22	-0.78	-1.00	1.35 : 1.00	41.88 ac
Agriculture	13.56	N/A	N/A	N/A	Re-seed**	0.00 ac
Valley Grasslands	17.85	N/A	N/A	N/A	Re-seed	0.00 ac
Total						**152.63 ac**

* The Compensation Ratio reflects the acreage per habitat type required in compensation for each acre of habitat cover-type impacted by project implementation.

** This report assumes agricultural land will be permanently removed from production.

RECOMMENDATIONS

The Service recommendations for the project are that the Corps:

1) Provide the Service with any changes to the acreage of each cover-type that would be permanently impacted, temporarily impacted, or created in each alternative as planning progresses.

2) Avoid impacts to migratory birds nesting in trees along the access routes, haul routes, staging areas, and adjacent to the proposed construction areas by conducting pre-

construction surveys for active nests. These surveys and results should be factored into the proposed project schedule.

3) Avoid potential future impacts by ensuring all fill material is free of contaminants.

4) Minimize temporary impacts in all disturbed areas by replanting/reseeding with appropriate native plant species. Revegetated areas should be monitored for 5 years or until they have been determined to be fully established.

5) Focus on decreasing/minimizing the duration of gross pool drawdown necessary for construction. Likewise, focus on decreasing/minimizing the duration and depth of inundation of upstream delta habitat on the North and South Forks Kern River.

6) Use the following compensation acreages for permanent impacts to the three habitat types calculated in the HEP. Compensate for impacts to the sagebrush scrub upland cover-type by creating 110.45 acres sage-brush scrub. Compensate for impacts to the emergent wetland cover-type by creating 0.30 acre of emergent wetlands. Compensate for impacts to the pine-oak woodland cover-type by creating 41.88 acres of pine-oak woodland.

7) Coordinate with the Service, the U.S. Forest Service, and the California Department of Fish and Game to develop a strategy for habitat development at the mitigation site.

8) Contact the California Department of Fish and Game regarding possible effects of the proposed project on State listed species.

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Appendix A:

Federal Endangered and Threatened Species that may occur in or may be affected by the project.

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: 121004101318
Database Last Updated: September 18, 2011

Listed Species

Fish

Hypomesus transpacificus
delta smelt (T)

Amphibians

Rana draytonii
California red-legged frog (T)

Birds

Empidonax traillii extimus
southwestern willow flycatcher (E)

Gymnogyps californianus
California condor (E)

Vireo bellii pusillus
Least Bell's vireo (E)

Candidate Species

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Mammals

Martes pennanti
fisher (C)

Quads Containing Listed, Proposed or Candidate Species:
LAKE ISABELLA NORTH (260B)
LAKE ISABELLA SOUTH (260C)

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 January 02, 2013.

BIOLOGICAL OPINION (BO)

Appendix B:

Federal Endangered Species Act
Section 7 Consultation.

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:
08ESMF00-2012-F-0671-1

OCT 10 2012

Alicia E. Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95825-2922

Subject: Request to Append the Isabella Lake Dam Safety Modification Project, Kern County, California, to the *Programmatic Formal Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle Within the Jurisdiction of the Sacramento Field Office, California* (1-1-96-F-66)

Dear Ms. Kirchner:

This letter is in response to your September 11, 2012, request for initiation of formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Isabella Lake Dam Safety Modification (DSM) Project (project), in Kern County. Your request was received by the Service on September 12, 2012. The Service has reviewed the biological information submitted by the U.S. Army Corps of Engineers (Corps) describing the effects of the proposed project on the federally-listed as threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (beetle), the federally-listed as endangered southwestern willow flycatcher (*Empidonax traillii extimus*), the federally-listed as endangered Least Bell's vireo (*Vireo bellii pusillus*), and the federal candidate species Western yellow-billed cuckoo (*Coccyzus americanus occidental*).

The Corps has determined that the project may affect, and is likely to adversely affect the beetle. The Service concurs with this determination, and has concluded the project is likely to adversely affect the beetle and can be appended to the *Programmatic Formal Consultation Permitting Projects with Relatively Small Effects on the Valley Elderberry Longhorn Beetle Within the Jurisdiction of the Sacramento Field Office, California* (programmatic).

You also requested our concurrence with your determination that the proposed action is not likely to adversely affect the southwestern willow flycatcher and Least Bell's vireo. We have reviewed the biological assessment transmitted with your correspondence and concur with this determination, providing the measures identified in this documentation are followed. Therefore,

unless new information reveals effects of the proposed action that may affect these listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action is necessary. The Service does not consult on species that are not federally listed, so the Western yellow-billed cuckoo, a candidate species, will not be considered.

The proposed project is not within critical habitat for federally-listed species. Therefore, critical habitat will not be affected. This response is in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act).

The findings and recommendations in this formal consultation are based on: 1) your September 11, 2010, letter requesting formal consultation and the attached Biological Assessment on the proposed project; 2) phone and email conversations conducted by the Service; 3) a site visit August 22 – August 24, 2011; and 4) additional information available to the Service.

Description of the Proposed Project

The Isabella Lake DSM Project is proposed by the Corps, in cooperation with the U.S. Department of Agriculture-Forest Service, to implement risk reduction measures to minimize the potential for, and consequences of, a catastrophic downstream flooding event. The Corps has determined that the Isabella Dam facilities require structural improvements in order to safely meet authorized project purposes and to reduce risk to the public and property from dam safety issues posed by floods, earthquakes, and seepage. The Corps proposes to remediate the significant seismic, hydrologic, and seepage deficiencies at the Isabella Main Dam, Auxiliary Dam, and spillway for safe and effective functioning at the authorized capacity. This would support the ultimate goal of having a safe facility that meets Corps risk reduction guidelines for existing dams and allows the project to provide the benefits for which it was authorized.

As an interim risk reduction measure (IRRM), an emergency deviation from the Reservoir Regulation Manual (Water Control Plan) was implemented in September 2006. Under the current IRRM, elevations are not to exceed 2,589.26 feet (North American Vertical Datum (NAVD88)) from March through September. As an additional IRRM, the Corps constructed the Auxiliary Dam Left Abutment Project in the fall of 2010, the purpose of which was to restore the height of the Isabella Auxiliary Dam at its junction with the left abutment that had been lowered during the work on State Route (SR) 178. This involved raising the area to design height, which would provide the level of flood protection intended in the original dam design (Corps 2012a).

The Corps initiated a multi-phased process in 2010 to develop and evaluate alternative risk management plans and select a Preferred Alternative for the Isabella Lake DSM Project. In March 2012, the Corps released the Isabella Lake DSM Draft Environmental Impact Statement (DEIS) that documented the analysis of the No Action Alternative and four final risk management plan alternatives resulting from this process (Corps 2012a). The Corps has selected

Alternative Plan 4 from the DEIS as the Preferred Alternative (project). The project includes some recent refinements developed by the Corps through consideration of agency and public comments.

The Isabella Lake DSM Project consists of implementing the project to remediate seismic, seepage, and hydrologic deficiencies at the Main Dam, Spillway, and Auxiliary Dam. Implementing the project represents a large and complex modification project that involves altering the Isabella Dams and spillway, constructing new structures and facilities, and preforming numerous associated support actions over an anticipated multi-year construction period. Under this alternative, the Corps would remediate all of the dam safety deficiencies that are significant contributors to the risk of dam failure

Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event, such as the Probable Maximum Flood (PMF). The Corps plans to remediate these deficiencies by constructing a full height filter and drain on the downstream slope of the dam to accommodate a crest raise (expected to be 16-foot), and constructing a toe filter/drain system to capture and collect seepage. The Main Dam control tower and access to the existing facility would be raised 16 feet to accommodate the increase in the crest elevation. Access to the raised tower would be provided by retaining walls and backfill material from the Main Dam.

The majority of the rock materials needed for the Main Dam construction would come from the excavation of the proposed Emergency Spillway. The sand material required for the full height filter and drain would come from the excavation of the Auxiliary Dam Recreation Area if sufficient material is not available from the Emergency Spillway excavation.

Existing Spillway

Remediation of the deficiencies identified for the existing spillway include: (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of anchors along the existing spillway wall and ogee crest for additional head during operation and to increase seismic stability; and (c) construction of an approximate 16-foot-high retaining wall added to the crest along the right and left walls (closest to the Main Dam) to protect against potential erosion of the Main Dam during high outflows and to accommodate the crest raise. The concrete needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along SR 178.

Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). Therefore, this alternative includes the construction of a new "Emergency Spillway", approximately 900 feet wide, which would be

located about 100 feet east of the existing spillway. The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping and/or failure of one or both dams. This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2,637.26 feet (NAVD88), which is 28 feet higher than existing spillway. The new spillway would have a labyrinth type weir with v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel.

The Emergency Spillway would function independently from the existing spillway. The crest elevation for the Main and Auxiliary Dams would be raised approximately 16 feet in order to provide for passage of the PMF without overtopping and minimize the increased incremental downstream consequences from passing additional flows. The 16-foot raise will also provide approximately 4 feet of freeboard under the PMF event. Only in the most extreme storms could the reservoir rise to an elevation at which the Emergency Spillway would operate, with the annual probability of reaching this elevation being about 1 in 4,700.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel. It is anticipated that a *Controlled Blasting Management Plan* would be developed by the Corps or the designated contractor prior to the start of construction. The excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source to construct the modification features of the project, and would likely be crushed, screened, and washed to generate the various sands, gravels, and rock required. Material processing would most likely be located at an approved on-site location, possibly in the vicinity of the proposed Emergency Spillway and adjacent to the Auxiliary Dam. The materials would be either temporarily stockpiled on-site in the staging area or delivered to the appropriate construction areas as needed. Excess material will be disposed of on Engineers Point.

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be produced by a concrete batch plant set up on-site in the vicinity of the Emergency Spillway. Cement and fly ash would come from an off-site source.

Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose an unacceptably high probability of failure of the dam. Under the project, the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities:

- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.

- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Constructing a crest raise to be able to safely pass an extreme storm event without overtopping. The height of the raise is expected to be approximately 16-foot high but may vary depending on final design.

The majority of the rock materials needed to complete the downstream buttress on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation, but, if necessary, would come from the Auxiliary Dam Recreation Area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on SR 178.

Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam. The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal, which has the first water rights to the flows out of the North Fork Kern River. Since the early 1900s, the canal has been supplying water via the canal to the Southern California Edison (SCE) power plant approximately 6 miles downstream of the Auxiliary Dam. The SCE has a water right to receive the first 605 cubic feet per second of the North Fork Kern River flows into Lake Isabella through the Borel Canal.

Under the project, the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement Borel Canal tunnel-conduit alignment would be constructed through the right abutment of the Auxiliary Dam, outside of the Kern Canyon fault sheer zone. The realigned canal and tunnel-conduit would connect the existing submerged Borel Canal in the lake to the existing exposed Borel Canal downstream of the Auxiliary Dam.

A temporary rock-fill coffer dam may be required depending on the elevation of the reservoir during the time of construction. The coffer dam would be located on the west side of Engineers Point to sufficiently dewater the area to construct the upstream portal and tunnel-conduit. Due to a natural high ridge in Engineers Point, a cofferdam is not necessary on the Auxiliary Dam side to protect the portal and tunnel-conduit excavation and construction.

The cofferdam is expected to be constructed in the wet without lowering the lake level to take advantage of the flood control pool (lower elevations). The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. The crest of the cofferdam would be set at the top of the restricted pool elevation of 2,589.26 feet (NAVD88). After the construction of the coffer dam, the lake would

be allowed to rise to within four feet below the cofferdam crest, 2,585.26 feet (NAVD88), to allow for storage of snow melt during the spring season.

The Corps has determined that the lake level would have to be lowered to an approximate elevation of 2,543 feet for a period of up to four months during fall-winter 2020, to allow time to tie in the relocated canal and tunnel-conduit into the existing canal upstream of the Auxiliary Dam. This is the portion of the proposed realignment that would be located east of Engineers Point ridge, and therefore would be subject to lake level fluctuations on the Auxiliary Dam side. The work required during this time includes excavation for and construction of the upstream approach channel. Also required during this lowered construction pool would be the demolition of the existing Borel Canal between the new upstream tie-in and the Auxiliary Dam. Scheduling these actions during the fall or winter would take advantage of the naturally occurring lower lake levels, and would be outside the summer high recreation season on the lake.

After the construction of the upstream portal and tie-in to the existing canal in the lake, the temporary coffer dam would be removed if it is not required to maintain access to Engineers Point. The concrete needed for the upstream portal, the tunnel lining, the downstream portal, and the connection to the existing Borel Canal would be supplied from the ready-mix plant on SR 178.

Realignment of State Route 178

State Route 178 would be realigned south of the Auxiliary Dam to accommodate the 16-foot raise on the left abutment. The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 miles east of SR 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet southeast of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet northeast of the present Lake Isabella Boulevard/Dam Road intersection, or 1.7 miles east of SR 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location. Construction details have not been developed for this project element.

Realignment of State Route 155

State Route 155 would also be modified to accommodate the 16-foot raise on the right abutment of the Main Dam. The modification would include realigning SR 155 to the west of the Main Dam. The realignment would begin upstream of the Main Dam and would shift the highway west, but still parallel to the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately one mile and the maximum shift of the alignment would be about 120 feet to the west. The realignment would require a modification and widening of the existing bridge across the Kern River to stay within Caltrans standard requirements. The realignment of SR 155 would result in the loss of some of the campsites along SR 155 to the north of the Main Dam and would require the construction of an uphill passing lane.

A total of nine elderberry shrubs have been recorded at three locations near or within the Isabella

Lake DSM Project Primary Action Area. Two of the locations are associated with the proposed road relocations and one is directly below the Auxiliary Dam. No valley elderberry longhorn beetles or beetle exit holes were observed, however, the diameters of the stems (all are at least one inch at ground level) suggest they could serve as potential habitat for the valley elderberry longhorn beetle (Corps 2012b)

Actions resulting in the loss of elderberry shrubs, the obligate host plant of the valley elderberry longhorn beetle in the Primary Action Area may result in adverse effects to individual beetles, pupae, or larvae as well as loss of habitat. Prior to site preparation, the Corps will implement avoidance and minimization measures from the *Conservation Guidelines for the Valley Elderberry Longhorn Beetle.*

Four of the shrubs will be avoided and protected in place. Protective measures put into place for these four shrubs include signage, fencing and flagging of all areas to be avoided during construction activities. In areas where encroachment of a 100-foot buffer has been approved by the Service, the Corps will provide a minimum setback of at least 20 feet from the dripline of each elderberry plant. Contractors will be briefed on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements.

Five elderberry plants that cannot be avoided will be transplanted to the Sprague Ranch conservation area in accordance with the Service conservation guidelines (USFWS 1999). Each elderberry stem measuring 1.0 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted or destroyed) will be replaced in the Sprague Ranch conservation area with elderberry seedlings or cuttings as shown in Table 1. If the Service determines that the elderberry plants on the proposed project site are unsuitable candidates for transplanting, additional plantings will be made to offset the additional habitat loss.

Table 1.

Location	Stem Diameter	Number of Stems Impacted	Exit Holes Present on Shrub (Y/N)	Elderberry Seedling Ratio	Elderberry Seedling Plantings	Associated Native Plant Ratio	Associated Native Plantings
Riparian	1"-3"	**31**	No	2:1	**62**	1:1	**62**
	3"-5"	**5**	No	3:1	**15**	1:1	**15**
Total		**36**			**77**		**77**
154/10=15.4 basins * 1800 = 0.64 acres							

Conservation Measures

The Corps will follow the following conservation measures proposed in the August 2012 Biological Assessment in addition to those listed in the programmatic.

1. Protect four elderberry shrubs ranging in distance from 51 to 115 feet from the project disturbance area as per the *Conservation Guidelines for the Valley Elderberry Longhorn*

Beetle, July 9, 1999 (conservation guidelines). Protective measures include signage, fencing, and flagging areas to be avoided during project construction.

2. Five elderberry shrubs that cannot be avoided due to construction activities will be transplanted to the Sprague Ranch conservation area (conservation area) in accordance with the conservation guidelines. Each elderberry stem measuring 1.0 inch or greater at ground level that is adversely affected (i.e., transplanted or destroyed) will be replaced at the conservation area with elderberry seedlings or cuttings at ratios in accordance with the conservation guidelines.

3. If the Service determines that any elderberry shrub is unsuitable for transplanting, the Corps will make additional plantings at the conservation area to compensate for the loss of the shrub(s).

4. The Corps will plant a mix of other native plants in the conservation area as per the conservation guidelines.

5. When possible, a 100-foot buffer will be established to protect elderberry shrubs from construction activities. A minimum setback of at least 20 feet from the dripline of elderberry shrubs will be established in areas where construction cannot be avoided.

6. No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant will be used within 100 feet of any elderberry shrub with a stem of at least 1.0 inch in diameter at ground level.

7. The Corps will avoid induced extreme fluctuations in lake level that could impact habitat for breeding birds.

8. Project plans include a: *Stormwater Pollution Prevention Plan*; *Soil and Groundwater Management Plan*; *Controlled Blasting Management Plan; Site Restoration Plan;* and best management practices as identified in *Water Quality Management for Forest System Lands in California: Best Management Practices* (USDA 2000).

The Corps will assure that the conservation measures described in the biological assessment, and the terms and conditions of the programmatic.

Appending to the Programmatic Biological Opinion

The Service has determined that it is appropriate to append the proposed project to the programmatic. This letter is an agreement by the Service to append the proposed project to the Programmatic Consultation and represents the Service's biological opinion on the effects of the proposed project. Compensation implemented through the programmatic should lead to the development of protected habitat areas distributed across the landscape. These protected areas can then be used as foundations for future habitat conservation plans by local communities.

The Service is tracking losses of beetle habitat permitted under the programmatic. The Service reevaluates the effectiveness of this programmatic consultation at least every 6 months to ensure continued implementation will not result in unacceptable effects to the species or the habitat upon which it depends.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed action, the Service considers the action area to be the footprint for modification of Isabella Lake Dam including the main and auxiliary dams, the existing and emergency spillways, the Borel canal, the rock disposal area at Engineers Point, the access routes, the areas of highway re-alignment, and the staging areas; and the habitat within one hundred feet of any elderberry shrubs associated with the proposed project in which construction activities take place.

Effects of the Proposed Action

The proposed action may affect all valley elderberry longhorn beetles inhabiting as many as nine elderberry plants with at least one stem measuring 1.0 inch or greater in diameter at ground level. Four of the elderberry plants will be avoided and protected in place, and the five other elderberry plants will be transplanted to a conservation area. Removing the five elderberry plants will adversely affect the valley elderberry longhorn beetle. Any beetle larvae occupying these plants are likely to be killed when the plants are removed.

To mitigate for these effects, each elderberry shrub that has one or more stems measuring 1.0 inch or greater in diameter at ground level that is adversely affected will be replaced at the Sprague Ranch conservation area. Replacement will be done with elderberry seedlings or cuttings at a ratio of 1:1 to 8:1 (new plantings to affected stems) and will be planted along with associated native species in accordance with Mitigation Guidelines for the Valley Elderberry Longhorn Beetle (Attachment 1).

Transplantation of elderberry shrubs that are or could be used by beetle larvae is expected to adversely affect the beetle. Beetle larvae may be killed or the beetles' life cycle interrupted during or after the transplanting process. For example:

1. Transplanted elderberry shrubs may experience stress or become unhealthy due to changes in soil, hydrology, microclimate, or associated vegetation. This may reduce their quality as habitat for the beetle, or impair their production of habitat-quality stems in the future.
2. Elderberry shrubs may die as a result of transplantation.
3. Branches containing larvae may be cut, broken, or crushed as a result of the transplantation process.

The construction and operation of the project which may be appended to this programmatic may have indirect effects on the beetle. Impacts to the beetle from construction and operation of the

projects, in relative proximity to elderberry host plants that will not be transplanted and are within 100 feet of the construction footprint, may include but are not limited to: fragmentation of habitat, altered hydrology, leaching or drift of fertilizers or pesticides (including herbicides), or trampling by increased pedestrian traffic. Also, accidental grading in areas designated as avoidance areas, or other careless handling of heavy equipment during construction could destroy or injure elderberry plants used by the beetle.

Conclusion

After reviewing the current status of the valley elderberry longhorn beetle, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the projects to be permitted under this programmatic biological opinion, as proposed, are not likely to jeopardize the continued existence of the threatened valley elderberry longhorn beetle. Our opinion is based on the relatively small numbers of elderberry stems that will be impacted and the new plantings that will be done to provide habitat for the beetle in perpetuity. Although critical habitat has been designated for the beetle, the proposed action would not affect critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act prohibits take (i.e. to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harass is defined as intentional or negligent acts that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Harm is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is any taking of listed animal species which results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps: (1) fails to require applicants to adhere to the terms and conditions of this incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

The Service has determined that implementation of the programmatic process authorized by this biological opinion will result in the loss of all valley elderberry longhorn beetles inhabiting as many as, but no more than, 31 stems between 1 and 3 inches in diameter at ground level, and 5 stems between 3 and 5 inches in diameter at ground level.

Effect of the Take

In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to result in jeopardy to the valley elderberry longhorn beetle or destruction or adverse modification of critical habitat.

This concludes the Service's review of the proposed project as outlined in your request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or, (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions or concerns about this Isabella Lake Dam Safety Modification please contact Harry Kahler, Staff Biologist at (916) 414-6612.

Sincerely,

for Susan K. Moore
Field Supervisor

Enclosure:

cc:
Mitchell Stewart, COE, Sacramento, CA
Marci Jackson, COE, Sacramento, CA
Regional Manager, CDFG, Fresno, CA
Central Valley Flood Protection Board, Sacramento, CA

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ATTACHMENT 1

United States Department of the Interior

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

Conservation Guidelines for the Valley Elderberry Longhorn Beetle

9 July 1999

The following guidelines have been issued by the U.S. Fish and Wildlife Service (Service) to assist Federal agencies and non-federal project applicants needing incidental take authorization through a section 7 consultation or a section 10(a)(1)(B) permit in developing measures to avoid and minimize adverse effects on the valley elderberry longhorn beetle. The Service will revise these guidelines as needed in the future. The most recently issued version of these guidelines should be used in developing all projects and habitat restoration plans. The survey and monitoring procedures described below are designed to avoid any adverse effects to the valley elderberry longhorn beetle. Thus a recovery permit is not needed to survey for the beetle or its habitat or to monitor conservation areas. If you are interested in a recovery permit for research purposes please call the Service's Regional Office at (503) 231-2063.

BACKGROUND INFORMATION

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), was listed as a threatened species on August 8, 1980 (*Federal Register* 45: 52803-52807). This animal is fully protected under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The valley elderberry longhorn beetle (beetle) is completely dependent on its host plant, elderberry (*Sambucus* species), which is a common component of the remaining riparian forests and adjacent upland habitats of California's Central Valley. Use of the elderberry by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the elderberry's use by the beetle is an exit hole created by the larva just prior to the pupal stage. The life cycle takes one or two years to complete. The animal spends most of its life in the larval stage, living within the stems of an elderberry plant. Adult emergence is from late March through June, about the same time the elderberry produces flowers. The adult stage is short-lived. Further information on the life history, ecology, behavior, and distribution of the beetle can be found in a report by Barr (1991) and the recovery plan for the beetle (USFWS 1984).

SURVEYS

Proposed project sites within the range of the valley elderberry longhorn beetle should be surveyed for the presence of the beetle and its elderberry host plant by a qualified biologist. The beetle's range extends throughout California's Central Valley and associated foothills from about the 3,000-foot elevation contour on the east and the watershed of the Central Valley on the west (Figure 1). All or portions of 31 counties are included: Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Madera, Mariposa, Merced,

Napa, Nevada, Placer, Sacramento, San Benito, San Joaquin, San Luis Obispo, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba.

If elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level occur on or adjacent to the proposed project site, or are otherwise located where they may be directly or indirectly affected by the proposed action, minimization measures which include planting replacement habitat (conservation planting) are required (Table 1).

All elderberry shrubs with one or more stems measuring 1.0 inch or greater in diameter at ground level that occur on or adjacent to a proposed project site must be thoroughly searched for beetle exit holes (external evidence of beetle presence). In addition, all elderberry stems one inch or greater in diameter at ground level must be tallied by diameter size class (Table 1). As outlined in Table 1, the numbers of elderberry seedlings/cuttings and associated riparian native trees/shrubs to be planted as replacement habitat are determined by stem size class of affected elderberry shrubs, presence or absence of exit holes, and whether a proposed project lies in a riparian or non-riparian area.

Elderberry plants with no stems measuring 1.0 inch or greater in diameter at ground level are unlikely to be habitat for the beetle because of their small size and/or immaturity. Therefore, no minimization measures are required for removal of elderberry plants with no stems measuring 1.0 inch or greater in diameter at ground level with no exit holes. Surveys are valid for a period of two years.

AVOID AND PROTECT HABITAT WHENEVER POSSIBLE

Project sites that do not contain beetle habitat are preferred. If suitable habitat for the beetle occurs on the project site, or within close proximity where beetles will be affected by the project, these areas must be designated as avoidance areas and must be protected from disturbance during the construction and operation of the project. When possible, projects should be designed such that avoidance areas are connected with adjacent habitat to prevent fragmentation and isolation of beetle populations. Any beetle habitat that cannot be avoided as described below should be considered impacted and appropriate minimization measures should be proposed as described below.

Avoidance: Establishment and Maintenance of a Buffer Zone

Complete avoidance (i.e., no adverse effects) may be assumed when a 100-foot (or wider) buffer is established and maintained around elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level. Firebreaks may not be included in the buffer zone. In buffer areas construction-related disturbance should be minimized, and any damaged area should be promptly restored following construction. The Service must be consulted before any disturbances within the buffer area are considered. In addition, the Service must be provided with a map identifying the avoidance area and written details describing avoidance measures.\

Protective Measures

1. Fence and flag all areas to be avoided during construction activities. In areas where encroachment on the 100-foot buffer has been approved by the Service, provide a minimum setback of at least 20 feet from the dripline of each elderberry plant.

2. Brief contractors on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements.

3. Erect signs every 50 feet along the edge of the avoidance area with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs should be clearly readable from a distance of 20 feet, and must be maintained for the duration of construction.

4. Instruct work crews about the status of the beetle and the need to protect its elderberry host plant.

Restoration and Maintenance

1. Restore any damage done to the buffer area (area within 100 feet of elderberry plants) during construction. Provide erosion control and re-vegetate with appropriate native plants.

2. Buffer areas must continue to be protected after construction from adverse effects of the project. Measures such as fencing, signs, weeding, and trash removal are usually appropriate.

3. No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle or its host plant should be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1.0 inch or greater in diameter at ground level.

4. The applicant must provide a written description of how the buffer areas are to be restored, protected, and maintained after construction is completed.

5. Mowing of grasses/ground cover may occur from July through April to reduce fire hazard. No mowing should occur within five (5) feet of elderberry plant stems. Mowing must be done in a manner that avoids damaging plants (e.g., stripping away bark through careless use of mowing/trimming equipment).

TRANSPLANT ELDERBERRY PLANTS THAT CANNOT BE AVOIDED

Elderberry plants must be transplanted if they can not be avoided by the proposed project. All elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level must be transplanted to a conservation area (see below). At the Service's discretion, a plant that is

unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation. In cases where transplantation is not possible the minimization ratios in Table 1 may be increased to offset the additional habitat loss.

Trimming of elderberry plants (e.g., pruning along roadways, bike paths, or trails) with one or more stems 1.0 inch or greater in diameter at ground level, may result in take of beetles. Therefore, trimming is subject to appropriate minimization measures as outlined in Table 1.

1. Monitor. A qualified biologist (monitor) must be on-site for the duration of the transplanting of the elderberry plants to insure that no unauthorized take of the valley elderberry longhorn beetle occurs. If unauthorized take occurs, the monitor must have the authority to stop work until corrective measures have been completed. The monitor must immediately report any unauthorized take of the beetle or its habitat to the Service and to the California Department of Fish and Game.

2. Timing. Transplant elderberry plants when the plants are dormant, approximately November through the first two weeks in February, after they have lost their leaves. Transplanting during the non-growing season will reduce shock to the plant and increase transplantation success.

3. Transplanting Procedure.

    a. Cut the plant back 3 to 6 feet from the ground or to 50 percent of its height (whichever is taller) by removing branches and stems above this height. The trunk and all stems measuring 1.0 inch or greater in diameter at ground level should be replanted. Any leaves remaining on the plant should be removed.

    b. Excavate a hole of adequate size to receive the transplant.

    c. Excavate the plant using a Vemeer spade, backhoe, front end loader, or other suitable equipment, taking as much of the root ball as possible, and replant immediately at the conservation area. Move the plant only by the root ball. If the plant is to be moved and transplanted off site, secure the root ball with wire and wrap it with burlap. Dampen the burlap with water, as necessary, to keep the root ball wet. Do not let the roots dry out. Care should be taken to ensure that the soil is not dislodged from around the roots of the transplant. If the site receiving the transplant does not have adequate soil moisture, pre-wet the soil a day or two before transplantation.

    d. The planting area must be at least 1,800 square feet for each elderberry transplant. The root ball should be planted so that its top is level with the existing ground. Compact the soil sufficiently so that settlement does not occur. As many as five (5) additional elderberry plantings (cuttings or seedlings) and up to five (5) associated native species plantings (see below) may also be planted within the 1,800 square foot area with the transplant. The transplant and each new planting should have its own watering basin measuring at least three (3) feet in diameter.

Watering basins should have a continuous berm measuring approximately eight (8) inches wide at the base and six (6) inches high.

e. Saturate the soil with water. Do not use fertilizers or other supplements or paint the tips of stems with pruning substances, as the effects of these compounds on the beetle are unknown.

f. Monitor to ascertain if additional watering is necessary. If the soil is sandy and well-drained, plants may need to be watered weekly or twice monthly. If the soil is clayey and poorly-drained, it may not be necessary to water after the initial saturation. However, most transplants require watering through the first summer. A drip watering system and timer is ideal. However, in situations where this is not possible, a water truck or other apparatus may be used.

PLANT ADDITIONAL SEEDLINGS OR CUTTINGS

Each elderberry stem measuring 1.0 inch or greater in diameter at ground level that is adversely affected (i.e., transplanted or destroyed) must be replaced, in the conservation area, with elderberry seedlings or cuttings at a ratio ranging from 1:1 to 8:1 (new plantings to affected stems). Minimization ratios are listed and explained in Table 1. Stock of either seedlings or cuttings should be obtained from local sources. Cuttings may be obtained from the plants to be transplanted if the project site is in the vicinity of the conservation area. If the Service determines that the elderberry plants on the proposed project site are unsuitable candidates for transplanting, the Service may allow the applicant to plant seedlings or cuttings at higher than the stated ratios in Table 1 for each elderberry plant that cannot be transplanted.

PLANT ASSOCIATED NATIVE SPECIES

Studies have found that the beetle is more abundant in dense native plant communities with a mature overstory and a mixed understory. Therefore, a mix of native plants associated with the elderberry plants at the project site or similar sites will be planted at ratios ranging from 1:1 to 2:1 [native tree/plant species to each elderberry seedling or cutting (see Table 1)]. These native plantings must be monitored with the same survival criteria used for the elderberry seedlings (see below). Stock of saplings, cuttings, and seedlings should be obtained from local sources. If the parent stock is obtained from a distance greater than one mile from the conservation area, approval by the Service of the native plant donor sites must be obtained prior to initiation of the revegetation work. Planting or seeding the conservation area with native herbaceous species is encouraged. Establishing native grasses and forbs may discourage unwanted non-native species from becoming established or persisting at the conservation area. Only stock from local sources should be used.

Examples

Example 1

The project will adversely affect beetle habitat on a vacant lot on the land side of a river levee. This levee now separates beetle habitat on the vacant lot from extant Great Valley Mixed Riparian Forest (Holland 1986) adjacent to the river. However, it is clear that the

beetle habitat located on the vacant lot was part of a more extensive mixed riparian forest ecosystem extending farther from the river's edge prior to agricultural development and levee construction. Therefore, the beetle habitat on site is considered riparian. A total of two elderberry plants with at least one stem measuring 1.0 inch or greater in diameter at ground level will be affected by the proposed action. The two plants have a total of 15 stems measuring over 1.0 inch. No exit holes were found on either plant. Ten of the stems are between 1.0 and 3.0 inches in diameter and five of the stems are greater than 5.0 inches in diameter. The conservation area is suited for riparian forest habitat. Associated natives adjacent to the conservation area are box elder (*Acer negundo californica*), walnut (*Juglans californica* var. *hindsii*), sycamore (*Platanus racemosa*), cottonwood (*Populus fremontii*), willow (*Salix gooddingii* and *S. laevigata*), white alder (*Alnus rhombifolia*), ash (*Fraxinus latifolia*), button willow (*Cephalanthus occidentalis*), and wild grape (*Vitis californica*).

Minimization (based on ratios in Table 1):

· Transplant the two elderberry plants that will be affected to the conservation area.

· Plant 40 elderberry rooted cuttings (10 affected stems compensated at 2:1 ratio and 5 affected stems compensated at 4:1 ratio, cuttings planted:stems affected)

· Plant 40 associated native species (ratio of associated natives to elderberry plantings is 1:1 in areas with no exit holes):

5 saplings each of box elder, sycamore, and cottonwood
5 willow seedlings
5 white alder seedlings
5 saplings each of walnut and ash
3 California button willow
2 wild grape vines

Total: 40 associated native species

· Total area required is a minimum of 1,800 sq. ft. for one to five elderberry seedlings and up to 5 associated natives. Since, a total of 80 plants must be planted (40 elderberries and 40 associated natives), a total of 0.33 acre (14,400 square feet) will be required for conservation plantings. The conservation area will be seeded and planted with native grasses and forbs, and closely monitored and maintained throughout the monitoring period.

Example 2

The project will adversely affect beetle habitat in Blue Oak Woodland (Holland 1986). One elderberry plant with at least one stem measuring 1.0 inch or greater in diameter at ground level will be affected by the proposed action. The plant has a total of 10 stems measuring over 1.0 inch. Exit holes were found on the plant. Five of the stems are between 1.0 and 3.0 inches in diameter and five of the stems are between 3.0 and 5.0 inches in diameter. The conservation area is suited for elderberry savanna (non-riparian habitat). Associated natives adjacent to the conservation area are willow (*Salix* species), blue oak (*Quercus douglasii*), interior live oak (*Q. wislizenii*), sycamore, poison oak (*Toxicodendron diversilobum*), and wild grape.

Minimization (based on ratios in Table 1):

· Transplant the one elderberry plant that will be affected to the conservation area.

· Plant 30 elderberry seedlings (5 affected stems compensated at 2:1 ratio and 5 affected stems compensated at 4:1 ratio, cuttings planted:stems affected)

· Plant 60 associated native species (ratio of associated natives to elderberry plantings is 2:1 in areas with exit holes):
20 saplings of blue oak, 20 saplings of sycamore, and 20 saplings of willow, and seed and plant with a mixture of native grasses and forbs

· Total area required is a minimum of 1,800 sq. ft. for one to five elderberry seedlings and up to 5 associated natives. Since, a total of 90 plants must be planted (30 elderberries and 60 associated natives), a total of 0.37 acre (16,200 square feet) will be required for conservation plantings. The conservation area will be seeded and planted with native grasses and forbs, and closely monitored and maintained throughout the monitoring period.

CONSERVATION AREA—PROVIDE HABITAT FOR THE BEETLE IN PERPETUITY

The conservation area is distinct from the avoidance area (though the two may adjoin), and serves to receive and protect the transplanted elderberry plants and the elderberry and other native plantings. The Service may accept proposals for off-site conservation areas where appropriate.

1. Size. The conservation area must provide at least 1,800 square feet for each transplanted elderberry plant. As many as 10 conservation plantings (i.e., elderberry cuttings or seedlings and/or associated native plants) may be planted within the 1800 square foot area with each transplanted elderberry. An additional 1,800 square feet shall be provided for every additional 10 conservation plants. Each planting should have its own watering basin measuring approximately three feet in diameter. Watering basins should be constructed with a continuous berm measuring approximately eight inches wide at the base and six inches high.

   The planting density specified above is primarily for riparian forest habitats or other habitats with naturally dense cover. If the conservation area is an open habitat (i.e., elderberry savanna, oak woodland) more area may be needed for the required plantings. Contact the Service for assistance if the above planting recommendations are not appropriate for the proposed conservation area.

   No area to be maintained as a firebreak may be counted as conservation area. Like the avoidance area, the conservation area should connect with adjacent habitat wherever possible, to prevent isolation of beetle populations.

   Depending on adjacent land use, a buffer area may also be needed between the conservation area and the adjacent lands. For example, herbicides and pesticides are often used on orchards or vineyards. These chemicals may drift or runoff onto the conservation area if an adequate buffer area is not provided.

2. Long-Term Protection. The conservation area must be protected in perpetuity as habitat for the valley elderberry longhorn beetle. A conservation easement or deed restrictions to protect the conservation area must be arranged. Conservation areas may be transferred to a resource agency or appropriate private organization for long-term management. The Service must be provided with a map and written details identifying the conservation area; and the applicant must receive approval from the Service that the conservation area is acceptable prior to initiating the conservation program. A true, recorded copy of the deed transfer, conservation easement, or deed restrictions protecting the conservation area in perpetuity must be provided to the Service before project implementation.

   Adequate funds must be provided to ensure that the conservation area is managed in perpetuity. The applicant must dedicate an endowment fund for this purpose, and designate the party or entity that will be responsible for long-term management of the conservation area. The Service must be provided with written documentation that funding and management of the conservation area (items 3-8 above) will be provided in perpetuity.

3. Weed Control. Weeds and other plants that are not native to the conservation area must be removed at least once a year, or at the discretion of the Service and the California Department of Fish and Game. Mechanical means should be used; herbicides are prohibited unless approved by the Service.

4. Pesticide and Toxicant Control. Measures must be taken to insure that no pesticides, herbicides, fertilizers, or other chemical agents enter the conservation area. No spraying of these agents must be done within one 100 feet of the area, or if they have the potential to drift, flow, or be washed into the area in the opinion of biologists or law enforcement personnel from the Service or the California Department of Fish and Game.

5. Litter Control. No dumping of trash or other material may occur within the conservation area. Any trash or other foreign material found deposited within the conservation area must be removed within 10 working days of discovery.

6. Fencing. Permanent fencing must be placed completely around the conservation area to prevent unauthorized entry by off-road vehicles, equestrians, and other parties that might damage or destroy the habitat of the beetle, unless approved by the Service. The applicant must receive written approval from the Service that the fencing is acceptable prior to initiation of the conservation program. The fence must be maintained in perpetuity, and must be repaired/replaced within 10 working days if it is found to be damaged. Some conservation areas may be made available to the public for appropriate recreational and educational opportunities with written approval from the Service. In these cases appropriate fencing and signs informing the public of the beetle's threatened status and its natural history and ecology should be used and maintained in perpetuity.

7. Signs. A minimum of two prominent signs must be placed and maintained in perpetuity at the conservation area, unless otherwise approved by the Service. The signs should note that the site is habitat of the federally threatened valley elderberry longhorn beetle and, if appropriate, include information on the beetle's natural history and ecology. The signs

must be approved by the Service. The signs must be repaired or replaced within 10 working days if they are found to be damaged or destroyed.

MONITORING

The population of valley elderberry longhorn beetles, the general condition of the conservation area, and the condition of the elderberry and associated native plantings in the conservation area must be monitored over a period of either ten (10) consecutive years or for seven (7) years over a 15-year period. The applicant may elect either 10 years of monitoring, with surveys and reports every year; or 15 years of monitoring, with surveys and reports on years 1, 2, 3, 5, 7, 10, and 15. The conservation plan provided by the applicant must state which monitoring schedule will be followed. No change in monitoring schedule will be accepted after the project is initiated. If conservation planting is done in stages (i.e., not all planting is implemented in the same time period), each stage of conservation planting will have a different start date for the required monitoring time.

Surveys. In any survey year, a minimum of two site visits between February 14 and June 30 of each year must be made by a qualified biologist. Surveys must include:

1. A population census of the adult beetles, including the number of beetles observed, their condition, behavior, and their precise locations. Visual counts must be used; mark-recapture or other methods involving handling or harassment must not be used.

2. A census of beetle exit holes in elderberry stems, noting their precise locations and estimated ages.

3. An evaluation of the elderberry plants and associated native plants on the site, and on the conservation area, if disjunct, including the number of plants, their size and condition.

4. An evaluation of the adequacy of the fencing, signs, and weed control efforts in the avoidance and conservation areas.

5. A general assessment of the habitat, including any real or potential threats to the beetle and its host plants, such as erosion, fire, excessive grazing, off-road vehicle use, vandalism, excessive weed growth, etc.

The materials and methods to be used in the monitoring studies must be reviewed and approved by the Service. All appropriate Federal permits must be obtained prior to initiating the field studies.

Reports. A written report, presenting and analyzing the data from the project monitoring, must be prepared by a qualified biologist in each of the years in which a monitoring survey is required. Copies of the report must be submitted by December 31 of the same year to the Service (Chief of Endangered Species, Sacramento Fish and Wildlife Office), and the Department of Fish and Game (Supervisor, Environmental Services, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814; and Staff Zoologist, California Natural Diversity Data Base,

Department of Fish and Game, 1220 S Street, Sacramento, California 95814). The report must explicitly address the status and progress of the transplanted and planted elderberry and associated native plants and trees, as well as any failings of the conservation plan and the steps taken to correct them. Any observations of beetles or fresh exit holes must be noted. Copies of original field notes, raw data, and photographs of the conservation area must be included with the report. A vicinity map of the site and maps showing where the individual adult beetles and exit holes were observed must be included. For the elderberry and associated native plants, the survival rate, condition, and size of the plants must be analyzed. Real and likely future threats must be addressed along with suggested remedies and preventative measures (e.g. limiting public access, more frequent removal of invasive non-native vegetation, etc.).

A copy of each monitoring report, along with the original field notes, photographs, correspondence, and all other pertinent material, should be deposited at the California Academy of Sciences (Librarian, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118) by December 31 of the year that monitoring is done and the report is prepared. The Service's Sacramento Fish and Wildlife Office should be provided with a copy of the receipt from the Academy library acknowledging receipt of the material, or the library catalog number assigned to it.

Access. Biologists and law enforcement personnel from the California Department of Fish and Game and the Service must be given complete access to the project site to monitor transplanting activities. Personnel from both these agencies must be given complete access to the project and the conservation area to monitor the beetle and its habitat in perpetuity.

SUCCESS CRITERIA

A minimum survival rate of at least 60 percent of the elderberry plants and 60 percent of the associated native plants must be maintained throughout the monitoring period. Within one year of discovery that survival has dropped below 60 percent, the applicant must replace failed plantings to bring survival above this level. The Service will make any determination as to the applicant's replacement responsibilities arising from circumstances beyond its control, such as plants damaged or killed as a result of severe flooding or vandalism.

SERVICE CONTACT

These guidelines were prepared by the Endangered Species Division of the Service's Sacramento Fish and Wildlife Office. If you have questions regarding these guidelines or to request a copy of the most recent guidelines, telephone (916) 414-6600, or write to:

U.S. Fish and Wildlife Service
Ecological Services
2800 Cottage Way, W-2605
Sacramento, CA 95825

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Barr, C. B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle *Desmocerus californicus dimorphus*. U.S. Fish and Wildlife Service; Sacramento, California.

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Figure 1: Range of the Valley Elderberry Longhorn Beetle

Table 1: Minimization ratios based on location (riparian vs. non-riparian), stem diameter of affected elderberry plants at ground level, and presence or absence of exit holes.

Location	Stems (maximum diameter at ground level)	Exit Holes on Shrub Y/N (quantify)[1]	Elderberry Seedling Ratio[2]	Associated Native Plant Ratio[3]
non-riparian	stems ≥ 1" & ≤ 3"	No:	1:1	1:1
		Yes:	2:1	2:1
non-riparian	stems > 3" & < 5"	No:	2:1	1:1
		Yes:	4:1	2:1
non-riparian	stems ≥ 5"	No:	3:1	1:1
		Yes:	6:1	2:1
riparian	stems ≥ 1" & ≤ 3"	No:	2:1	1:1
		Yes:	4:1	2:1
riparian	stems > 3" & < 5"	No:	3:1	1:1
		Yes:	6:1	2:1
riparian	stems ≥ 5"	No:	4:1	1:1
		Yes:	8:1	2:1

[1] All stems measuring one inch or greater in diameter at ground level on a single shrub are considered occupied when exit holes are present anywhere on the shrub.

[2] Ratios in the *Elderberry Seedling Ratio* column correspond to the number of cuttings or seedlings to be planted per elderberry stem (one inch or greater in diameter at ground level) affected by a project.

[3] Ratios in the *Associated Native Plant Ratio* column correspond to the number of associated native species to be planted per elderberry (seedling or cutting) planted.

HABITAT EVALUATION PROCEDURES REPORT (HEP)

Appendix C:

Habitat Evaluation Procedures

Lake Isabella Dam Safety Modifications

September 2012

Prepared by:
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INTRODUCTION

This application of Habitat Evaluation Procedures (HEP) is intended to quantify the anticipated impacts and benefits to fish and wildlife resources that would occur with the proposed Lake Isabella Dam Safety Modification (Lake Isabella DSM) Project in Kern County, California.

PROJECT DESCRIPTION

The Lake Isabella DSM Project consists of implementing the Preferred Risk Management Plan (Proposed Action) to remediate seismic, seepage, and hydrologic deficiencies at the Main Dam, Spillway, and Auxiliary Dam (Corps 2011). Implementing the proposed action is a large and complex project that involves altering the Lake Isabella Dams and Spillway, constructing new structures and facilities, and performing numerous associated support actions over a multi-year construction period. The U.S. Army Corps of Engineers (Corps) has developed seven alternatives for remediating safety concerns at both the Main and Auxiliary Dams at Lake Isabella:

- **No Action Alternative**—Do nothing and operate the reservoir up to the authorized gross pool elevation of 2,609.26 feet (NAVD88).
- **Make the Interim Risk Management Measure (IRRM) Permanent**—No new actions, but make the current restricted pool elevation of 2,589.26 feet (NAVD88) permanent.
- **Alternative Base Plan**—Remediate those deficiencies identified for the Main Dam, Spillway, and Auxiliary Dam that if not remediated, would likely result in catastrophic (potentially life-threatening) failure of the dams from an occurrence of a large seismic or extreme storm event.
- **Alternative Plan 1**—Remediate the deficiencies covered in the Base Plan Alternative, plus additional deficiencies identified for the Main Dam.
- **Alternative Plan 2**— Remediate the deficiencies covered in Alternative Plan 1, plus additional deficiencies identified for the Auxiliary Dam.
- **Alternative Plan 3**—Remediate the deficiencies covered in Alternative Plan 2, plus additional deficiencies identified for the Main Dam, ensuring that both dams achieve the best rating regarding dam safety.
- **Alternative Plan 4**— Remediate the deficiencies covered in Alternative Plan 1, plus additional remediation measures for the Main Dam, Existing and Emergency Spillways, the Auxiliary Dam, and a realignment of State Routes 178 and SR 155. Alternative Plan 4 is the preferred project alternative. Acreages provided in this report reflect Alternative Plan 4.

All dam modification alternatives involve varying levels and combinations of increasing dam size, installing toe drains, modification of the existing spillway, construction of a new emergency spillway, realignment of the Borel Canal, and realignment of State Routes 178 and 155. For a complete description of the alternatives and measures proposed for the Lake Isabella DSM

project, see the project description section of the Fish and Wildlife Coordination Act report.

HEP OVERVIEW

HEP is a methodology developed by the Fish and Wildlife Service (Service) and other State and Federal resource agencies which can be used to document the quality and quantity of available habitat for selected fish and wildlife species. HEP provides information for two general types of habitat comparisons: (1) the relative value of different areas at the same point in time; and (2) the relative value of the same areas at future points in time. By combining the two types of comparisons, the impacts of the proposed or anticipated land-use and or water-use changes on habitat can be quantified. Similarly, any compensation needs (in terms of acreage) for the project can also be quantified, provided a mitigation strategy has been developed for a specific mitigation site.

A HEP application is based on the assumption that the value of a habitat for a selected species or the value of a community can be described in a model which produces a Habitat Suitability Index (HSI). This HSI value (from 0.0 to 1.0) is multiplied by the area of available habitat to obtain Habitat Units (HUs). The HU and Average Annual Habitat Units (AAHUs) over the life of the project are then used in the comparison described above.

The reliability of a HEP application and the significance of HUs are directly dependent on the ability of the user to assign a well-defined and accurate HSI to the selected evaluation elements or communities. In addition, a user must be able to measure the areas of each distinct habitat being utilized by fish and wildlife species within the project area. Both the HSIs and the habitat acreages must also be reasonably estimable at various future points in time. The HEP Team comprised of Corps and Service staff determined that the HEP criteria could be met, or at least reasonably approximated, for the Lake Isabella DSM Project alternatives. Thus HEP was considered an appropriate analytical tool to assess impacts of the proposed project.

GENERAL HEP ASSUMPTIONS

Some general assumptions are necessary to use HEP and HSI Models in the impact assessment.

Use of HEP:

- HEP is the preferred method to evaluate the impacts of the proposed project on fish and/or wildlife resources.
- HEP is a suitable methodology for quantifying project-induced impacts on fish and wildlife habitats.
- Quality and quantity of fish and wildlife habitat can generally be numerically described using the indices derived from the HSI models and associated habitat units.
- HEP assessment is applicable to the habitat types being evaluated.

Use of HSI Models

- HSI models are hypotheses based on available data.
- HSI models are conceptual models and may not measure all ecological factors that affect the quality of a given cover-type for the evaluation species (e.g. vulnerability to

predation). In some cases, the HEP Team may make assumptions and incorporate them into the analysis to account for loss of those factors not reflected by the model.

- A peer reviewed "blue book" model must be used to evaluate each habitat type. Supplemental "non-blue book" models may be used for additional information.

METHODOLOGY

Habitat Workshop 3.0, a windows based HEP program, was used in this application, which was conducted in September 2011. The study design was developed jointly by Service (Tyler Willsey and Harry Kahler) and Corps (Mitchell Stewart) staff. Participants in the data collection portion of the HEP included the same agency representatives listed above.

Sites impacted by the project and for mitigation were identified by Corps staff with guidance from the Service. Habitat mapping of the project site was delineated in August 2010 by Mike Ericsson of Ericsson Mapping. General plant communities in or near the project area were classified as valley grassland, oak woodland, pine-oak woodland, sagebrush-scrub upland, riparian woodland, emergent wetland, open water, and agriculture. The acreage of habitat types potentially impacted by the project is summarized in Table 1.

The purpose of using HEP is to provide a quantitative basis for identifying the habitat values which would be degraded, destroyed, and/or created by the construction of the proposed project. Barren ruderal, valley grassland, and agricultural habitats were not modeled because these areas disturbed by project activities are to be re-seeded after construction is complete. Therefore, the focus of this HEP is on three habitat types that would be lost due to Lake Isabella DSM Project activities: emergent wetland, pine-oak woodland, and sagebrush-scrub upland.

Emergent Wetland

The marsh wren (Gutzwiller and Anderson 1987) and Pacific Tree Frog HSI (Anonymous 1978) Models were selected for use in the emergent wetland habitat. Marsh wrens require dense stands of emergent herbaceous vegetation, typically cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) for nesting and cover. They prefer emergent vegetation in relatively deeper water, > 15 centimeters deep is considered optimum. Pacific tree frogs require dense cover in permanent to semi-permanent water with the availability of insect prey. They prefer areas in close proximity to a permanent water source. Together these models account for the aquatic, herbaceous understory and overstory components of the wetland area.

Pine-Oak Woodland

The Downy Woodpecker (Schroeder 1982) and California Ground Squirrel HSI (Anonymous 1980) Models were selected for use in the project's pine-oak woodland habitat. The downy woodpecker was selected because it forages and nests in oak and pinyon-juniper woodlands. Optimal nesting habitat for the Downy woodpecker is provided in natural cavities or self created holes 2 to 15 meters off the ground, in stands with moderate to high canopy closure. The California ground squirrel was selected to quantify the herbaceous and scrub understory found in the pine-oak woodland areas. The California ground squirrel is found predominantly in open or rocky areas and feeds on seeds, nuts, and legumes. It prefers habitat in open areas in close proximity to water.

Table 1. Summary of existing habitat types and their approximate acreages in the project area.

LOCATION (SITE)	COVER-TYPE (HOLLAND HABITAT TYPE)	ACREAGE
Highway 155 Relocation	Pine-Oak Woodland	11.8
	Total	**11.8**
Highway 178 Relocation	Pine-Oak Woodland	4.1
	Total	**4.1**
Main Dam	Pine-Oak Woodland	2.57
	Total	**2.57**
Auxiliary Dam	Sagebrush Scrub Upland	12.55
	Emergent Wetland	0.11
	Total	**12.66**
Emergency Spillway	Sagebrush Scrub Upland	13.30
	Pine-Oak Woodland	1.53
	Valley Grasslands	16.41
	Total	**31.24**
Borel Canal	Sagebrush Scrub Upland	2.14
	Emergent Wetland	0.08
	Agriculture	1.71
	Valley Grasslands	1.28
	Total	**5.21**
Staging Areas/ Haul Routes	Sagebrush Scrub Upland	29.82
	Pine-Oak Woodland	11.02
	Emergent Wetland	0.11
	Agriculture	11.85
	Valley Grasslands	0.16
	Total	**52.96**
Engineer's Point	Sagebrush Scrub Upland	17.84
	Total	**17.84**
HABITAT TOTAL	Sagebrush Scrub Upland	75.65
	Pine-Oak Woodland	31.02
	Emergent Wetland	0.30
	Agriculture	13.56
	Valley Grasslands	17.85
PROJECT TOTAL		**138.38**

Sagebrush Scrub Upland

The Ferruginous Hawk (Jasikoff 1982) HSI Model was selected for use in the project's sagebrush-scrub upland habitat. The ferruginous hawk was selected because it forages in the scrubland areas for small mammals which are common in the project area. The species commonly winters in the project area.

HEP Analyses

When using HEP, it is necessary to determine HSI values for each evaluation species at selected target years for both with-project and without-project scenarios. Proposed compensation areas must be treated similarly (with-management is substituted for with-project conditions). The capacity of each sample site to meet the needs of the evaluation elements within the project impact and compensation areas was determined by the HEP team through measurement of specific habitat variables. Baseline values for each of the model variables can be obtained by field sampling, map interpretation, and by reviewing historic records and reports. Table 2 lists the variables in each model and indicates how data was collected.

Table 2. Summary of Habitat Suitability Index Models, variables, and how values were obtained.

HSI MODEL	HSI VARIABLE	HOW OBTAINED
Ferruginous Hawk	V1- Average height of herbaceous shrub Canopy	Field measurement
	V2- Percent herbaceous shrub canopy	Field measurement
	V3- Topographic diversity	Field measurement
	V4- Distance to tree or shrub greater than 1 meter (3 ft) tall	Field measurement
Downy Woodpecker	V1- Basal area	Field measurement
	V2- Number of snags	Field measurement
Marsh wren	V1- Growth form of emergent hydrophytes	Field measurement
	V2- Percent canopy cover of emergent herbaceous vegetation	Field measurement
	V3- Mean water depth	Field measurement
	V4- Percent canopy cover of woody vegetation	Field measurement
California Ground Squirrel	V1- Abundance and availability of suitable food	Field measurement
	V2- Distance to water	Field measurement
	V3- Presence of cover	Field measurement
	V4- Interspersion of open area with promontories	Field measurement
Pacific Tree Frog	V1- Water permanence	Field measurement
	V2- Stream gradient	Field measurement
	V3- Food cover availability	Field measurement
	V4- Water cover relationship	Field measurement

At the completion of data collection, an HSI value was calculated for each evaluation element. A higher numerical rating is indicative of a higher suitability for the evaluated element. The HSI measurements of the same habitat in an impact area were averaged. The HSI, when multiplied by the area of the habitat, yields HUs, a measure of the quality and quantity of the habitat. The equations to calculate HSIs are contained within each model (HEP Appendix A).

Because it is not possible to calculate habitat quality and quantity for future years, future HSI values were projected. This was accomplished by increasing or decreasing specific baseline Suitability Index values for each evaluation species based on the HEP Team's best professional judgment of probable future conditions. The assumptions used to derive future HSI and acreage values for with- and without-project conditions on the impact and mitigation area(s) are contained in HEP Appendix D. A mitigation site for the project was identified in the Sprague Ranch Conservation area (Figure 1).

Given these assumptions, long-term losses and gains in HUs can be estimated for each future scenario over the life of the project, and then expressed as AAHU gains or losses. Basic HEP outputs, expressed in the Habitat Workshop 3.0 Software Package are displayed in Table 3.

In order to make the comparison of future with- and without-project conditions for each alternative described above, it was necessary to first develop the future without-project scenario for the habitat impacted within the proposed project area. This required several key assumptions that existing land uses and maintenance activities would not change in the future without the project. Given these conditions, a future without-project scenario was developed which included: (1) no change in the existing habitat acreages, (2) sagebrush scrub upland, pine-oak woodland, and emergent wetland habitat would continue to develop, and (3) the existing hydrology would be maintained in the study area. Similarly, a compensation site was selected which was assumed to currently be primarily non-native grassland and future scenarios with- and without the project were developed.

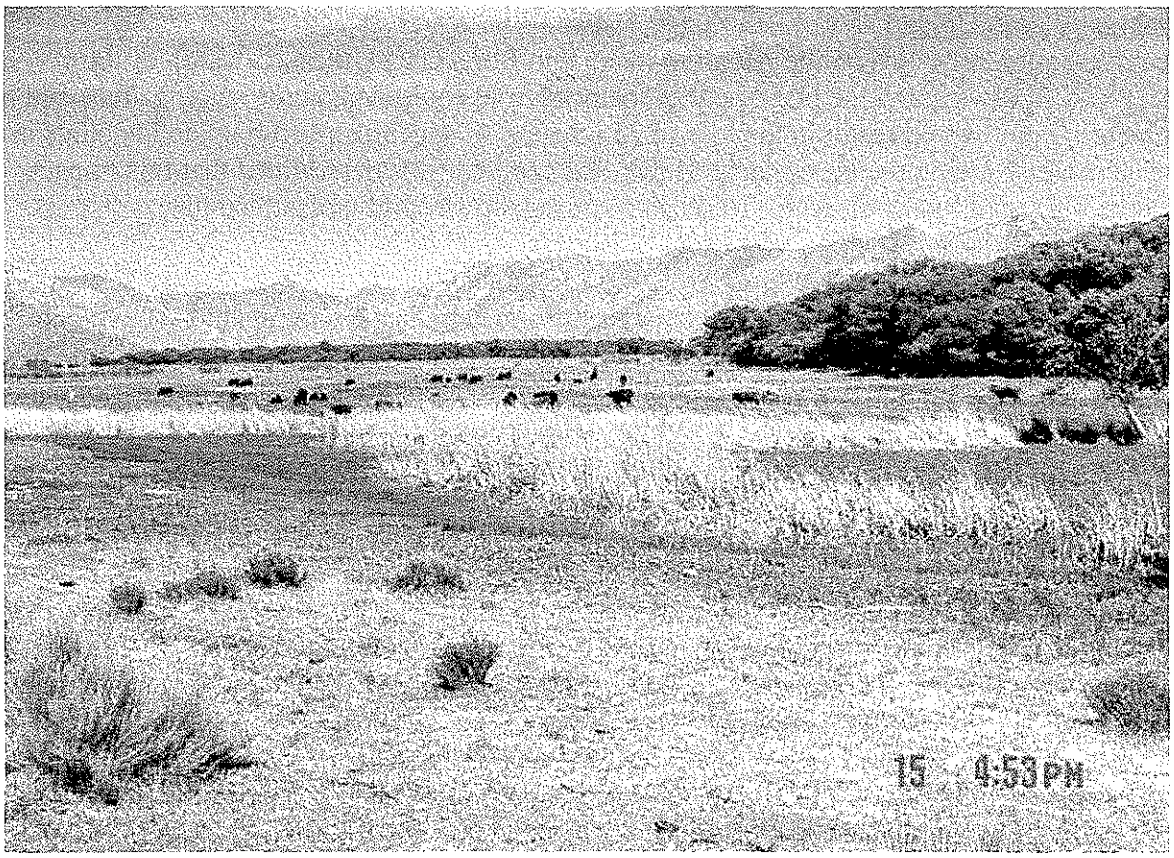

Figure 1. The Sprague Ranch Conservation area mitigation site.

RESULTS AND DISCUSSION

Table 3 shows the net change in AAHUs and compensation need for each cover-type affected by the Lake Isabella DSM Project. Agricultural fields, barren ruderal, and valley grassland were not modeled or analyzed, yet should be re-seeded with native grasses at the conclusion of the project.

Table 3. Net change in Average Annual Habitat Units (AAHUs) and compensation need for the habitats affected by the Lake Isabella DSM Project, Alternative 4.

Cover-Type (All sites)	Area Affected (acres)	AAHUs Without Project	AAHUs With Project	Net Change in AAHUs	Compensation Ratio	Compensation Acres Needed
Sagebrush-Scrub Upland	75.65	0.06	-0.66	-0.72	1.46 : 1.00	110.45 ac
Emergent Wetland	0.30	0.04	-0.02	-0.06	1.00 : 1.00	0.30 ac
Pine-Oak Woodland	31.02	0.22	-0.78	-1.00	1.35 : 1.00	41.88 ac
Agriculture	13.56	N/A	N/A	N/A	Re-seed*	0.00 ac
Valley Grasslands	17.85	N/A	N/A	N/A	Re-seed	0.00 ac
Total						**152.63 ac**

* This report assumes agricultural land will be permanently removed from production.

Sagebrush-Scrub Upland

The remediation activities on the Auxiliary Dam and Borel Canal, the excavation of the Emergency Spillway, and the placement of materials and equipment at the staging areas and Engineer's Point would result in the loss of 75.65 acres of sagebrush-scrub upland habitats in the impacted areas. Using the Ferruginous Hawk HSI model it was determined that this impact could be mitigated by developing 110.45 acres of sagebrush scrub upland habitat.

Emergent Wetland

The remediation of the seepage and the placement of materials and equipment at staging area A-2 in the Auxiliary Dam area would destroy 0.30 acres of emergent wetlands downstream. The Service's mitigation policy for wetland habitat types is to recommend that no net loss of habitat value or acreage results from project activities. Therefore, 0.30 acres of emergent wetland habitat are needed to compensate for the impacts to emergent wetlands due to the project.

Pine-Oak Woodland

The Main Dam remediation actions, the re-alignment of State Routes 178 and 155, and the construction of the Auxiliary Spillway would result in the loss of 31.02 acres of pine-oak woodland habitat in the project area. Using the California Ground Squirrel and Downy Woodpecker HSI Models it was determined that 41.88 acres of pine-oak woodland habitat are needed to compensate for this impact.

All mitigation would occur at the Sprague Ranch conservation area mitigation site located on the South Fork of the Kern River upstream of Lake Isabella near the town of Weldon, California.

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Appendix D:

Habitat Evaluation Procedures

Data Analysis and Assumptions

Lake Isabella Dam Safety Modifications

October 2012

Prepared by:
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DATA ANALYSIS/ASSUMPTIONS
LAKE ISABELLA DAM SAFETY MODIFICATION
KERN COUNTY, CALIFORNIA

EMERGENT WETLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY0- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (88.4%)	SI = 1.00
V3- Mean water depth (7.37 cm)	SI = 0.49
V4- Percent canopy cover woody vegetation (4.6%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.49)^1/3*0.95= 0.51

Pacific Treefrog

TY0- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) / 2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY1- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0
V2- Percent canopy cover emergent herbaceous vegetation (0.0%)	SI = 0
V3- Mean water depth (0.0 in)	SI = 0
V4- Percent canopy cover woody vegetation (0.0 %)	SI = 0

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.0*0.0*0.0)^1/3*0.0= 0.0

Pacific Treefrog

TY1- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.00
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00%)	SI= 0.00
V4- Distance to Water body (300 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.00+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.000

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Marsh Wren

TY50- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0
V2- Percent canopy cover emergent herbaceous vegetation (0.0%)	SI = 0
V3- Mean water depth (0.0 in)	SI = 0
V4- Percent canopy cover woody vegetation (0.0 %)	SI = 0

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.0*0.0*0.0)^1/3*0.0= 0.0

Pacific Treefrog

Pacific Treefrog

TY50 - Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.00
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00%)	SI= 0.00
V4- Distance to Water body (300 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.00+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.000

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 4 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY0- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (88.4%)	SI = 1.00
V3- Mean water depth (2.9 in)	SI = 0.49
V4- Percent canopy cover woody vegetation (4.6%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.49)^1/3*0.95= 0.51

Pacific Treefrog

TY0- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 4 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (95.0 %)	SI = 1.00
V3- Mean water depth (2.0 in)	SI = 0.34
V4- Percent canopy cover woody vegetation (7.0 %)	SI = 0.93

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.34)^1/3*0.93= 0.58

Pacific Treefrog

TY25- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Project Area
Alternative 4 No Action – Future Without the Project

ASSUME:

1. Existing emergent wetland habitat area is 0.30 acres.
2. Emergent wetland habitat will experience little change over a 51 year period.
3. Models are weighted equally.

Marsh Wren

TY50- Baseline (measured*)

V1- Emergent hydrophytes (Category 2)	SI = 0.50
V2- Percent canopy cover emergent herbaceous vegetation (97.0 %)	SI = 1.00
V3- Mean water depth (2.0 in)	SI = 0.34
V4- Percent canopy cover woody vegetation (12.0 %)	SI = 0.88

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.50*1.00*0.34)^1/3*0.88= 0.57

Pacific Treefrog

TY50- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (100.0 %)	SI= 1.00
V3- Percent Stream Gradient (0.66 %)	SI= 1.00
V4- Distance to Water body (6.66 ft)	SI= 0.99

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * .99 = 0.99

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY0- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (10.0 in)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY0- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (00.0 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050 ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY1- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 1.00
V2- Percent canopy cover emergent herbaceous vegetation (25.0%)	SI = 0.05
V3- Mean water depth (10.0 in)	SI = 1.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.97

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*0.05*1.00)^1/3*0.97= 0.36

Pacific Treefrog

TY1- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (25.0 %)	SI= 0.50
V3- Percent Stream Gradient (1.00 %)	SI= 1.00
V4- Distance to Water body (0.00ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 0.50)^1/2 +1.00)) /2) * 1.00 = 0.78

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 1.00
V2- Percent canopy cover emergent herbaceous vegetation (70.0%)	SI = 0.70
V3- Mean water depth (10.0 in)	SI = 1.00
V4- Percent canopy cover woody vegetation (5.0%)	SI = 0.95

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*0.70*1.00)^1/3*0.95= 0.84

Pacific Treefrog

TY25- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (60.0 %)	SI= 1.00
V3- Percent Stream Gradient (1.00 %)	SI= 1.00
V4- Distance to Water body (0.00 ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * 1.00 = 1.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY50- Baseline (measured*)

V1- Emergent hydrophytes (Category 1)	SI = 1.00
V2- Percent canopy cover emergent herbaceous vegetation (82.0%)	SI = 1.00
V3- Mean water depth (10.0 in)	SI = 1.00
V4- Percent canopy cover woody vegetation (8.0%)	SI = 0.92

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(1.00*1.00*1.00)^1/3*0.92= 0.92

Pacific Treefrog

TY50- Baseline (measured*)

V1- Water Permanence (Permanent)	SI= 1.00
V2- Food/ Cover Availability (76.0 %)	SI= 1.00
V3- Percent Stream Gradient (1.00 %)	SI= 1.00
V4- Distance to Water body (1.00ft)	SI= 1.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((1.00+ 1.00)^1/2 +1.00)) /2) * 1.00 = 1.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY0- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (0.00 inch)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY0- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY25- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (0.00 inch)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY25- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

EMERGENT WETLAND
Compensation Area
No Action Alternative – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing a small creek and a canal, but no wetland habitat.
2. Models are weighted equally.

Marsh Wren

TY50- Baseline (measured*)

V1- Emergent hydrophytes (Category 4)	SI = 0.00
V2- Percent canopy cover emergent herbaceous vegetation (75.0%)	SI = 0.00
V3- Mean water depth (0.00 inch)	SI = 0.00
V4- Percent canopy cover woody vegetation (3.0%)	SI = 0.00

HSI=(SIV1*SIV2*SIV3)^1/3*SIV4

HSI=(0.00*0.00*0.00)^1/3*0.00= 0.00

Pacific Treefrog

TY50- Baseline (measured*)

V1- Water Permanence (Intermittent)	SI= 0.70
V2- Food/ Cover Availability (0.00 %)	SI= 0.00
V3- Percent Stream Gradient (0.00 %)	SI= 0.00
V4- Distance to Water body (1050ft)	SI= 0.00

HSI= ((V1+ V2)^1/2 +V3)) /2) * V4

HSI= ((0.70+ 0.00)^1/2 +0.00)) /2) * 0.00 = 0.00

Compensate at 1:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.66
V2- Distance to Water (free water available)	SI = 0.95
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.82
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.93

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.66 + 0.95 + 0.82 + 0.93) / 4 = 0.84

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY1- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will be covered by staging areas and haul routes material and lost permanently for the entire life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.00
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.00
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.00

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.00+ 1.00 + 0.00 + 0.00) / 4 = 0.25

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.66
V2- Distance to Water (free water available)	SI = 0.95
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.82
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.93

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.66 + 0.95 + 0.82 + 0.93) / 4 = 0.84

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY1- Baseline (measured)

V1- Basal Area of trees per acre (76.25 sq ft)	SI = 1.00
V2- Number of Snags (1)	SI = 0.20

HSI = Lowest life requisite value = 0.20

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.85
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.74
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.76

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.85 + 1.00 + 0.74 + 0.76) / 4 = 0.84

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (80.00 sq ft)	SI = 1.00
V2- Number of Snags (2)	SI = 0.40

HSI = Lowest life requisite value = 0.40

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.80
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.90

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.80+ 1.00 + 0.80 + 0.90) / 4 = 0.88

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Pine-oak woodland habitat will remain relatively the same with modest improvement throughout the life of the project.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (80.00 sq ft)	SI = 1.00
V2- Number of Snags (3)	SI = 0.60

HSI = Lowest life requisite value = 0.60

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.80
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.90

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.80+ 1.00 + 0.80 + 0.90) / 4 = 0.88

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.20
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.20

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.20+ 1.00 + 0.30 + 0.20) / 4 = 0.43

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY1- Baseline (measured)

V1- Basal Area of trees per acre (25.00 sq ft)	SI = 0.57
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY1- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.50
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.70
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.70

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.50+ 1.00 + 0.70 + 0.70) / 4 = 0.73

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (40.00 sq ft)	SI = 0.90
V2- Number of Snags (4)	SI = 0.80

HSI = Lowest life requisite value = 0.80

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.70
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.80
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.75

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.70+ 1.00 + 0.80 + 0.75) / 4 = 0.81

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (60.00 sq ft)	SI = 1.00
V2- Number of Snags (5)	SI = 1.00

HSI = Lowest life requisite value = 1.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.90
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.90
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.80

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.90+ 1.00 + 0.90 + 0.80) / 4 = 0.90

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY0- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY0- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.20
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.20

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.20+ 1.00 + 0.30 + 0.20) / 4 = 0.43

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY25- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY25- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.30
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.30

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.30+ 1.00 + 0.30 + 0.30) / 4 = 0.48

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

PINE OAK WOODLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Pine-oak woodland habitat area is 31.02 acres for Alternative 4.
2. Compensation area is currently an actively grazed grassland area, containing no pine-oak woodland habitat.
3. Models are weighted equally.

Downy Woodpecker

TY50- Baseline (measured)

V1- Basal Area of trees per acre (0.00 sq ft)	SI = 0.00
V2- Number of Snags (0)	SI = 0.00

HSI = Lowest life requisite value = 0.00

California Ground squirrel

TY50- Baseline (measured)

V1- Abundance and availability of suitable food (less abundant)	SI = 0.30
V2- Distance to Water (free water available)	SI = 1.00
V3- Presence of Cover (Grasses and Forbs <1 ft)	SI = 0.30
V4- Interspersion of open area with promontories (Well scattered)	SI = 0.30

HSI = (V1 + V2 + V3 + V4) / 4

HSI = (0.30+ 1.00 + 0.30 + 0.30) / 4 = 0.48

Compensate at 1.35:1 ratio.

* The habitat values were measured at Year 0.

SAGEBRUSH-SCRUB SCRUBLAND
Project Area
Alternative 4 – Future With the Project

ASSUME:

1. Existing sagebrush-scrub cover type is 75.65 acres.
2. Sagebrush-scrub habitat will be covered by the new dam footprint, staging areas, and haul routes and lost permanently for the entire life of the project.
3. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
4. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}

for values where

48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY1-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00
TY25-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00
TY50-	Estimated	HSI=0.00
	V1- Summer height of herbaceous and shrub layer (0 inches)	SI = 0.00
	V2- Percent herbaceous and shrub cover (0.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (0%)	SI = 0.00

Compensate at 1.46:1 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Project Area
No Action – Future Without the Project

ASSUME:

1. Existing sagebrush-scrub cover type is 75.65 acres.
2. Sagebrush-scrub habitat will remain relatively the same with modest improvement over the life of the project.
3. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
4. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY1-	Estimated	HSI=0.67
	V1- Summer height of herbaceous and shrub layer (20 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (87%)	SI = 1.00
TY25-	Estimated	HSI=0.72
	V1- Summer height of herbaceous and shrub layer (21 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (45.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00
TY50-	Estimated	HSI=0.78
	V1- Summer height of herbaceous and shrub layer (22 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (48.0%)	No SI**
	V4- Topographic diversity (D - mountainous)	SI = 0.00
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00

Compensate at 1.46:1 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Compensation Area
Alternative 4 – Future With the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing no sagebrush-scrub upland habitat.
2. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
3. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 1.00
TY1-	Estimated	HSI=0.90
	V1- Summer height of herbaceous and shrub layer (16 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (90.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.0
	V6- Percent area in equivalent optimum food (90%)	SI = 1.00
TY25-	Estimated	HSI=0.94
	V1- Summer height of herbaceous and shrub layer (18 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (90.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (94%)	SI = 1.00
TY50-	Estimated	HSI=0.96
	V1- Summer height of herbaceous and shrub layer (18 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (91.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (96%)	SI = 1.00

Compensate at 1.46:1 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

SAGEBRUSH-SCRUB SCRUBLAND
Compensation Area
No Action – Future Without the Project

ASSUME:

1. Compensation area is currently an actively grazed grassland area, containing no sagebrush-scrub upland habitat.
2. The maximum height of vegetation above which any food value is 0.0 is assumed to be 48 inches.
3. The height of vegetation at which optimum food values occur at 100% canopy cover is 6 inches.

Ferruginous Hawk

HSI= Food SI * Reproduction SI * V6

Where:

Food SI = SI_{V1} * Sin {(360*48*V2)/[400*(48-V1-6)]}
for values where
48*V2/(48-V1-6) ≤ 200 (Food SI = 0 if value is > 200)

and

Reproduction SI = SI_{V4} + SI_{V5} with a maximum value of 1.00

(V3 – Size of cropland – removed from the model because no cropland exists.)

TY0-	Baseline (measured*)	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY1-	Estimated	HSI=0.26
	V1- Summer height of herbaceous and shrub layer (8 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY25-	Estimated	HSI=0.27
	V1- Summer height of herbaceous and shrub layer (10 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53
TY50-	Estimated	HSI=0.29
	V1- Summer height of herbaceous and shrub layer (11 inches)	SI = 1.00
	V2- Percent herbaceous and shrub cover (55.0%)	No SI**
	V4- Topographic diversity (B – generally flat)	SI = 0.20
	V5- Distance to vegetation ≥ 1 meter (3.3 feet) in height (0.5 miles)	SI = 1.00
	V6- Percent area in equivalent optimum food (40%)	SI = 0.53

Compensate at 1.46:1 ratio.

* The habitat values were measured at Year 0.

** No Suitability Index is calculated. The percent cover variable (V2) along with shrub height is used to calculate the "Food" Suitability Index.

Appendix E:

Habitat Suitability Index Models

Lake Isabella Dam Safety Modifications

October 2012

Pt♠

FWS/OBS-82/10.10
February 1982

HABITAT SUITABILITY INDEX MODELS: FERRUGINOUS HAWK

by

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Washington, D.C. 20240

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that follow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

Habitat Evaluation Procedures Group
Western Energy and Land Use Team
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2625 Redwing Road
Ft. Collins, CO 80526

CONTENTS

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FERRUGINOUS HAWK (Buteo regalis)

HABITAT USE INFORMATION

General

The ferruginous hawk inhabits grasslands, shrublands, and steppe-deserts of the Western United States. It is a common nester in Colorado, Idaho, Montana, Utah, and Wyoming (Call 1978). Populations in the more Northern States tend to be migratory, spending the winter in New Mexico, Colorado, Kansas, Texas, and Oklahoma (Call 1979).

Ferruginous hawks thrive in areas that favor the production of rabbits (Lagomorpha), prairie dogs (Cynomys spp.), or ground squirrels (Citellus spp. and Spermophilus spp.) (Call 1979), provided that suitable nesting sites are available. Foraging habitat consists of nonforested, nonmountainous areas, such as desert shrub and grassland communities. Nesting habitat consists of communities with isolated trees, woodland edges, buttes, cliffs, and/or grassland with some relief.

Food

Analysis of prey items collected from nests in many studies indicate that jackrabbits (Lepus spp.) often constitute the most important prey item, based on biomass (Weston 1969; Platt 1971; Smith and Murphy 1973; Howard 1975; Howard and Wolfe 1976; Woffinden and Murphy 1977; Thurow et al. 1980). In some of these studies, analysis of prey items was based not only on prey biomass but also on percent frequency of occurrence. For instance, the northern pocket gopher (Thomomys talpoides) was the most frequent prey item in Howard's study (1975) conducted in northern Utah and southern Idaho, whereas the Ord's kangaroo rat (Dipodomys ordii) was most frequent in the studies conducted in Utah by Weston (1969) and Woffinden and Murphy (1977). In some studies, prey species other than jackrabbits were most important, based on biomass. Thirteen-lined ground squirrels (Spermophilus tridecemlineatus) comprised 41% of the prey biomass in Colorado (Olendorff 1973). In South Dakota, the Richardson's ground squirrel (Spermophilus richardsonii) comprised 68% of the total prey biomass (Lokemoen and Duebbert 1976). In all of the study areas listed above, however, jackrabbits remained an important, if not the most important, prey item. Other known prey items include desert cottontails (Sylvilagus audubonii), antelope squirrels (Ammospermophilus spp.), deer mice (Peromyscus maniculatus), and passerine birds (Weston 1969).

Significant fluctuations in raptor densities may be an indication of the abundance and diversity of prey species (Howard and Wolfe 1976). This predator-prey relationship seems to exist in certain ferruginous hawk populations. A decline in ferruginous hawk numbers in Utah was directly correlated with a drop in the jackrabbit population (Woffinden and Murphy 1977; Smith et al. 1981). Ferruginous hawk fledgling success and nesting densities in southern Idaho and northern Utah were closely correlated with the cyclic black-tailed jackrabbit (Lepus californicus) population (Thurow et al. 1980).

Fluctuations of small mammal populations often are caused by intrinsic factors that have little relationship to habitat suitability (Odum 1971). Although manipulation of these cyclic populations is not normally possible, range management practices that result in ranges in good condition that will support abundant and diverse prey may provide suitable food alternatives to predators, such as the ferruginous hawk, during periods of jackrabbit decline (Call 1979). The nesting success of some populations of ferruginous hawks in Utah, where jackrabbit numbers declined dramatically, was attributed to the presence of a broad prey base (Woffinden and Murphy 1977). Ground squirrels were the major prey for immature ferruginous hawks in southern Idaho and northern Utah during midsummer when jackrabbit availability became limiting (Thurow et al. 1980).

Land management practices that dramatically alter the density and structure of native vegetation can adversely affect jackrabbit and alternate prey populations, resulting in a reduction of breeding ferruginous hawks. For example, conversion of extensive tracts of brushland and native vegetation to either agriculture or monotypic fields of grass is particularly disruptive to the production of both jackrabbits and cottontails because they survive best in mixtures of brush and grassland types (Call 1979). It is also disruptive to ground squirrels and other rodents (Murphy 1978). However, moderate amounts of rangeland and agricultural land support colonization by pocket gophers and ground squirrels, which may provide alternate prey species for the ferruginous hawk.

Areas providing an interspersion of tall cover and open spaces are preferred by jackrabbits (Taylor and Lay 1944; Lechleitner 1958). Jackrabbits are normally associated with areas that have shrubs at least 0.6 m (2 ft) tall (Orr 1940) and use this shrub cover for hiding and resting (Bear and Hansen 1966). Black-tailed jackrabbits fed primarily on grasses during spring and summer in Idaho, whereas in fall the diet was comprised primarily of forbs and shrubs (Fagerstone et al. 1981).

Ferruginous hawks usually hunt by flying low over open fields, seldom rising more than a few feet above the ground (Weston 1969). They normally hunted in sagebrush-grassland areas in Utah (Smith and Murphy 1973). Habitat use by foraging raptors is sometimes, but not always, a function of prey density. Studies have shown that raptors often forage over areas where cover conditions make prey more vulnerable (Craighead and Craighead 1956; Wakeley 1978). Thus, an area supporting many concealed prey individuals may be less important to raptors than an area supporting a few vulnerable individuals. Although overgrazed areas temporarily may provide vulnerable prey, it is unlikely that such areas will support an adequate prey base for a long period of time (Call 1979).

Water

Water does not appear to be limiting to the ferruginous hawk (Bartholomew and Cade 1963). Most water is supplied by the metabolic process of digesting food.

Cover

Cover for concealment does not appear to be limiting to the ferruginous hawk. On the plains of Colorado, ferruginous hawks used fence posts, telephone poles, and dead trees as perch sites (Marion and Ryder 1975).

Reproduction

The ferruginous hawk is a versatile nester, using isolated trees, cliffs, buttes and cutbanks, manmade structures, ground locations, and trees in the juniper-sagebrush ecotone. Of 71 nests on the plains of Colorado, 69% were in trees, 11.3% on erosional remnants, 5.6% on the ground, 5.6% on cliffs, 5.6% on creek banks, and 2.9% on manmade structures (Olendorff 1973). Most ferruginous hawk nesting studies indicate a preference for tree nests (Olendorff 1973; Powers et al. 1973; Smith and Murphy 1973; Howard 1975; Lokemoen and Duebbert 1976; Thurow et al. 1980). Despite the abundance of potential ground nest sites (Call 1979), the ferruginous hawk is vulnerable to tree removal management practices (Platt 1971; Howard 1975; Woffinden 1975; Murphy 1978; Call 1979). Peripheral trees should be left throughout the treatment area during tree removal and chaining operations to provide nest sites (Howard and Wolfe 1976). Tree nests provide protection from ground predators (Fitzner et al. 1977) and shade for nestlings (Tomback and Murphy 1981).

Ground nests in southern Idaho and northern Utah were constructed in areas of rangeland where no suitable nest trees were available (Thurow et al. 1980). They were usually located near a small hill. Typical nest locations of ferruginous hawks in pristine North Dakota prairies were on the ground, usually on hilltops (Rolfe 1896 cited by Lokemoen and Duebbert 1976). Knolls were preferred nesting sites in Utah and were heavily utilized (Smith and Murphy 1973). Ground nests in South Dakota were always located in prairies with tall herbaceous cover or prairies that were in a lightly grazed condition (Lokemoen and Duebbert 1976).

Ferruginous hawks accept both modified and completely artificial nest structures (Call 1979). Use of manmade structures for nesting appears to occur most often when natural nesting substrates are scarce or unavailable, such as in deserts, grasslands, and areas with few shrubs or trees.

Juniper (*Juniperus* spp.) is most commonly used for tree nesting, but pine (*Pinus* spp.), willow (*Salix* spp.) (Williams and Matteson 1947), cottonwoods (*Populus* spp.) (Olendorff 1973), and sagebrush (Smith and Murphy 1973) have been used. The nest may be located as high as 12 m (40 ft) from the ground (Call 1978), but is usually 2 to 3 m (6 to 10 ft) from the ground (Weston 1969). Steep-sided canyons and pinyon-juniper woodland interiors were usually avoided as nesting areas in Utah, probably due to the low abundance of lagomorphs (Smith and Murphy 1973). Tree nests were located in cropland in South Dakota, but were always close to undisturbed prairie (Lokemoen and Duebbert 1976). Olendorff (1973) contends that cultivation is detrimental to ferruginous hawk nesting populations.

Interspersion

The juniper-sagebrush ecotone is commonly used habitat by the ferruginous hawk in the semi-arid Western United States (Powers et al. 1973; Smith and Murphy 1973; Thurow et al. 1980). Wooded foothills interspersed with valleys and large desert expanses provide optimal nesting sites because of the combination of human inaccessibility, remoteness, and ease of surveillance of the surrounding area (Smith and Murphy 1973). While most nests were constructed in junipers and the perimeters of the valley foothills, home ranges extended into the desert, the principal hunting area of the ferruginous hawk.

Ferruginous hawks generally nest within a short distance of their food supply (Smith and Murphy 1973). Average territory size of ferruginous hawks is 2.6 to 7.7 km^2 (1 to 3 mi^2), with a diameter of 1.6 to 4 km (1 to 2.5 mi) (Call 1978). Hunting forays of nine adults on the Utah-Idaho border were usually less than 0.8 km (0.5 mi) from the nest site, but extended up to 1.9 km (1.2 mi) (Howard and Wolfe 1976). Home range diameters averaged from 3.2 to 3.4 km (2 to 2.1 mi), with minimum and maximum diameters of 2.4 km (1.5 mi) and 4.2 km (2.6 mi), respectively.

Special Considerations

The ferruginous hawk is sensitive to human disturbance and, consequently, is prone to nest desertion (Olendorff and Stoddart 1974; Fyfe and Olendorff 1976; Woffinden and Murphy 1977). Human disturbance and habitat alteration are the two factors considered most responsible for the decline of the ferruginous hawk throughout its range (Thurow et al. 1980).

Due to their sensitivity to human disturbance, ferruginous hawks rarely nest near well traveled roads or extensive cultivation (Weston and Ellis 1968; Olendorff 1973). They avoid pure grassland areas with no trees. The problem of damage to isolated trees by animals seeking shade and rubbing posts can be alleviated by erecting artificial nest structures and protecting trees by constructing fenced enclosures.

Vegetation management for ferruginous hawks should emphasize maximizing the amount of edge and interspersion (Howard and Wolfe 1976). Where crested wheatgrass plantings are planned, a minimum of 20% of the area should be left in scattered islands of shrubby vegetation.

The ferruginous hawk has been on the Blue List of declining birds for the last 10 years (Tate 1981). The presence of the ferruginous hawk on this list has been attributed to its intolerance of disturbances during the breeding season and habitat loss through overgrazing and conversion of feeding areas to agricultural use.

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for the area encompassing the principal breeding range of the species. This area, which is north of Arizona

and New Mexico, is semi-arid land classified by Bailey (1978) as the dry domain.

Season. This model will produce HSI values based upon breeding habitat needs for the ferruginous hawk.

Cover types. The ferruginous hawk, like most raptors, is opportunistic and utilizes several cover types. Some cover types are more suitable than others, but all of the following are utilized to some degree: Grassland (G); Pasture and Hayland (P/H); Forbland (F); Cropland (C); Desertic Woodland (DeW); Desertic Shrubland (DeS); Desertic Herbland (DeH); Evergreen Shrubland (ES); Deciduous Shrubland (DS); Evergreen Shrub Savanna (ESS); Deciduous Shrub Savanna (DSS) (U.S. Fish and Wildlife Service 1981).

Mountainous areas and the interior of forested areas are not used by the ferruginous hawk. Although forested areas are not considered as a useable cover type, ferruginous hawks will nest in trees and large shrubs along the edge of forests and wooded areas that are adjacent to "open" areas.

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous suitable habitat that is required before an area will be occupied by a particular species. This information was not found in the literature for the ferruginous hawk. If local information is available to define the minimum habitat area, and less than this amount of area is available, the HSI for the species will be zero.

Verification level. This model was critiqued by Joseph R. Murphy, Ph.D., Brigham Young University, and Richard P. Howard, U.S. Fish and Wildlife Service. Murphy concluded that this model is as reasonable as can be expected, given the fact that field tests have not been completed (Murphy, pers. comm). Howard concluded that this model accurately reflects the biological realities of the ferruginous hawk, contains reasonable assumptions, and displays a mathematical index which is flexible enough to subtract or add variables for more precise adjustments (Howard, pers. comm). Comments from both reviewers have been incorporated into the current model.

Model Description

Overview. The HSI model for the ferruginous hawk considers the quality of the life requisites in each cover type and interspersion of life requisites when the habitat is composed of two or more cover types. Figure 1 illustrates how the HSI is related to cover types, life requisites, and specific habitat variables. Food and reproduction needs of the ferruginous hawk are considered in this model. It is assumed that water and cover resources will never be more limiting than food and reproduction.

In the following life requisite sections, the rationale for developing the model is presented. Specifically, these sections cover the following: (1) identification of variables used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationships between variables.

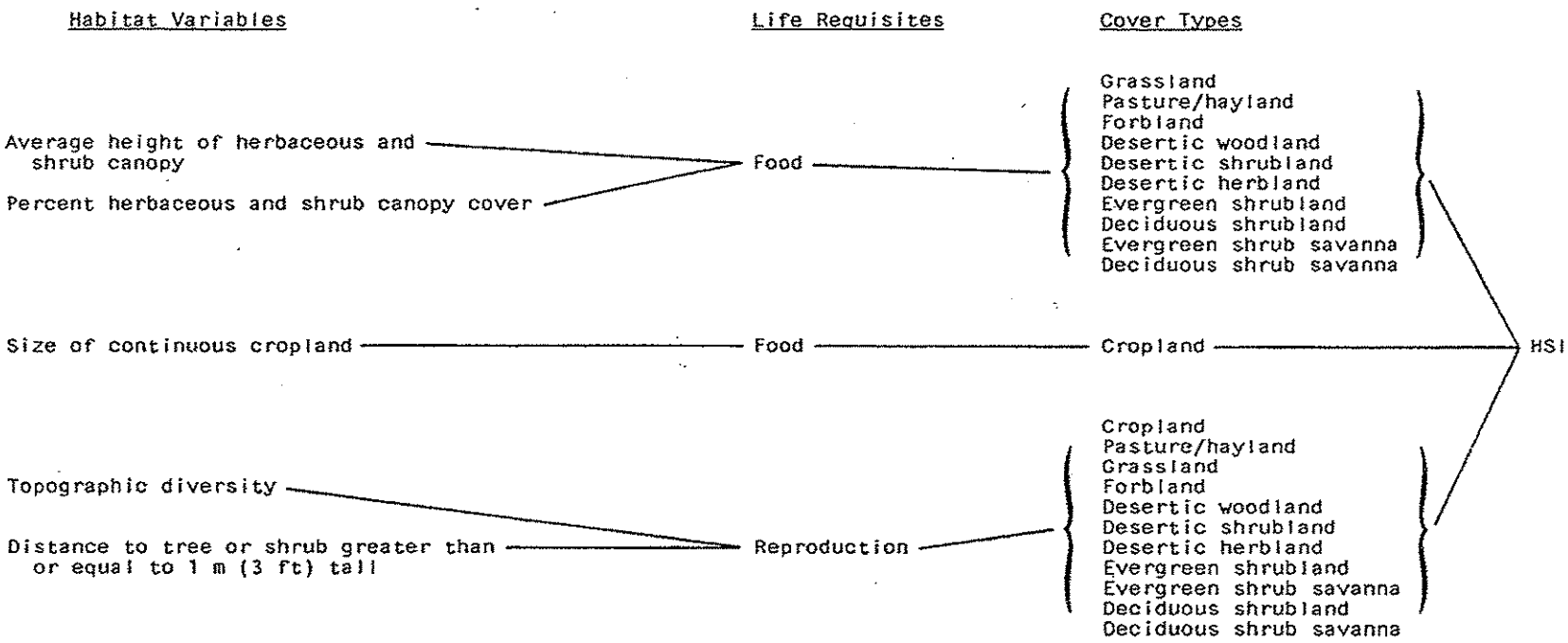


Figure 1. Relationships of habitat variables, life requisites, and cover types in the ferruginous hawk model.

Food component. Food suitability for the ferruginous hawk is related to the availability of suitable prey. This relationship is based on the premise that optimum conditions for prey do not necessarily reflect optimum conditions for the predator. For this reason, coupled with the fact that the ferruginous hawk hunts several prey species, a general approach to modeling food suitability for this raptor is presented. Food suitability in all cover types other than cropland is determined by assessing both the abundance and accessibility of prey, as determined by the height and density of the vegetation.

The abundance of major prey species is assumed to be related to the volume and structure of both herbaceous and shrub vegetation. The accessibility of prey is related to the level of concealment provided for prey by the vegetation and the degree of access by the hawk to all huntable areas. Food suitability for the ferruginous hawk is optimum when the vegetation occurs at a mix of heights and densities which optimizes prey abundance and minimizes hunting interference.

It is also assumed that very dense, tall vegetation will provide abundant prey, but very poor accessibility for the ferruginous hawk. Vegetation that is low and very dense will provide lower levels of prey abundance but increased accessibility. For this model, it is assumed that optimum vegetation heights occur when the average height of herbaceous and shrub vegetation is between 15 and 60 cm (6 and 24 in). It is further assumed that suitability will decrease as average vegetation heights approach both 0 and 120 cm (0 and 48 in).

Optimum food suitabilities are assumed to occur at different combinations of average vegetative heights and densities (Fig. 2). Habitats with average vegetative heights of 15 cm (6 in) will provide optimum food when vegetative densities approach 100% canopy cover. Habitats with vegetation heights increasing to 60 cm (24 in) will provide optimum food at successively lower densities, down to an average canopy closure of 60%. Vegetative densities less than 60% canopy closure will always be less than optimum.

A major assumption of this model is that the average vegetative height and density conditions in a particular habitat actually reflect a mix of individual heights and densities, and not a uniform, homogeneous condition. Optimum prey abundance and accessibility are assumed to occur in this mixed, or more structurally diverse, conditon. The average condition is more readily measured or estimated in the field, and hence is the variable included in this model.

Food suitability in cropland cover types is related to the size of each contiguous unit of cropland. Prey species often use croplands as a food source, provided that adequate cover is nearby. It is assumed that prey abundance will decrease as the cropland size increases, due to the decreasing amount of nearby cover in larger cropland fields. Small croplands [less than 16 ha (40 ac)] are assumed to provide the best conditions, while croplands larger than 128 ha (316 ac) are assumed to be of very low suitabilities. Due to the frequency of disturbance and cultivation, croplands in the best condition are assumed to be only half as valuable as noncroplands in the best condition.

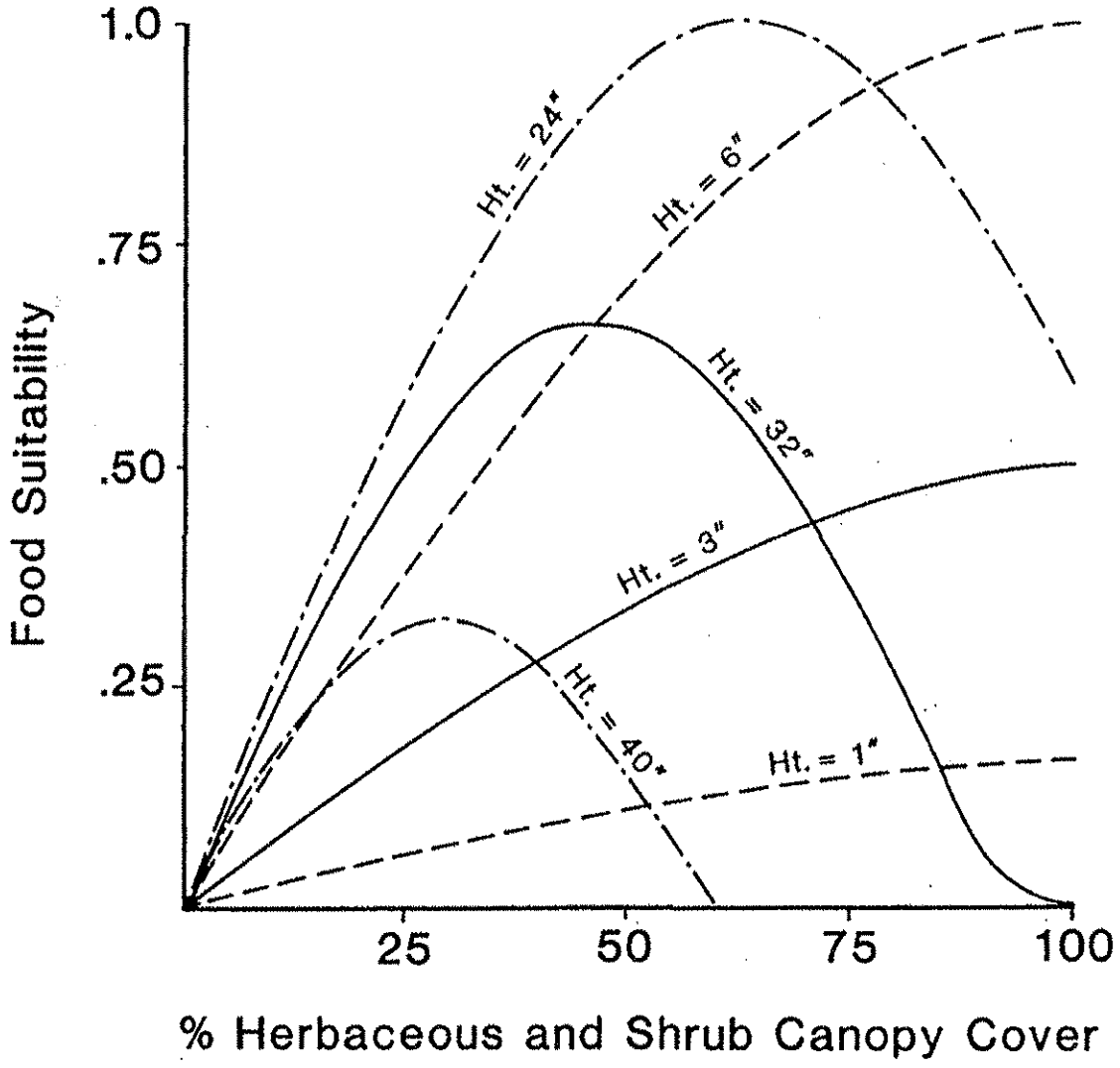


Figure 2. The relationship of percent of vegetative canopy cover and vegetative height, to food suitability for the ferruginous hawk. Individual curves show the change in suitability for the particular height class indicated on the curve.

Reproduction component. Reproductive suitability for the ferruginous hawk is related to the availability of nesting sites. It is assumed that the availability of suitable nest sites can be adequately assessed by measuring the suitability of potential ground nesting sites and the abundance of trees and large shrubs.

The availability of trees or large shrubs is considered to be the most important factor for nesting. It is assumed that the presence of a tree or large shrub within a distance of 1.6 km (1.0 mi) of random sample points will provide optimum nesting conditions, whereas the lack of shrubs or trees within 4.8 km (3.0 mi) will not contribute any value to reproductive requirements. Shrubs $\geq$ 1 m (3.3 ft) in height are considered large enough to support the large bulky nest of the ferruginous hawk.

Suitability of ground nests is assumed to be related to topography. Ferruginous hawks appear to favor elevated sites for nesting, be it ground, cliff, or tree nests. Ground nests described in the literature were usually associated with rolling terrain, where nests could be situated on hills, knolls, or rims. Areas that are flat, with no breaks in topography to provide ground nest sites, will not be suitable unless trees or shrubs are present. Mountainous areas with slopes exceeding 25% are assumed to be unsuitable for ferruginous hawks regardless of the presence of trees or shrubs. Areas with rolling terrain provide optimum ground nest sites, however, it is assumed that the best ground nest sites will only provide one-half the suitability of the best conditions for tree or shrub nests.

Overall reproductive value is assumed to be equal to the combined suitabilities of the variables for topography, and shrubs and trees.

Special habitat component. Ferruginous hawks are highly sensitive to human disturbance during the nesting season. Habitat alteration due to agricultural development and direct human disturbance are the two factors believed to be most responsible for the decline of the ferruginous hawk throughout its range. It is difficult to accurately quantify the effects of human disturbance. Habitat evaluations for the ferruginous hawk should take into account the nature, length, location, and season of any human disturbances. Overall habitat quality values will be lower in areas where significant human disturbances are likely to occur.

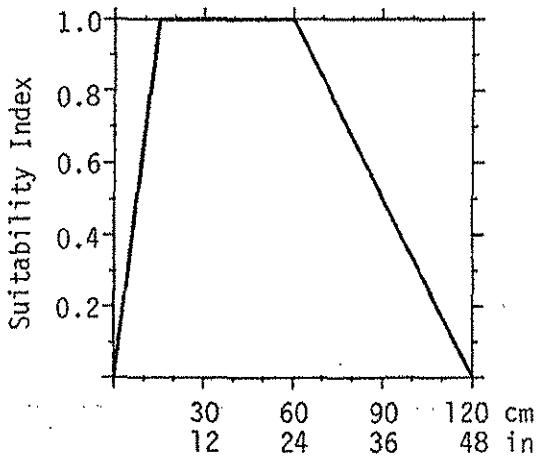
Interspersion component. It is assumed that the best habitat for the ferruginous hawk contains high quality food over 75% of the habitat. This estimate is based on data that indicate that ferruginous hawks generally hunt over large portions of their home range. High quality food is not required over 100% of the area because the effective hunting range is usually smaller than the home range, i.e., hunting activities are concentrated in areas where prey capture rates are highest.

Interspersion of nesting sites is addressed in the variable for distance to a tree or shrub and subjectively considered in the topographic variable. Low reproduction values will thus indicate a poor interspersion of nest sites and indicate that effectively less of the habitat is useable by the ferruginous hawk.

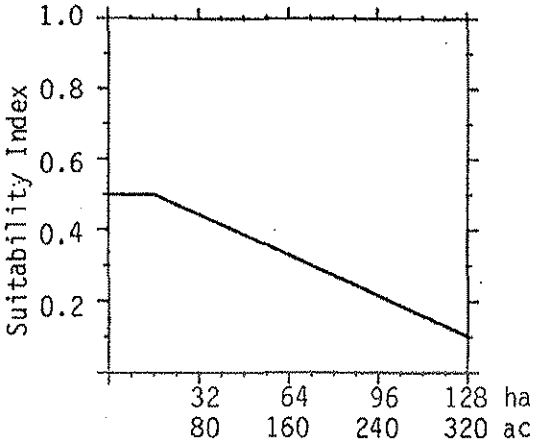
Model Relationships

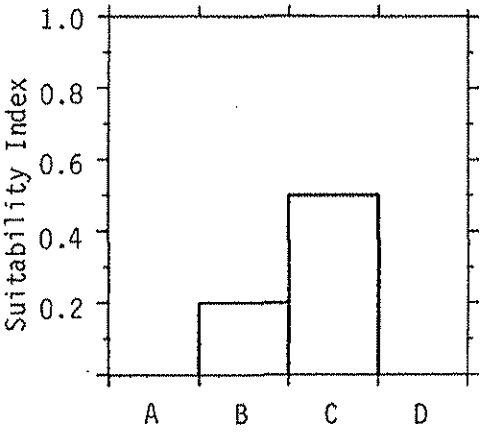
Suitability Index (SI) graphs for habitat variables. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

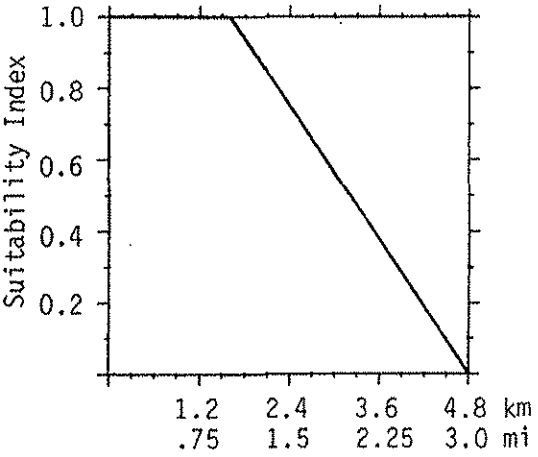
Cover type	Variable	
G,P/H,F,DeW, DeS,DeH, ES,DS, ESS,DSS	(V_1)	Average height of herbaceous and shrub canopy (summer).



G,P/H,F,DeW, DeS,DeH, ES,DS, ESS,DSS	(V_2)	Percent herbaceous and shrub canopy cover.	Note: No SI graph is needed. The actual percent of cover should be incorporated into the proper equation in Figure 3.

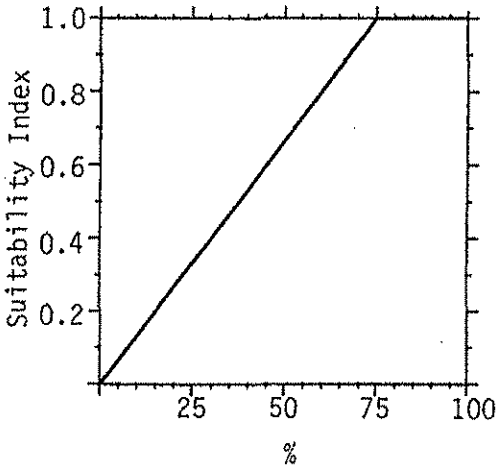
C	(V_3)	Size of continuous cropland.	

C,P/H,G, F,DeW,DeS, DeH,ES,DS, ESS,DSS	(V_4)	Topographic diversity. A) Flat terrain, no hills or breaks in topography B) Generally flat terrain, with scattered hills or breaks in topography C) Rolling terrain with frequent breaks in topography D) Mountainous terrain, > 25% slope	

C,P/H,G, F,DeW,DeS, DeH,ES,DS, ESS,DSS	(V_5)	Distance to tree or shrub ≥ 1 m (3.3 ft) tall.	

Suitability Index (SI) graphs for interspersion variables. This section contains curves used in computing the overall life requisite value for food.

Cover type	Variable	
C,P/H,G, F,DeW,DeS, DeH,ES,DS, ESS,DSS	(V_6)	Percent area in equivalent optimum food.



Equations. In order to determine life requisite values for the ferruginous hawk, the SI values for appropriate variables must be combined through the use of equations. A discussion and explanation of the assumed relationships between variables was included under Model Description, and the specific equations in this model were chosen to mimic these perceived biological relationships as closely as possible. The suggested equations for obtaining life requisite values are presented in Figure 3.

HSI determination. Determination of an HSI for a multicover type user involves consideration of both habitat variables and interspersion variables. Several steps and calculations are necessary in order to properly determine an HSI score. They are as follows:

1. Compute the food and reproduction values for each cover type by collecting field data for each variable by cover type and entering this data into the proper suitability index curve. The resulting index values are used in the appropriate life requisite equations.

Life requisite	Cover types	Equation
Food	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS,DSS	$\text{Food} = V_1 \times \text{SIN} \frac{360 \times (P1 \times CC\%)}{400 \times [P1-(HT-P2)]}$ for values of $\frac{P1 \times CC\%}{P1-(HT-P2)} \leq 200$ Food = 0.0 for values of $\frac{P1 \times CC\%}{P1-(HT-P2)} > 200$ Where: V_1 = SI value from graph for V_1 CC% = % herbaceous and shrub canopy cover HT = Average height of herbaceous and shrub vegetation P1 = Height of vegetation above which food value is zero for any value of canopy closure [= 120 cm (48 in) for this model, SI of 0.0 on graph for V_1]. P2 = Height of vegetation at which optimum food values occur at 100% canopy cover [≐ 15 cm(6 in) for this model, SI of 1.0 on graph for V_1].
Food	C	V_3
Reproduction	C,P/H,G,F, DeW,DeS,DeH, ES,DS,ESS,DSS	$\min(1, V_4 + V_5)$

Note: See Special Habitat Component discussion on p. 9 for effects of human disturbance.

Figure 3. Equations to determine life requisite values by cover type for the ferruginous hawk.

2. Determine the relative area (%) of each cover type within the study area as follows:

$$\text{Relative area (\%) for cover type A} = \frac{\text{Area of cover type A}}{\text{Total area of all cover types used by the species}} \times 100$$

Be certain that you consider only those cover types used by the species in determining this percentage.

3. Determine the percent of the area in the equivalent of optimum food by multiplying the food value for each cover type by the relative area (%) of that cover type. Sum these values, and enter this percent into the food composition suitability graph (V_6) to obtain an overall food index.

4. Multiply the reproduction value in each cover type by the relative area (%) of that cover type and sum these values to obtain an overall reproduction index. This index value accounts for the interspersion of nest sites. A low reproduction value will indicate poor interspersion of nest sites and will mean that effectively less of the total habitat is useable by the ferruginous hawk.

5. The HSI is determined by multiplying the food index by the reproduction index. This will take into account the quality, quantity, and distribution of the food and reproduction life requisites.

Application of the Model

If it is desirable to decrease the cost and amount of time necessary to apply this model, it is recommended that the reproductive value be estimated or assumed to be not limiting. This recommendation is based on the following two reasons. First, it is assumed that reproductive value is easier and more accurately estimated using subjective methods than is food value. The variables used to measure food value are more indirect than those used to measure reproductive value, which reflects the tangible nature of nest site characteristics and the difficulties involved with measuring prey abundance and prey accessibility. Second, it is assumed that food will usually be more limiting than reproduction because the ferruginous hawk is such a versatile nester.

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 4.

Variable (definition)	Cover types	Suggested technique
(V_1) Average height of herbaceous and shrub canopy (summer) (the average height from the ground surface to the dominant height stratum of the vegetative canopy).	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS, DSS	Line intercept and graduated rod
(V_2) Percent herbaceous and shrub canopy cover (the percent of the ground surface that is shaded by a vertical projection of herbaceous and shrub vegetation).	G,P/H,F,DeW,DeS, DeH,ES,DS,ESS, DSS	Line intercept and Daubenmire plot
(V_3) Size of continuous cropland (the average size of each contiguous block of cropland)	C	Aerial photograph and dot grid
(V_4) Topographic diversity (the most prevalent and characteristic topographic feature present).	C,P/H,G,F,DeW, DeS,DeH,ES,DS, ESS,DSS	Ocular estimate or aerial photograph
(V_5) Distance to tree or shrub ≥ 1 m (3.3 ft) tall (the distance from random points to the nearest tree or shrub, including the edge of shrub or forested cover types).	C,P/H,G,F,DeW, DeS,DeH,ES,DS, ESS,DSS	Aerial photograph, dot grid

Figure 4. Definitions of variables and suggested measurement techniques.

SOURCES OF OTHER MODELS

No other habitat models for the ferruginous hawk were located.

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

Habitat preferences and species characteristics of the ferruginous hawk (Buteo regalis) are described in this publication. It is one of a series of Habitat Suitability Index (HSI) models and was developed through an analysis of available scientific data on the species-habitat requirements of the ferruginous hawk. Habitat use information is presented in a review of the literature, followed by the development of a HSI model. The model is presented in three formats: graphic, word and mathematical. Suitability index graphs quantify the species-habitat relationship. These data are then synthesized into a model which is designed to provide information for use in impact assessment and habitat management activities.

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Habitat Suitability

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Ferruginous hawk, Buteo regalis,
Habitat Suitability Index, Habitat

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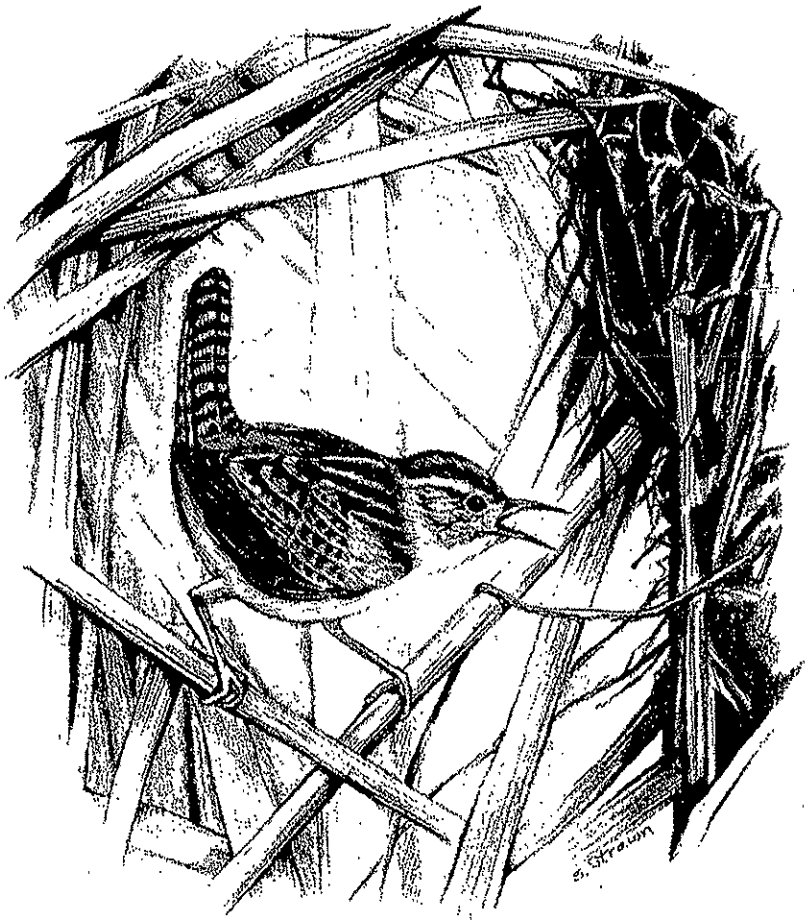
HABITAT SUITABILITY INDEX MODELS: MARSH WREN



Fish and Wildlife Service

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HABITAT SUITABILITY INDEX MODELS: MARSH WREN

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PREFACE

This document is part of the Habitat Suitability Index (HSI) model series [Biological Report 82(10)], which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. This information provides the foundation for the HSI model and may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model section documents the habitat model and includes information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The HSI Model section includes information about the geographic range and seasonal application of the model, its current verification status, and a list of the model variables with recommended measurement techniques for each variable.

The model is a formalized synthesis of biological and habitat information published in the scientific literature and may include unpublished information reflecting the opinions of identified experts. Habitat information about wildlife species frequently is represented by scattered data sets collected during different seasons and years and from different sites throughout the range of a species. The model presents this broad data base in a formal, logical, and simplified manner. The assumptions necessary for organizing and synthesizing the species-habitat information into the model are discussed. The model should be regarded as a hypothesis of species-habitat relationships and not as a statement of proven cause and effect relationships. The model may have merit in planning wildlife habitat research studies about a species, as well as in providing an estimate of the relative suitability of habitat for that species. User feedback concerning model improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning are encouraged. Please send suggestions to:

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FIGURES

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We thank Michael J. Armbruster, Herbert W. Kale, II, and Jared Verner for reviewing an earlier draft of this model and providing valuable suggestions for improvement. The cover of this document was illustrated by Susan Strawn. Word processing was provided by Carolyn Gulzow, Dora Ibarra, Elizabeth Graf, and Trish Gillis.

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MARSH WREN (Cistothorus palustris)

HABITAT USE INFORMATION

General

The marsh wren (Cistothorus palustris) is a locally abundant breeding bird in freshwater and saltwater marshes throughout much of the United States and southern Canada (Bent 1948; Robbins et al. 1966). Marsh wrens winter in Mexico and on the gulf coast as far east as western Florida. In some maritime and southern climates, where marshes do not freeze over, marsh wrens are year-round residents (Bent 1948; Verner 1965; American Ornithologists' Union 1983).

Food

Insects and spiders are taken by marsh wrens from marsh vegetation, the marsh floor, and by flycatching. Insect orders commonly taken include Coleoptera, Diptera, Hemiptera, and Odonata. Carabidae and Dytiscidae dominate within Coleoptera, whereas Tipulidae composes most of the Diptera in marsh wren diets (Bent 1948; Kale 1964).

Food items brought to young depend on the age of the nestlings. Mosquitoes (Culicidae) and their larvae, midges (Chironomidae), larval tipulids, and other delicate stages of various insects are fed first. Later, as the nestlings mature, larger forms, such as ground beetles, diving beetles, long-horned beetles (Coleoptera), caterpillars (Lepidoptera), and sawflies (Hymenoptera), are brought to the young (Welter 1935).

Water

Marsh wrens living in salt marshes are apparently able to get sufficient dietary water from succulent insects and spiders (Kale 1967). We found no discussion in the literature of dietary water needs or water procurement techniques for marsh wrens breeding in freshwater environments. Marsh wrens bathe in saltwater and freshwater, but they apparently only drink freshwater (Kale 1967). Water also protects nests from predation and supports an important food source (arthropods) (Verner and Engelsen 1970).

Cover

Cover needs of the marsh wren are assumed to be the same as reproduction habitat needs and are discussed in the following section.

Reproduction

Marsh wrens typically nest in cattails (Typha spp.), bulrushes (Scirpus spp.), or sedges (Carex spp.). Other plants frequently present in nesting habitats include horsetails (Equisetum spp.), bluejoint reedgrass (Calamagrostis canadensis), reed canarygrass (Phalaris arundinacae), cordgrasses (Spartina spp.), annual wildrice (Zizania aquatica), spirea (Spiraea spp.), needle rush (Juncus roemerianus), and American mangrove (Rhizophora mangle) (Welter 1935; Bent 1948; Kale 1965; Verner 1965; Clapp and Abbott 1966).

This species typically nests in marshes where water depths range from several centimeters to 61 to 91 cm (Bent 1948). Marsh wrens usually do not nest in areas without some standing water (Verner and Engelsen 1970). In intertidal areas, however, nests are built in marshes where standing water may be present only during high tides or during periods of spring tides (H.W. Kale, Florida Audubon Society, Maitland, FL; letter dated August 11, 1985). Further, marshes that dry out by mid to late summer have been used successfully by nesting marsh wrens (Verner 1965), but permanent water through the breeding season is generally required to supply a dependable food source and security from predation (Verner and Engelsen 1970). Marsh wrens construct various layers of their nests with water-soaked vegetation that they obtain from the marsh (Welter 1935; Verner 1965).

Nests are normally anchored at least 38.1 cm above the ground; the average above-ground height for 21 nests measured in early June was 83.8 cm (Bent 1948). Occasionally, nests are placed in mangrove (Rhizophora spp.) trees 1.52 to 2.74 m above the ground (Bent 1948). Verner (1965) found mean nest heights varying from 76.2 to 92.7 cm above the marsh floor in cattails and bulrushes. Kale (1965) recorded nest heights, from early to late in the breeding season, that ranged from 0.5 m to 2.0 m above the marsh bed. Nests are typically placed 30 to 91 cm above standing water or high tide (Bent 1948). Nest height tends to increase with plant growth (Verner 1965); second nests generally yield higher mean heights than do first nests.

Bigamous and monogamous males nested in cattails much more frequently than if they had simply used cattails in proportion to their availability; male marsh wrens without mates did not exhibit this preference for cattails (Verner and Engelsen 1970). Verner (1964) reported a positive trend between the fraction of a male's territory covered by emergent vegetation (including floating portions of vegetation without standing water between roots and nests) and that male's pairing success. On the average, about 83.2% of the area of bachelor male territories at four marshes was covered by emergent vegetation (cattails and bulrushes); overall average percentages for these four marshes for monogamous and bigamous males were 85.1% and 87.8%. Verner (1964) suggested that this trend reflects the ability of female marsh wrens to recognize the amount of available feeding habitat in a male's territory. He thus implied that the proportion of a male's territory covered by emergent plants is a criterion used by female marsh wrens for mate selection. Marsh wrens tend to use denser areas of cattails because their nests require several stems for attachment (Burger 1985).

Interspersion and Movements

Marshes <0.40 ha are usually not used by breeding marsh wrens (Bent 1948), although Verner (J. Verner, Pacific Southwest Forest and Range Experiment Station, Forestry Sciences Lab, Fresno, CA; letter dated July 16, 1985) found nests in 0.04-ha patches of emergent, lakeside vegetation that were as much as 60 m from similar patches. Welter (1935) described a monogamous male territory that was 0.12 to 0.14 ha in a preferred cattail-sedge association; in a less preferred bluejoint-reedgrass-dominated wetland, a monogamous male held a 0.28 ha territory. Welter (1935) also noted that the territory of a bigamous male was almost twice that held by a monogamous male in the same vegetation type.

Verner (1964) found bachelor, monogamous, and bigamous marsh wrens holding territories that were, on the average, 0.08 ha, 0.13 ha, and 0.17 ha. Verner (1964) also noted one trigamous male with a territory that was 0.02 ha. Verner and Engelsen (1970) reported mean territory sizes for bachelor, monogamous, and bigamous marsh wrens of 0.05 ha, 0.06 ha, and 0.07 ha. There was no significant difference between these latter three means, nor was there a significant correlation between pairing success of males and their territory sizes, presumably because territory size was so variable. Indeed, among five Washington sites, mean territory size for all males ranged from 0.05 to 0.17 ha (Verner 1965). Kale (1965) reported mean territory size (for all males collectively) to range from 0.01 to 0.02 ha during four breeding seasons at nine study sites in Georgia.

Verner (1971) determined that the average dispersal distance between successive territory centers of 13 adult male marsh wrens during 2 consecutive years was approximately 386 m (range = 0 - 3353 m). Of these 13 males, five used the same territory in both years, and one set up a territory on a different lake during the second year. Ten yearling male marsh wrens established their first breeding territories at a mean distance of 1,951 m (range = 180 - 4090 m) from their natal lake. These mean dispersal distances for yearling versus adult males were significantly different ($0.01 > P > 0.001$) (Verner 1971).

Special Considerations

Marsh wren nestlings are occasionally consumed by common grackles (Quiscalus quiscula) (Welter 1935). Clapp and Abbott (1966) found a pilot black snake (Elaphe obsoleta obsoleta) that had preyed on marsh wren eggs. Rice rats (Oryzomys palustris), raccoons (Procyon lotor), and mink (Mustella vison) are important predators of marsh wren eggs and young in Georgia (Kale 1965). Yellow-headed blackbirds (Xanthocephalus xanthocephalus) physically attack adult marsh wrens on the breeding grounds during territorial conflict (Burt 1970, cited in Picman 1980). Adult marsh wrens of both sexes destroy the eggs of other marsh wrens, presumably as a result of the evolution of intraspecific nest destruction, or perhaps because it decreases intraspecific competition for resources within a marsh (Picman 1977). Red-winged blackbirds (Agelaius phoeniceus) aggressively suppress the singing activities of marsh wrens and may, therefore, reduce marsh wren reproductive success. Nesting success in marsh wrens improves with increased distance between marsh wren

breeding nests and the nearest red-winged blackbird nest (Picman 1982). Thus, the density of predators, breeding marsh wrens, and red-winged and yellow-headed blackbirds in a marsh may significantly influence its suitability as marsh wren breeding habitat.

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for application throughout the breeding range of the marsh wren (Figure 1).

Season. This model was developed to evaluate breeding season habitat for the marsh wren.

Cover type. This model was developed to assess habitat suitability in permanently and semipermanently flooded estuarine, riverine, lacustrine, and palustrine wetlands that can be classed as emergent or scrub-shrub (Cowardin et al. 1979).

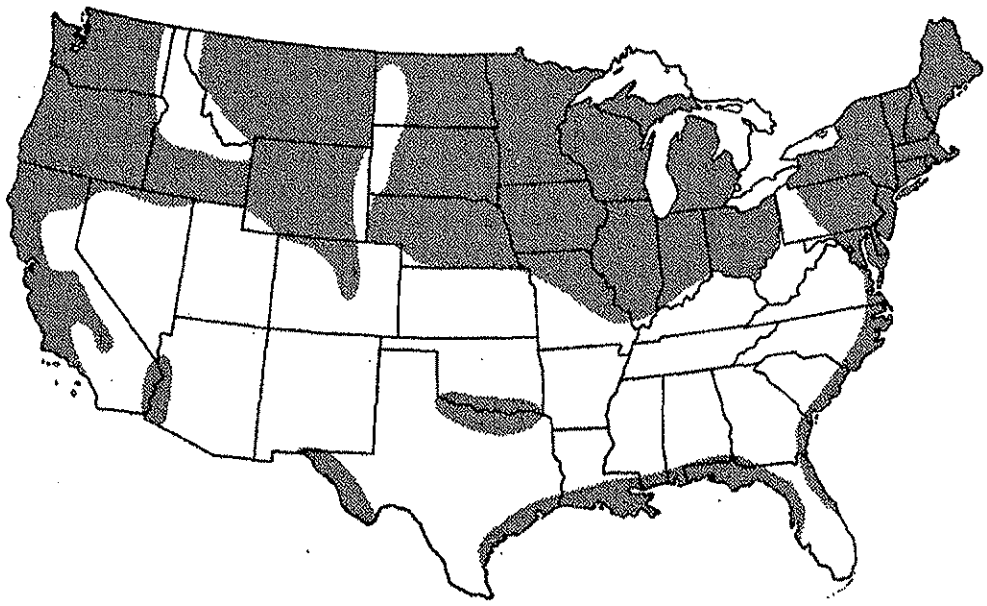

Figure 1. Approximate area of marsh wren model applicability. Range estimates were adapted from several sources (including Kale, unpubl. and Verner, unpubl.) that combine both breeding and year-round observations.

Minimum habitat area. Minimum habitat area is defined as the mininum amount of contiguous habitat that is necessary before an area will be used by a species. Marsh wrens do not usually nest in marshes that are <0.40 ha. Accordingly, it is assumed that if less than this amount of wetland (open water plus emergent vegetation) is present, the HSI is 0.

Verification level. Considerable interesting work has been conducted with marsh wrens in the areas of reproductive strategy (Verner 1964), and interspecific competition between it and other marsh-dwelling passerines (Picman 1983; Leonard and Picman 1986); however, information linking the species to habitat suitability is limited. For example, Verner and Engelsen (1970) were unable to exhibit statistically significant relationships between various measures of vegetation coverage within wren territories and pairing success of bachelor, monogamous, or bigamous males. Where marsh wrens occur with red-winged blackbirds and yellow-headed blackbirds, redwings tend to use the drier, shallower locations, yellowheads the deeper areas bordering open water, and marsh wrens the areas in between (Weller and Spatcher 1965; Burger 1985). Measures of habitat use under these conditions apparently reflect active spatial segregation among the three species, as wrens expand their territories into areas previously occupied by redwings or yellowheads after the blackbirds leave the marshes in late summer (Leonard and Picman 1986). How these relationships relate to habitat suitability is unknown.

The standard of comparison for this model focuses on male territories in wetlands as reported in the literature and interpreted by the authors. The potential of a permanently or semipermanently flooded wetland to support territorial males and, we assume, nesting marsh wrens is described; the model should be useful for baseline assessments and habitat management. The model is a set of hypotheses describing our interpretations of suitable marsh wren habitat conditions; however, it is not intended to serve as a predictor of numbers of wrens occupying a given wetland at any particular time. The model is intended to rate the suitability of potential nesting areas as would an expert thoroughly familiar with the reproductive requirements of marsh wrens; however, we have not evaluated the model's performance under actual field conditions.

Comments and suggestions from H.W. Kale, II, and J. Verner on an earlier draft of the marsh wren model were used to formulate the present model. Modifications suggested by these individuals have been incorporated into the model where possible. Use of the reviewers' names, however, does not necessarily imply that they concur with each section of the model, or the model in its entirety.

Model Description

Overview. Cover and reproduction requirements of the marsh wren are combined into a single habitat component because these needs are assumed to be supplied by the same habitat features. It is assumed that if the cover and reproduction needs are satisfied, adequate amounts of food and water will also be available.

In the sections that follow, we document the logic and assumptions used to relate marsh wren habitat information to the variables and equations used in this model. Specifically, we identify variables used in the model, define and justify suitability levels for each variable, and describe the assumed relationships between variables.

Cover/reproduction component. It is assumed that the cover and nesting requirements for marsh wrens can be supplied by herbaceous wetlands that support hydrophytes, such as cattails, bulrushes, cordgrasses, sedges, and other species, and that contain standing water. Marsh wrens tend to avoid areas of abundant woody vegetation, thus high tree or shrub densities are assumed to lower the value of a wetland for nesting marsh wrens. Verner (unpubl.) found marsh wrens nesting in a stand of Spiraea aquatica in Washington; isolated trees and shrubs did not preclude habitat use. Instead, woody vegetation was used for singing and feeding sites.

Early accounts describing the nest sites of marsh wrens identify a wide variety of emergent species used as nest support (Bent 1948). A common characteristic of nest-support vegetation is several erect and closely spaced stalks or limbs that together provide the strength and height to support a bulky nest (approximately 12.5 x 17.5 cm) at least several centimeters above the water surface. Cattails and cordgrasses appear to provide a growth form commonly acceptable to nest-building marsh wrens; bulrushes are also important, especially during drier years (Verner and Engelsen 1970). Aquatic emergents exhibiting a growth form similar to cattails, cordgrass, or bulrush are assumed to provide ideal conditions for nest building and the general cover requirements for marsh wrens (SIV1, Figure 2). Species such as bluejoint reedgrass, reed canarygrass, and sedges are also used by marsh wrens, but are assumed to provide lower suitability because of their different structure, or shorter stature and assumed lower stem strength, than that exhibited by cattails and similar species. Emergent species with growth forms differing significantly from those described above [e.g., buttonbush (Cephalanthus occidentalis) and mangrove (Rhizophora spp.)], but that are occasionally used to support nests, are assumed to have very low suitability. The assignment of a suitability index to emergent vegetation not specifically identified above will require some judgement by the user.

Although Verner and Engelsen (1970) were unable to exhibit statistical relationships between cover and pairing status, we feel that some consideration of relative availability of emergent vegetation for breeding marsh wrens is required to characterize cover/reproduction suitability. Most studies indicate or imply that marsh wrens use areas supporting relatively dense emergent vegetation for territories and nesting. The lowest mean percent coverage of emergent vegetation recorded for territorial males in Washington was 50% for bachelors using "blue" marsh (Verner 1964:257). Coverage of emergent vegetation in other territories in other marshes ranged from 57% to 100%. A diagram of marsh wren territories provided by Leonard and Picman (1986:136) also indicates the use of areas with extensive vegetation coverage, at least while yellow-headed blackbirds were present.

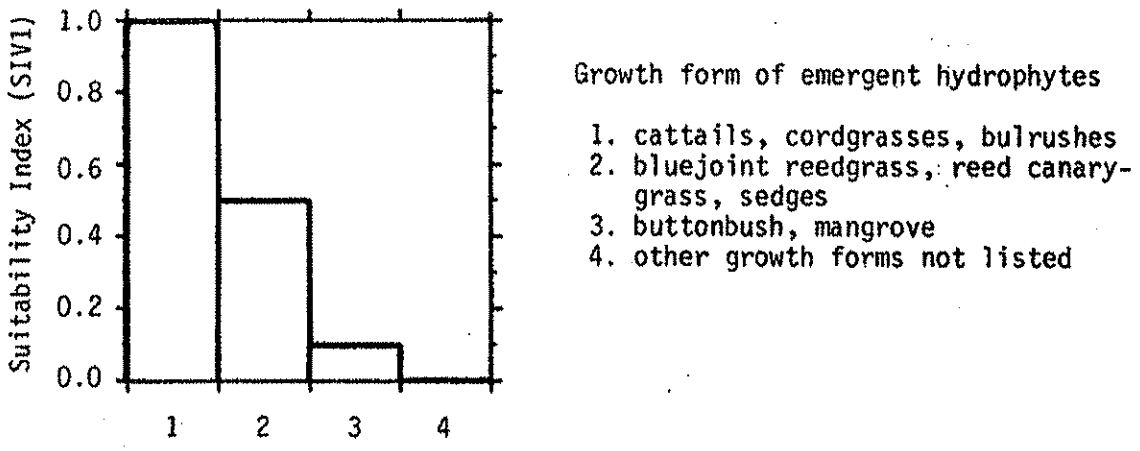

Figure 2. The assumed relationship between the growth form of emergent hydrophytes and the suitability of a wetland as cover/reproduction habitat for marsh wrens.

We present the above information as increasing suitability with increasing percent canopy cover of emergent herbaceous vegetation (SIV2, Figure 3). Fifty percent canopy cover is assigned a value of 0.1, and optimum conditions are reached at 80%. These values are somewhat arbitrary, as use may equal availability after some coverage threshold is reached, especially in wetlands also used by red-winged or yellow-headed blackbirds. The ultimate determination of nesting suitability may depend on female assessments of food resources within the territory, which are based on as yet unknown characteristics (Verner and Engelsen 1970).

Wetlands without standing water usually are not used for nesting by marsh wrens, although intertidal coastal marshes and other marshes that periodically lack standing water are acceptable (Verner 1965; Kale, unpubl.). Information relating water depths to cover/reproduction suitability was not located; however, we have assumed a linear increase in suitability as mean depth increases (SIV3, Figure 4). Optimum conditions are assumed to occur at a minimum mean depth of 15 cm. The upper depth limit for standing water is unknown, and the graph for SIV3 indicates no limit. In reality, as water increases in depth, some threshold will be reached at which growth of emergent herbaceous vegetation will be affected, and the suitability of the wetland as represented by SIV1 and SIV2 will decrease.

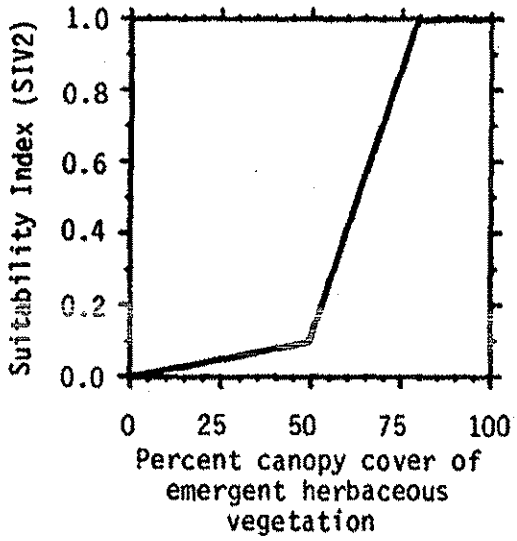

Figure 3. The assumed relationship between percent canopy cover of emergent herbaceous vegetation and cover/reproduction suitability of a wetland for marsh wrens.

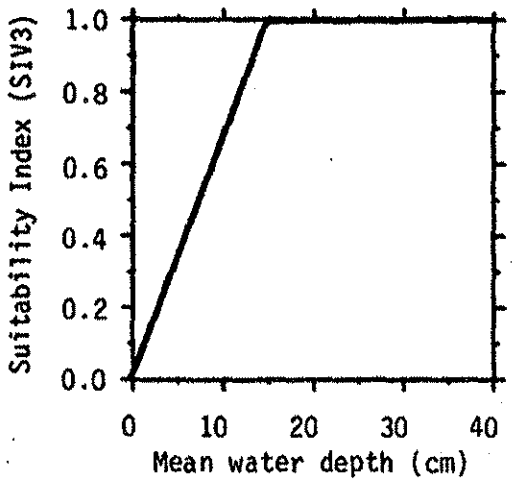

Figure 4. The assumed relationship between mean water depth and cover/reproduction suitability of a wetland for marsh wrens.

The effect of woody vegetation on marsh wren habitat suitability is unclear. Bent (1948) cites several early studies from the eastern United States that document nesting in woody vegetation; however, the relative importance of this activity in the overall nesting effort of the populations under study is unknown. More recent studies emphasize emergent herbaceous vegetation as nesting substrate. Therefore, for the purposes of this model, woody vegetation is assumed to lower the suitability of wetlands for nesting marsh wrens. Forested wetlands with >30% coverage of trees >6 m in height (U.S. Fish and Wildlife Service 1981) are considered unsuitable. Shrub-dominated wetlands (>30% coverage of woody plants <6 m tall) may have some value for nesting marsh wrens, but the value of both herbaceous and deciduous-shrub wetlands are assumed to decrease with increasing canopy closure of woody vegetation (SIV4, Figure 5). Wetlands supporting trees with <30% canopy coverage should be evaluated as either emergent or scrub-shrub wetlands.

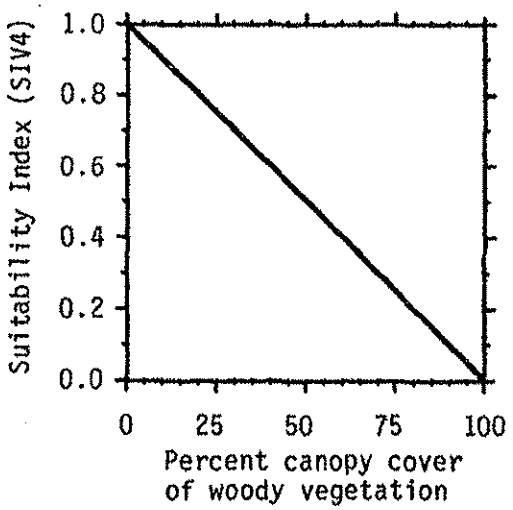

Figure 5. The assumed relationship between percent canopy cover of woody vegetation and cover/reproduction suitability of a wetland for marsh wrens.

HSI determination. We have assumed that habitat suitability, in terms of cover/reproduction for the marsh wren, is a reflection of the characteristics of individual permanently or semipermanently flooded estuarine, riverine, lacustrine, or palustrine wetlands classed as emergent or scrub-shrub (Cowardin et al. 1979). Criteria characterizing the growth form of emergent vegetation (SIV1), the percent canopy cover of emergent herbaceous vegetation (SIV2), mean water depth (SIV3), and the percent canopy cover of woody vegetation (SIV4) can be used to assess suitability. Suitability among the first three variables is compensatory, i.e., a low value for one index can be compensated for by a high value in one of the other indices. A zero value for any of the three variables, however, indicates a wetland that is unsuitable in terms of cover/reproduction requirements for marsh wrens. The relationship between woody vegetation and habitat suitability is unclear, but we have assumed a negative affect on overall cover/reproduction suitability as the percent canopy cover of woody vegetation increases. Thus, SIV4 is used to lower the value of a wetland supporting woody vegetation. These relationships are described by equation 1.

$$HSI = (SIV1 \times SIV2 \times SIV3)^{1/3} \times SIV4 \qquad (1)$$

Application of the Model

Summary of model variables. Four habitat variables are used in this model to characterize the suitability of a wetland for supplying cover and reproductive needs of marsh wrens. Relationships among these variables, the cover and reproduction component, and the HSI value are summarized in Figure 6. During application of this model, variables should be defined and measured as discussed in Figure 7.

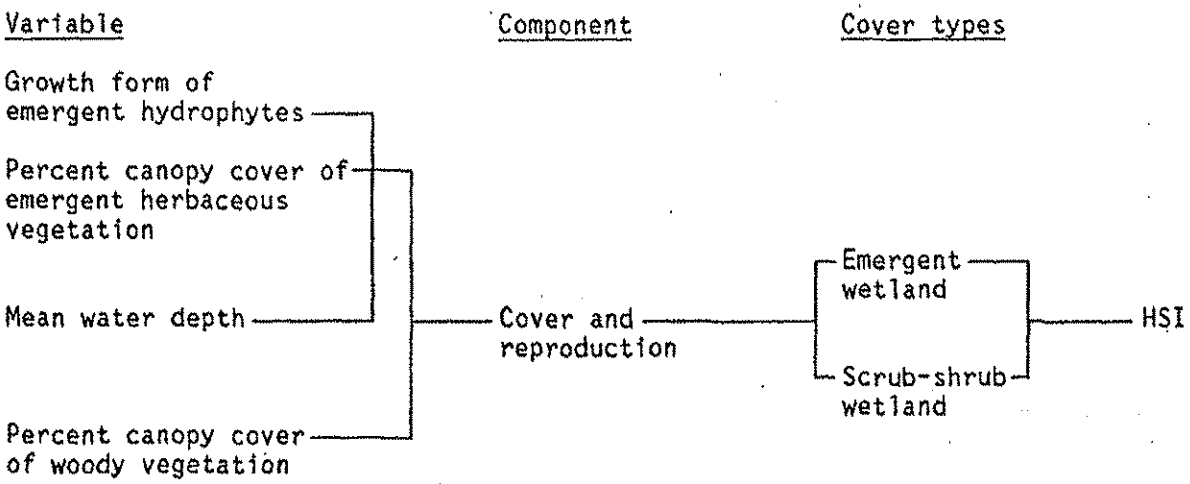

Figure 6. Relationship among habitat variables, component, cover types, and HSI for the marsh wren.

Variable (definition)	Cover type	Recommended technique
Growth form of emergent hydrophytes.	Emergent and scrub-shrub wetlands	Aerial photos, on-site inspection
Percent canopy cover of emergent herbaceous vegetation (the percent of the water surface shaded by a vertical projection of the canopies of emergent herbaceous vegetation, both persistent and nonpersistent).	Emergent and scrub-shrub wetlands	Line intercept
Mean water depth (cm).	Emergent and scrub-shrub wetlands	Graduated rod
Percent canopy cover of woody vegetation (the percent of the ground surface that is shaded by a vertical projection of the canopies of all woody vegetation).	Emergent and scrub-shrub wetlands	Line intercept

Figure 7. Definition of variables, applicable cover types, and recommended measurement techniques (Hays et al. 1981) for the marsh wren model.

Model assumptions. This model was developed to assess the habitat suitability of wetlands for supplying the cover and reproductive needs of marsh wrens. The model is not intended to produce outputs that reflect actual population densities at any particular time, but rather it attempts to estimate the potential of a site to supply the habitat requirements as defined above, regardless of nonhabitat variables influencing populations. Model variables and relationships are based on information obtained from studies disjunct in time and space. As such, the model is a collection of hypotheses and should not be interpreted as statements of proven cause and effect. Users should refine the model as necessary to better represent localized conditions.

Three basic assumptions characterize the model. First, we assume that the growth form of herbaceous hydrophytes and percent canopy cover of emergent herbaceous vegetation in a wetland are dominant factors determining habitat suitability for marsh wrens. Second, we assume that any depth of water ≥15 cm, if present during the breeding season, indicates optimum conditions. Wetlands lacking such conditions would be unsuitable by definition of this variable. No information was located that could be used to relate various degrees of water permanence throughout the breeding season with relative suitability. Third, we assume that changes in suitability of marsh wren habitat follow a direct linear response to changes in woody vegetation canopy cover, although the influences of woody vegetation are difficult to interpret from the literature.

SOURCES OF OTHER MODELS

No other habitat models for the marsh wren were found.

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

A review and synthesis of existing information were used to develop a Habitat Suitabiltiy Index (HSI) model for the marsh wren (Cistothorus palustris). The model consolidates habitat use information into a framework appropriate for field application, and is scaled to produce an index between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). HSI models are designed to be used with Habitat Evaluation Procedures previously developed by U.S. Fish and Wildlife Service.

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Wildlife
Habitability
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Cistothorus palustris
Habitat suitability

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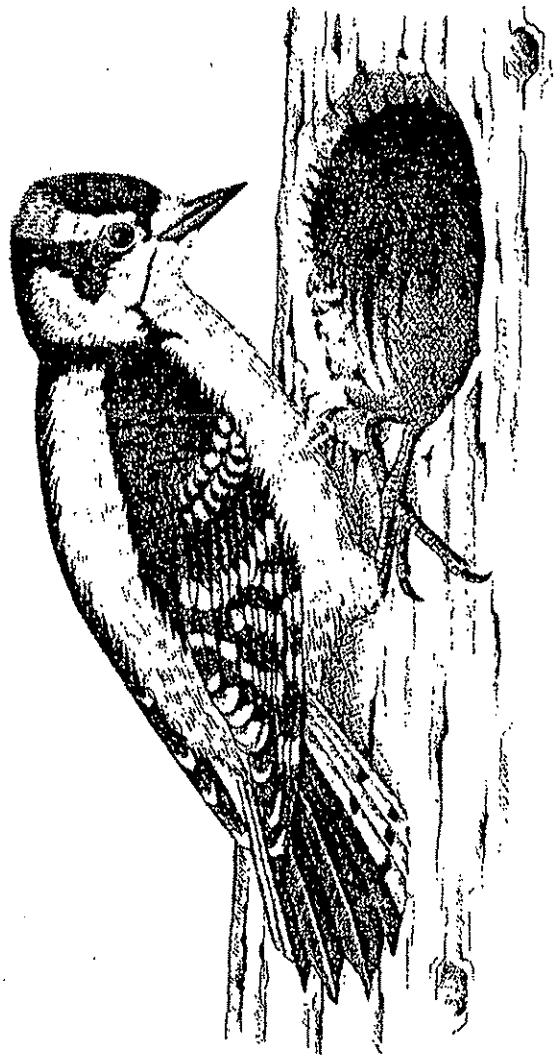
HABITAT SUITABILITY INDEX MODELS: DOWNY WOODPECKER



Fish and Wildlife Service

U.S. Department of the Interisr

This model is designed to be used by the Division of Ecological Services in conjunction with the Habitat Evaluation Procedures.

FWS/OBS-82/10.38
April 1983

HABITAT SUITABILITY INDEX MODELS: DOWNY WOODPECKER

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Washington, DC 20240

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PREFACE

This document is part of the Habitat Suitability Index (HSI) Model Series (FWS/OBS-82/10), which provides habitat information useful for impact assessment and habitat management. Several types of habitat information are provided. The Habitat Use Information Section is largely constrained to those data that can be used to derive quantitative relationships between key environmental variables and habitat suitability. The habitat use information provides the foundation for HSI models that follow. In addition, this same information may be useful in the development of other models more appropriate to specific assessment or evaluation needs.

The HSI Model Section documents a habitat model and information pertinent to its application. The model synthesizes the habitat use information into a framework appropriate for field application and is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). The application information includes descriptions of the geographic ranges and seasonal application of the model, its current verification status, and a listing of model variables with recommended measurement techniques for each variable.

In essence, the model presented herein is a hypothesis of species-habitat relationships and not a statement of proven cause and effect relationships. Results of model performance tests, when available, are referenced. However, models that have demonstrated reliability in specific situations may prove unreliable in others. For this reason, feedback is encouraged from users of this model concerning improvements and other suggestions that may increase the utility and effectiveness of this habitat-based approach to fish and wildlife planning. Please send suggestions to:

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2627 Redwing Road
Ft. Collins, CO 80526

CONTENTS

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DOWNY WOODPECKER (Picoides pubescens)

HABITAT USE INFORMATION

General

Downy woodpeckers (Picoides pubescens) inhabit nearly all of North America where trees are found (Bent 1939). They are rare or absent in arid desert habitats and most common in open woodlands.

Food

The downy woodpecker is primarily an insectivore; 76% of the diet is animal foods, and the remainder is vegetable food (Beal 1911). Beetles, ants, and caterpillars are the major animal foods, and vegetable foods include fruits, seeds, and mast. Downy woodpeckers feed by digging into the bark with the bill, by gleaning along the bark surface, and, infrequently, by flycatching (Jackson 1970).

Downy woodpeckers in Illinois foraged more in the lower height zones of trees than in the tree canopies and foraged more often on live limbs than on dead limbs (Williams 1975). Similarly, downy woodpeckers in Virginia foraged primarily on live wood in pole age and mature forests (Conner 1980). Downy woodpeckers in New York spent 60% of their foraging time in elms (Ulmus spp.) (Kisiel 1972). They foraged most frequently on twigs 2.5 cm (1 inch) or less in diameter, and drilling was the foraging technique used most often. Downy woodpeckers are not strong excavators and do not excavate deeply to reach concentrated food sources, such as carpenter ants (Camponotus spp.) (Conner 1981).

Downy woodpeckers in Virginia foraged in the breeding season in habitats with a mean basal area of 11.3 m^2/ha (49.2 ft^2/acre). Habitats used for foraging during the postbreeding and winter seasons had significantly higher mean basal areas of 21.4 m^2/ha (93.2 ft^2/acre) and 17.2 m^2/ha (74.9 ft^2/acre), respectively. Downy woodpeckers in New Hampshire fed heavily in stands of paper birch (Betula papyrifera) that were infected with a coccid (Xylococchus betulae) (Kilham 1970). The most attractive birches for foraging were those that were crooked or leaning, contained broken branches in their crown, and had defects, such as cankers, old wounds, broken branch stubs, and sapsucker drill holes. Downy woodpeckers invaded an area in Colorado in high numbers during the winter months in response to a severe outbreak of the pine bark beetle (Dendroctonus ponderosae) (Crockett and Hansley 1978). This outbreak of beetles had not resulted in increased breeding densities of the woodpeckers at the time of the study.

Downy woodpeckers foraged more on tree surfaces during summer than in winter (Conner 1979). They increased the amount of time spent in subcambial excavation in winter months, probably in response to the seasonal availability and location of insect prey. Downy woodpeckers appear to broaden all aspects of their foraging behavior in the winter in order to find adequate amounts of food (Conner 1981).

Downy woodpeckers in Ontario extracted gall fly (Eurosta solidaginis) larvae from goldenrod (Solidago canadensis) gall s growing near forest edges (Schlichter 1978). Corn stubble fields supported small winter populations of downy woodpeckers in Illinois (Graber et al. 1977).

Water

Information on the water requirements of the downy woodpecker was not located in the literature.

Cover

The cover requirements of the downy woodpecker are similar to their reproductive requirements, which are discussed in the following section.

Reproduction

The downy woodpecker is a primary cavity nester that prefers soft snags for nest sites (Evans and Conner 1979). These woodpeckers nest in both coniferous and deciduous forest stands in the Northwest. Nests in Virginia were common in both edge situations and in dense forests far from openings (Conner and Adkisson 1977). Downy woodpeckers in Oregon occur primarily in deciduous stands of aspen (Populus tremuloides) or riparian cottonwood (Populus spp.) (Thomas et al. 1979). The highest nesting and winter densities in Illinois were in virgin or old lowland forests (Graber et al. 1977).

Downy woodpeckers in Virginia preferred to nest in areas with high stem density, but with lower basal area and lower canopy heights than areas used by the other woodpeckers studied (Conner and Adkisson 1977). They preferred sparsely stocked forests commonly found along ridges (Conner et al. 1975). Preferred nest stands had an average basal area of 10.1 m^2/ha (44 ft^2/acre), 361.8 stems greater than 4 cm (1.6 inches) diameter/ha (894/acre), and canopy heights of 16.3 m (53.5 ft) (Conner and Adkisson 1976). Downy woodpeckers in Tennessee were frequently seen feeding in the understory and apparently selected habitats with an abundance of understory vegetation (Anderson and Shugart 1974).

Downy woodpeckers excavate their own cavity in a branch or stub 2.4 to 15.3 m (8 to 50 ft) above ground, generally in dead or dying wood (Bent 1939). There was a positive correlation between downy woodpecker densities and the number of dead trees in Illinois (Graber et al. 1977). Downy woodpeckers rarely excavate in oaks (Quercus spp.) or hickories (Carya spp.) with living cambium present at the nest site (Conner 1978). They apparently require both sap rot, to soften the outer part of trees, and heart rot, to soften the

interior, when hardwoods, and possibly pines, are used for nesting. Downy woodpeckers in Virginia nested mainly in dead snags with advanced stages of fungal heart rot (Conner and Adkisson 1976).

Downy woodpeckers "search image" of an optimal nest site is a live tree with a broken off dead top (Kilham 1974). Suitable nest trees are in short supply in most areas and appear to be a limiting factor in New Hampshire. Downies in Montana appeared to prefer small trees, possibly to avoid the difficulty of excavating through the thick sapwood of large trees (McClelland et al. 1979). The average dbh of nest trees (n = 3) in Montana was 25 cm (10 inches). All 11 nests in an Ontario study were in dead aspen, and the average dbh of four of these nest trees was 26.2 cm (10.3 inches) (Lawrence 1966). Fourteen of 19 nest trees in Virginia were dead, the average dbh of nest trees was 31.8 cm (12.4 inches), and nest trees averaged 8.3 m (27.2 ft) in height (Conner et al. 1975).

Thomas et al. (1979) estimated that downy woodpeckers in Oregon require 7.4 snags, 15.2 cm (6 inches) or more dbh, per ha (3 snags/acre). This estimate is based on a territory size of 4 ha (10 acres), a need for two cavities per year per pair, and the presence of 1 useable snag with a cavity for each 16 snags without a cavity. Evans and Conner (1979) estimated that downies in the Northeast require 9.9 snags, 15 to 25 cm (6 to 10 inches) dbh, per ha (4 snags/acre). Their estimate is based on a territory size of 4 ha (10 acres), a need for four cavity trees per year per pair, and a need for 10 snags for each cavity tree used in order to account for unuseable snags, a reserve of snags, feeding habitat, and a supply of snags for secondary users. Conner (pers. comm.) recommended 12.4 snags/ha (5 snags/acre) for optimal downy woodpecker habitat.

Interspersion

Downy woodpeckers occupy different size territories at different times of the year (Kilham 1974). Fall and winter territories consist of small, defined areas with favorable food supplies and the area near roost holes. Breeding season territories consist of an area as large as 10 to 15 ha (24.7 to 37.1 acres) used to search out nest stubs, and a smaller area around the nest stub itself. Breeding territories of downies in Illinois ranged from 0.5 to 1.2 ha (1.3 to 3.1 acres) (Calef 1953 cited by Graber et al. 1977). Male and female downy woodpeckers retain about the same breeding season territory from year to year, while their larger overall range has more flexible borders (Lawrence 1966).

Downy woodpeckers occupy all portions of their North American breeding range during the winter (Plaza 1978). There is, however, a slight, local southward migration in many areas.

Special Considerations

Conner and Crawford (1974) reported that logging debris in regenerating stands' (1-year old) following clear cutting were heavily used by downy woodpeckers as foraging substrate. Timber harvest operations that leave snags and

trees with heart rot standing during regeneration cuts and subsequent thinnings will help maintain maximum densities of downy woodpeckers (Conner et al. 1975). Foraging habitat for the downy woodpecker in Virginia would probably be provided by timber rotations of 60 to 80 years (Conner 1980).

HABITAT SUITABILITY INDEX (HSI) MODEL

Model Applicability

Geographic area. This model was developed for the entire range of the downy woodpecker.

Season. This model was developed to evaluate the year-round habitat needs of the downy woodpecker.

Cover types. This model was developed to evaluate habitat in Deciduous Forest (DF), Evergreen Forest (EF), Deciduous Forested Wetland (DFW), and Evergreen Forested Wetland (EFW) areas (terminology follows that of U.S. Fish and Wildlife Service 1981).

Minimum habitat area. Minimum habitat area is defined as the minimum amount of contiguous habitat that is required before a species will live and reproduce in an area. Specific information on minimum habitat areas for downy woodpeckers was not found in the literature. However, based on reported territory and range sizes, it is assumed that a minimum of 4 ha (10 acres) of potentially useable habitat must exist or the HSI will equal zero.

Verification level. Previous drafts of this model were reviewed by Richard Conner and Lawrence Kilham and their comments were incorporated into the current draft (Conner, pers. comm.; Kilham, pers. comm.).

Model Description

Overview. This model considers the ability of the habitat to meet the food and reproductive needs of the downy woodpecker as an indication of overall habitat suitability. Cover needs are assumed to be met by food and reproductive requirements and water is assumed not to be limiting. The food component of this model assesses food quality through measurements of vegetative conditions. The reproductive component of this model assesses the abundance of suitable snags. The relationship between habitat variables, life requisites, cover types, and the HSI for the downy woodpecker is illustrated in Figure 1.

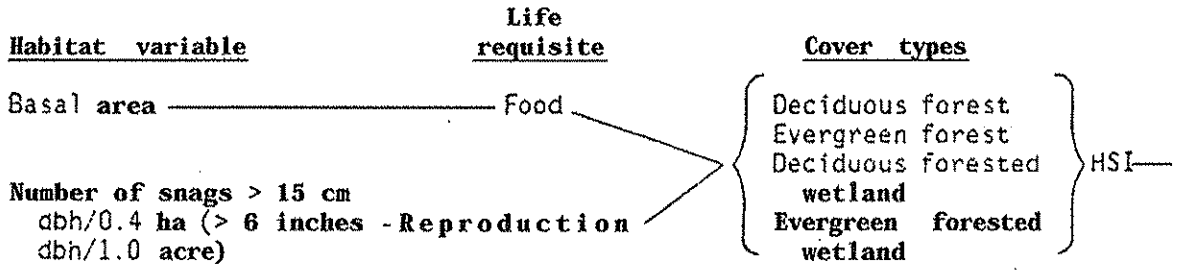


Figure 1. Relationships of habitat variables, life requisites, and cover types in the downy woodpecker model.

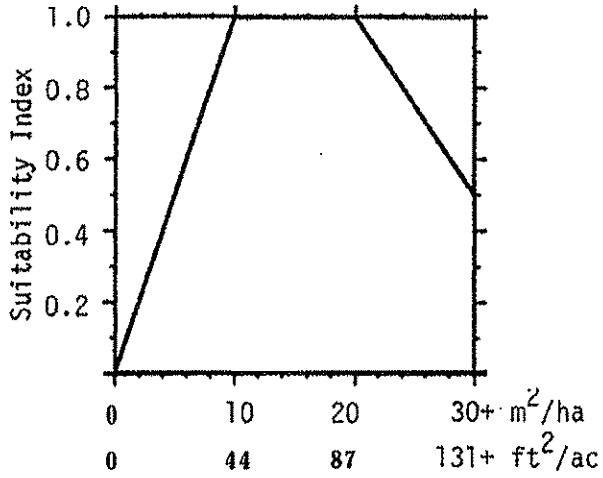
The following sections provide a written documentation of the logic and assumptions used to interpret the habitat information for the downy woodpecker in order to explain the variables and equations that are used in the HSI model. Specifically, these sections cover the following: (1) identification of variables used in the model; (2) definition and justification of the suitability levels of each variable; and (3) description of the assumed relationship between variables.

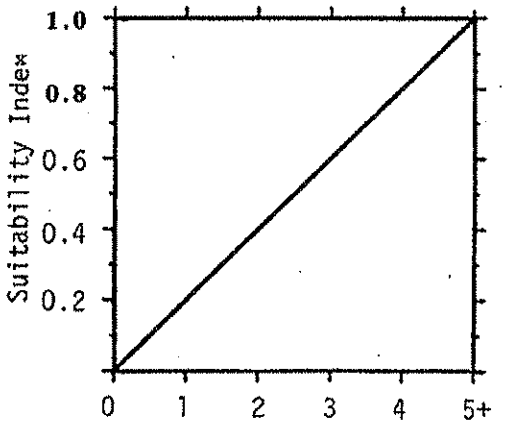
Food component. Food for the downy woodpecker consists of insects found on trees in forested habitats. Downy woodpeckers occupy a wide variety of forested habitats from virgin bottomlands to sparsely stocked stands along ridges. The highest downy woodpecker densities were most often reported in the more open stands with lower basal areas, but it is assumed that all forested habitats have some food value for downies. Optimal conditions are assumed to occur in stands with basal areas between 10 and 20 m^2/ha (43.6 and 37.2 ft^2/acre), and suitabilities will decrease to zero as basal area approaches zero. Stands with basal areas greater than 30 m^2/ha (130.8 ft^2/acre) are assumed to have moderate value for downy woodpeckers.

Reproduction component. Downy woodpeckers nest in cavities in either totally or partially dead small trees. They require snags greater than 15 cm (6 inches) dbh for nest sites. Optimal habitats are assumed to contain 5 or more snags greater than 15 cm dbh/0.4 ha (6 inches dbh/1.0 acre), and habitats without such snags have no suitability.

Model Relationships

Suitability Index (SI) graphs for habitat variables. This section contains suitability index graphs that illustrate the habitat relationships described in the previous section.

Cover type	Variable		Suitability graph
EF,DF, EFW,DFW	V_1	Basal area.	

EF,DF, EFW,DFW	V_2	Number of snags > 15 cm dbh/0.4 ha (> 6 inches dbh/ 1.0 acre).	

Life requisite values. The life requisite values for the downy woodpecker are presented below.

Life requisite	Cover type	Life requisite value
Food	EF,DF,EFW,DFW	V_1
Reproduction	EF,DF,EFW,DFW	V_2

HSI determination. The HSI for the downy woodpecker is equal to the lowest life requisite value.

Application of the Model

Definitions of variables and suggested field measurement techniques (Hays et al. 1981) are provided in Figure 2.

Variable	(definition)	Cover types	Suggested technique
V_1	Basal area [the area of exposed stems of woody vegetation if cut horizontally at 1.4 m (4.5 ft) height, in m^2/ha (ft^2/acre)].	EF,DF,EFW,DFW	Bitterlich method
V_2	Number of snags > 15 cm (6 inches) dbh/0.4 ha (1.0 acre) [the number of standing dead trees or partly dead trees, greater than 15 cm (6 inches) diameter at breast height (1.4 m/4.5 ft), that are at least 1.8 m (6 ft) tall. Trees in which at least 50% of the branches have fallen, or are present but no longer bear foliage, are to be considered snags].	EF,DF,EFW,DFW	Quadrat

Figure 2. Definitions of variables and suggested measurement tecnniques.

SOURCES OF OTHER MODELS

Conner and Adkisson (1976) have developed a discriminant function model for the downy woodpecker that can be used to separate habitats that possibly provide nesting habitat from those that do not provide nesting habitat. The model assesses basal area, number of stems, and canopy height of trees.

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9. Performing Organization Name and Address	Habitat Evaluation Procedures Group Western Energy and Land Use Team U.S. Fish and Wildlife Service Drake Creekside Building One 2627 Redwing Road Fort Collins, CO 80526		10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
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15. Supplementary Notes

16. Abstract (Limit: 200 words)

A review and synthesis of existing information was used to develop a habitat model for the downy woodpecker (Picoides pubescens). The model is scaled to produce an index of habitat suitability between 0 (unsuitable habitat) and 1 (optimally suitable habitat) for areas of the continental United States. Habitat suitability indexes are designed for use with Habitat Evaluation Procedures previously developed by the U.S. Fish and Wildlife Service.

17. Document Analysis a. Descriptors

Mathematical models, Wildlife, Birds, Habitability.

b. Identifiers/Open-Ended Terms

Downy woodpecker
Picoides pubescens
Habitat Suitability Indexes (HSI)

c. COSATI Field/Group

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DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

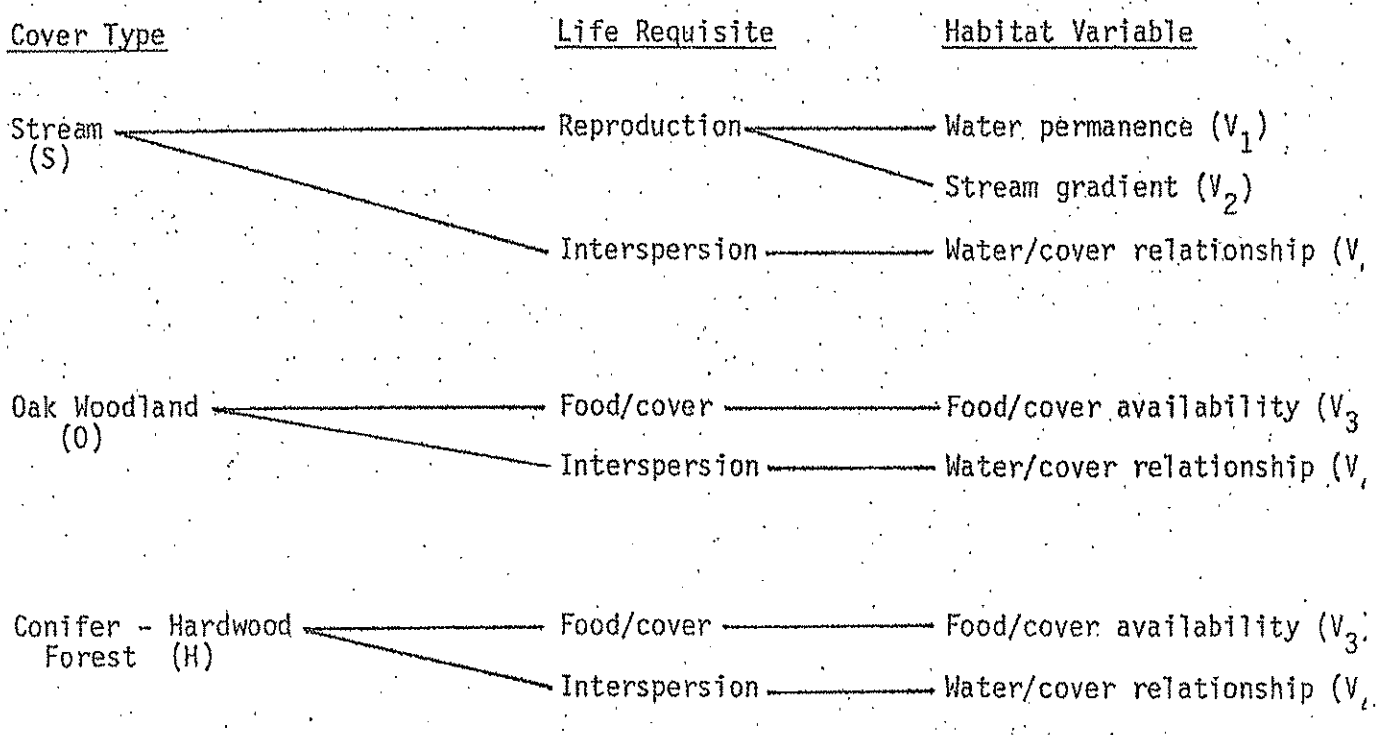
As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving thsenvironmental and cultural values of our national parks and historical places, and providing for the enjoyment of life thmugh outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

DRAFT HABITAT SUITABILITY INDEX MODEL
PACIFIC TREE FROG (*Hyla regilla*)

U.S. Fish and Wildlife Service
Division of Ecological Services
Sacramento, California

September 1984

VARIABLE	COVER TYPES	SUGGESTED TECHNIQUE
(V_1) Water permanence - Number of months that water is present in an average year.	S	Rainfall charts, ocular estimate.
(V_2) Stream gradient	S	USFS data
(V_3) Food/cover availability - percent cover of rock crevices, ground debri, rank vegetation.	H,O	Point intercept - step point.
(V_4) Water/cover relationship - distance in yards between cover and nearest water body.	H,O,S	Range finder, measuring tape


Cover Type
Life Requisite
Habitat Variable
Stream (S)
Reproduction
Water permanence (V_1)
Stream gradient (V_2)
Interspersion
Water/cover relationship ($V_$
Oak Woodland (O)
Food/cover
Food/cover availability (V_3
Interspersion
Water/cover relationship ($V_$
Conifer - Hardwood Forest (H)
Food/cover
Food/cover availability (V_3
Interspersion
Water/cover relationship ($V_$

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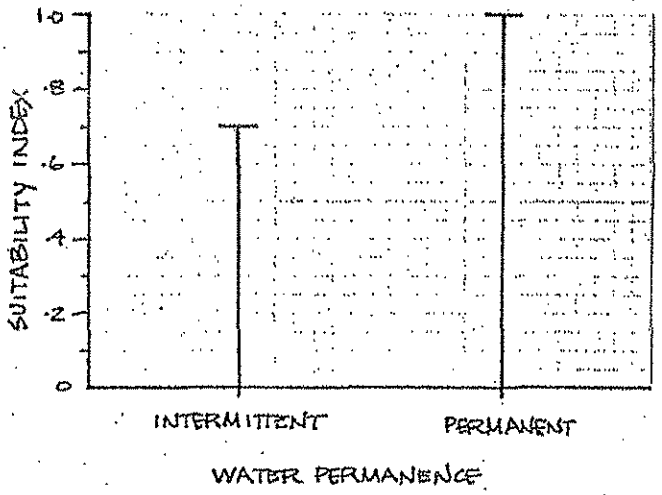
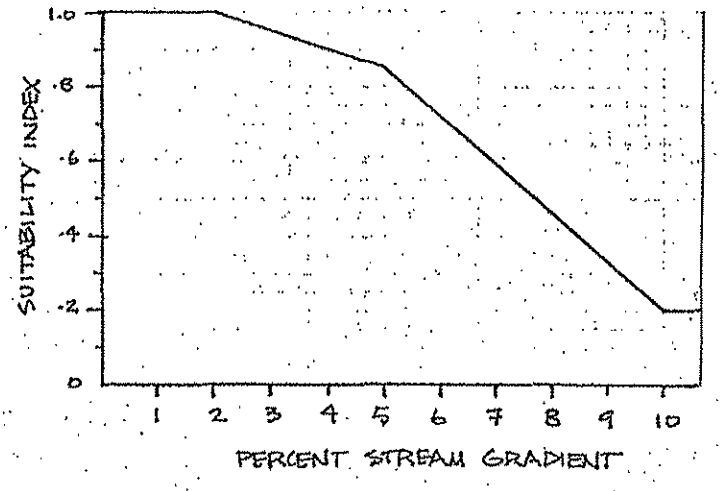
Variable 1. Water permanence - number of months that standing water is present in an average year.

Assumes: 1) Water present six months of the year or longer is optimum for development of young (Stebbins, 1951).



Variable 2. Stream gradient

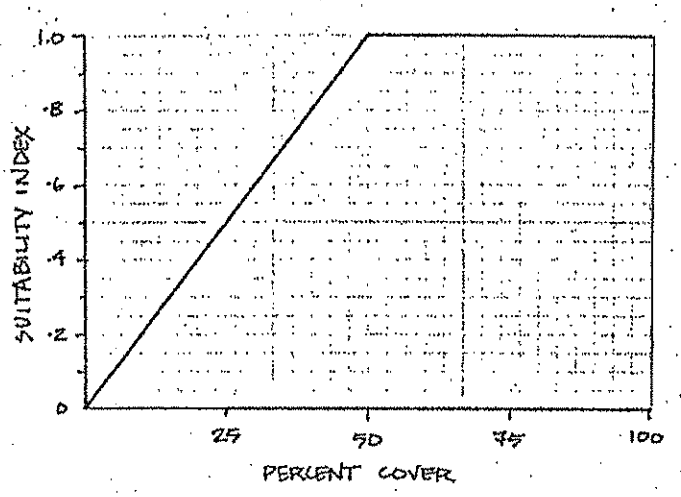
Assumes: 1) Quiet water optimum for tree frog reproduction (Storm, 1948).



Variable 3. Food/cover availability - percent cover of rock crevices, ground debris, rank vegetation, etc.

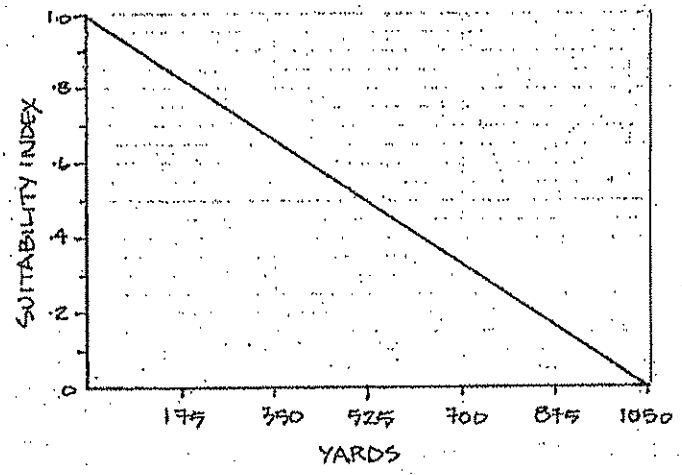
Assumes: 1) Tree frogs require ground debris, crevices, etc. for food and cover in upland habitats (Stebbins, 1951; Brattstrom and Warren, 1955).

2) 50% or greater cover is optimum.



Variable 4. Water/cover relationship - distance in yards between cover and nearest water body.

Assumes: 1) Habitat equal to or less than 1,000 yards from reproductive water body is optimum (derived from Jameson, 1957).



1981

Equations Used to Calculate Suitability Indices

a) Equation for reproduction component.

Cover Type	Equation
S	$(V_1 \times V_2)^{1/2}$

b) Equation for food/cover component.

Cover Type	Equation
O,H	V_3

C) Equation for interspersion component.

Cover Type	Equation
S,O,H	V_4

HSI Determination:

The HSI value equals the life requisite value calculated for each cover type multiplied by the interspersion value.

Assumptions Used in Applying the Pacific Tree Frog Model

V_1 - Water permanance

It was assumed that permanent streams had an SI value of 1.0 and intermittent streams a value of 0.7. Lengths and widths of stream habitat for the tree frog provided by a USFS fisheries biologist was then used to calculate a weighted SI value for the study area.

V_3 - Food/cover availability

It was assumed that cover for the tree frog was not limiting in the study area; SI 1.0.

V_4 - Water/cover relationship

The distance between cover and the nearest body of water suitable for reproduction was assumed not to be limiting in the study area for the tree frog; SI = 1.0.

It was assumed that the reservoir was not suitable habitat due to the fluctuating water levels of the lake.

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KMiller:3/21/84:rlm
revised 10/23/84
Leidy5/I

A8

Rodentia

DRAFT
August 1980

14.0 CALIFORNIA GROUND SQUIRREL

ES-S IN MAY

General

The California ground squirrel (Spermophilus beecheyi), sometimes referred to as the beechey ground squirrel, is common throughout much of Ecoregion 2610. Its range extends south from south-central Washington to northern Baja California, through western Oregon and California (Burt and Grossenheider 1964; Ingles 1965; MacClintock 1970; Orr 1971).

This ground squirrel occupies a variety of open habitats in the Central Valley. It can be found in most agricultural land, grassland, plains, small meadows, open rocky places, and on slopes with scattered trees; it avoids areas with dense stands of brush, trees, tall grasses, or herbaceous annual vegetation.

Food Requirements

The diet of the California ground squirrel varies seasonally and includes green herbage, seeds, nuts, bulbs, acorns, agricultural row crops, orchard crops, grains and pasture (Martin et al. 1961). On the San Joaquin Experimental Range, Schitoskey and Woodmansee (1978) found nonlegume forbs to be the most prevalent forage plants in the ground squirrel's annual diet. Over a fifteen month sampling period, the percent composition of dietary elements are as follows:

Nonlegume Forbs	46.4%	Grasses	16.0%
Legumes	19.0%	Miscellaneous	1.5%
Woody Vegetation	17.1%		

Within the San Joaquin Experimental Range, Filaree (Erodium spp.) is the most important nonlegume forb (Fitch 1948; Schitoskey and Woodmansee 1978); comprising 50.2 percent of the nonlegume forbs used and 23.3 percent of the annual diet (Schitoskey and Woodmansee 1978). Filaree forms the bulk of the diet, on the Experimental Range, through winter and spring (Fitch 1948). For detailed diet and seasonal shifts, the reader is referred to: Evans and Holdenried (1943); Fitch (1948); Schitoskey and Woodmansee (1978).

Although only a small proportion of the diet, California ground squirrels have been observed to occasionally seek animal food (Fitch 1948). Linsdale (1946) and Fitch (1948) both report active predation upon grasshoppers and small birds caught in squirrel traps. Linsdale described a tendency of ground squirrels to colonize near chicken enclosures and frequently raid both chicken feed and eggs. Fitch (1948) additionally reports the following predatory observations: eggs of gopher snakes, quail, killdeer and mourning doves; young cottontails removed from their nests; pocket gophers; kangaroo rats; and other ground squirrels killed by accident, poison, or disease.

Many authors agree that the California ground squirrel's habitat has greatly expanded with the introduction of agriculture to Ecoregion 2610. Some of the new food items added to this squirrel's diet are as follows: grain (all types); fruits and nuts including almonds, apples, apricots, peaches, pistachios, prunes, oranges, tomatoes and walnuts; seedlings of certain vegetables and field crops such as sugar beets and cotton; bark of young orchard trees (Clark 1975). Tomich (1962) reports an agricultural setting, in the Sacramento Valley, in which the California ground squirrel thrives as: typically large farms of barley, grain hay, milo maize, tomatoes, sugar beets and dry beans; irrigated pasture, stubble, and grassland grazed by sheep and beef cattle; fallow land and field borders of weedy annual vegetation. Additionally, permanent burrow systems develop in uncultivated fenceline margins providing "...a choice of crops on either side of a fence, as well as of a variety of wild annual weeds along the fenceline or fallow land" (Tomich 1962, p. 215).

Winter hibernation is common to most ground squirrels; the frequency and timing of which varies according to geographical variations of environmental conditions (Linsdale 1946; Fitch 1948). Fat storage and food caches enables ground squirrels to remain below the surface through most, if not all, of the wet and cold season. Therefore, food requirements for winter are actually more closely related to food availability in the fall.

Water Requirements

Of the literature reviewed, very little addressed the issue of moisture requirements or acquisition by the California ground squirrel. However, from studies of grassland populations in southern California, it is believed that the moderate minimum water requirement of 1.2 percent body weight per day is satisfied by a seasonal shift of diet (Baudinette 1974). Fitch (1948, p. 541) suggests that "...the succelence available in tarweed [Madia spp.] may be a vital factor in providing them with the necessary amount of moisture," in the dry season.

Estivation (summer dormancy), on stored body fat, occurs in many California ground squirrels. There is a greater tendency for adults, particularly females, to estivate than for young squirrels (Evans and Holdenried 1943; Fitch 1948). This relieves water stress in estivating individuals and reduces intraspecific competition for water sources (i.e., succulent vegetation) among the nondormant segment of the population.

Besides the introduction of new succelent food items into the ground squirrels diet, agriculture provides free water by summer irrigation of even the driest parts of the Central Valley. According to Grinnell and Dixon (1918, in Linsdale 1946) ground squirrels will travel up to a quarter of a mile for water where surface water is available; however, populations still thrive where it is not. Linsdale (1946) further reports observations of free water sources used by ground squirrels as follows: streams and creeks; fog, dew and rain water condensed on broad leaf vegetation; and watering troughs.

Cover Requirements

In Ecoregion 2610, California ground squirrels occupy a variety of habitats, principally characterized as open areas. These include: agricultural pasture and grain fields (Tomich 1962; Burt and Grossenheider 1964; Orr 1971; Clark 1975), orchards (Ingles 1965; Clark 1975), and field crops (Clark 1975); slopes, with scattered trees, and rocky places (Burt and Grossenheider 1964;

MacClintock 1970; Clark 1975); plains and small meadows (MacClintock 1970); open grassland (Evans and Holdenriod 1943); suitable open areas in riparian forest (Roberts et al. 1977).

Surface cover requirements of these ground squirrels appear to be not what vegetation is present, but more or less what vegetation is not present. Escape, reproduction, resting, shelter, and foraging cover is provided almost exclusively by extensive communal burrow systems, with many entrances and simple, singular emergency burrows. Almost all activities are carried on within 137.2 m (150 yds) from the burrow complex (Evans and Holdenried 1943; Fitch 1948; MacClintock 1970; Clark 1975) thus permitting quick access to one of the system's entrances or to an outlying emergency borrow. Therefore, surface cover preferences seem to be for open areas with conspicuously short vegetation; which extends the visibility range for predator detection. California ground squirrels avoid tall, dense vegetation such as heavy brush or dense stands of trees (Evans and Holdenried 1943; Burt and Grossenheider 1964; Clark 1975) and even dense stands of tall grasses and herbaceous annual vegetation (Evans and Holdenried 1943; Linsdale 1946; Tomich 1962).

Owings et al. (1977) observed that California ground squirrels often use promontories (logs, mounds, stones, etc.) when assuming alert postures. In another study, Owings and Borchert (1975) found a partial correlation ($r=0.62$) between promontory and burrow location; which probably offset visual obstruction by the tall grasses present in the area. According to Linsdale (1946), large boulders, mounds, trees, stumps, and fence posts serve ground squirrels as basking and lookout areas. Rocky outcrops and trees also served to anchor and protect burrow systems.

Agricultural land use and grazing have greatly increased suitable habitat for California ground squirrels by reducing excess cover and introducing new food items (Linsdale 1946; Orr 1971). Grazing, in particular, improves ground squirrel habitat by reducing excessive growth (Evans and Holdenried 1943; Linsdale 1946). Tomich (1962) found a large colony in an area of sparse, low cover. However, vegetation of barley and mustard grew to heights between five and seven feet the following year and all but eliminated ground squirrels in

that area. Tomich further suggested that excessive rainfall is the most adverse environmental factor affecting these squirrels. Dry years provide adequate seed production and reduces cover which, with the addition of squirrel and cattle grazing, maintains open ground.

Interspersion Requirements

No specific interspersion requirements could be found in the literature. Limited interspersion appears to be tolerated by ground squirrels, so long as the physiognomy of the land is relatively open. Interspersion of scattered trees, bushes and/or inanimate objects (boulders, stumps, fence posts, etc.) may actually be perferred for use as basking and/or lookout perches; particularly where grasses and forbs are several feet tall.

Reproductive Requirements

In Ecoregion 2610, the ground squirrel primarily breeds during the first half of the year (Clark 1975). In northern California, the breeding season runs from February through April (Evans and Holdenried 1943).

No specific requirements were found in the literature.

Special Habitat Requirements

No special habitat requirements were found in the literature.

Special Considerations

Many authors report on the agricultural pest status of the California ground squirrel. All of the crop types listed in the "food requirements" section above are damaged to some extent by ground squirrels.

This common ground squirrel is associated with several human diseases. On this subject, Clark (1975) summarizes:

Ground squirrels are frequently named as causal agents in human cases of sylvatic (bubonic) plague in California. Circumstantial evidence points to ground squirrels as the host to plague-infected fleas in over half the reported human plague cases in California in the last 40 years. Ground squirrels are not the "reservoir" hosts of the disease; apparently wild mice (and their fleas) are the reservoir hosts from which the disease periodically spreads to other rodents. Records of the incidence of plague in wild mouse and squirrel populations show some areas of the state to be "high risk" areas, while the disease is rare in other areas. Ground squirrels are themselves susceptible to plague, and insecticides have been used as a preventive measure in some recreation areas to kill the fleas, with the result that both human and squirrel populations were protected from the disease. Ground squirrels are also associated with the spread of Rocky Mountain spotted fever, rat bite fever, tularemia, Chagas' disease, adiospiromycosis and encephalomycarditis.

It has long been felt that ground squirrel foraging is in direct competition with cattle grazing on rangeland (Fitch 1948; Clark 1975). However, a recent controversy has emerged on this subject. Schitoskey and Woodmansee (1978) studied the California ground squirrel's diet and energy requirements, at the San Joaquin Experimental Range (where previous cattle-squirrel relationships have been studied) and concluded that 1) the diets of cattle and ground squirrels were generally dissimilar and 2) ground squirrel consumption of the net above ground plant production was only a small amount. Further research is apparently needed to develop a final conclusion.

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DRAFT
August 1980

GUIDELINES FOR DETERMINING
HABITAT SUITABILITY INDEX (HSI)

Species: California Ground Squirrel (Spermophilus beecheyi; Formerly Beechey Ground Squirrel)

Cover Types: Grassland; Agricultural Field and Row Crops; Deciduous Treeland (Orchards)

Ecoregion: 2610 - The Central Valley of California

HABITAT RELATIONSHIPS

Range Size

Almost all activities take place within 137.2 m (150 yds.) from the ground squirrel's burrow system; or about 5.9 ha (14.3 ac.) in extent. However, some movements to 1,097 m (1,200 yds) have been detected (Evans and Holdenried 1943). The home range may be permanently maintained or shifted to a new area, depending upon annual shifts in environmental conditions. Young of the year have the greatest tendency to establish adult ranges in new territory; always in areas of lower squirrel density.

Optimum Habitat Composition

Linsdale (1946; p. 450) concluded that a favored living place for ground squirrels, in the grassland community of the Hastings Natural History Reservation (Monterey County), has "...scattered trees, scattered bushes, sparse low grass, dry, loose soil, an area which slopes toward the sun, moderate sunshine, dryness, few carnivores, moderate heat, moderate humidity, light wind, protective obstacles, light, burrows, and other squirrels." Tomich (1962) reports on agricultural setting, in the Sacramento Valley, in which the California ground squirrel thrives as: typically large farms of barley, grain hay, milo maize, tomatoes, sugar beets and dry beans; irrigated pasture, stubble, and grassland grazed by sheep and beef cattle; fallow land and field borders of weedy annual vegetation.

Life Requisite Values

Food - Related to the abundance, availability and diversity of green herbage, seeds, nuts, bulbs, acorns and many agricultural row crops, orchard crops, grains and pasture. [V_1]

Water - The absence of free water is not limiting to California ground squirrels as feeding patterns are shifted towards greater succulence during dry parts of the year and adult squirrels estivate ("summer sleep") in their borrows, thus escaping the dry conditions. However, where free water is available, ground squirrels will exceed their normal home range to drink. [V_2]

Cover - Related primarily to the physiognomy of the sample site and the presence of burrows. Prefered sample sites include an open character with sparse, low vegetation of grasses and weedy annual forbs. Due to summer estivation and winter hibernation, above ground activity of squirrels may be difficult to detect during some months; particularly August-September and December-January, respectively. Hence, the presence of burrows indicate present use of the area by these squirrels. Even abandoned burrows may be recolonized as environmental conditions change; either on the sample site or in adjacent areas (i.e., dispersement of young-of-the-year). [V_3]

Interspersion - Habitat interspersion, or the lack thereof, is not limiting to the California ground squirrel, so long as the "open" character of the area is maintained. However, ground squirrels prefer a pseudointerspersion of scattered inanimate objects (e.g., fence posts, stumps, mounds, rocks, etc.), bushes, and trees for use as basking and "lookout" promontories. [V_4]

Mechanism to Determine the Habitat Suitability Index (HSI)

The HSI equals the mean of the above Life Requisite Values.

HSI (≤ 1.0) = _____

HABITAT EVALUATION CRITERIA

Food - Related to the abundance, availability, and diversity of green herbage, seeds, nuts, bulbs, and agricultural row crops, orchard crops, grains, and pasture. In natural areas, nonlegume herbs form the bulk of the ground squirrels diet, particularly tarweed (Madia spp.) and filaree (Erodium spp.). Acorns, when present, form an important winter food as they are cached during fall months. During sample site inspections, optimal diversity is difficult to assess because it includes seasonal changes in the annual vegetation. However, the optimum includes dominance by nonlegume forbs followed by equal abundance of grasses, legumes and in some areas, woody vegetation.

Food Value is a function of:

[V_1] The abundance, availability, and diversity of suitable food types within 137.2 m (150 yds.) from the sample site.

(a) Suitable food types abundant, readily available, and diverse with nonlegume forbs dominant; within 137.2 m (150 yds.) from sample site . . . . . (0.8 - 1.0 rating)

(b) Suitable food types scattered, less abundant (medium density), less available (concentrated from 68.6 - 137.2 m or 75 - 150 yds.), or less diverse (nonlegume forbs less than dominant) . . . . . (0.4 - 0.7 rating)

(c) Suitable food types
scarce, not available
within 137.2 m (150 yds)
or of monotypic diversity . . . . . (0.0 - 3.0 rating)

Food Value [V_1] = _____

Water - Related to the availability of free water. Since the lack of free water is not limiting to ground squirrels, low ratings do not apply. However, the presence of free water does improve the habitat suitability of the area and increases the HSI of the sample site.

Water Value is a function of:

[V_2] The availability of free water within 402 m (0.25 mi) from the sample site.

(a) Free water available
within 137.2 m (150 yds) . . . . . (0.8 - 1.0 rating)

(b) Free water available
between 137.2 m (150 yds)
and 402 m (0.25 mi) . . . . . (0.6 - 0.7 rating)

(c) Free water not available
within 402 m (0.25 mi) . . . . . DO NOT USE AS A LIFE REQUISITE VALUE IN THE HSI FORMULA BELOW.

Water Value [V_2] = _____

Cover - Related not to what vegetation is present, but more or less to what vegetation is not present; i.e., the "open" character of the land. California ground squirrels prefer surface cover which is "open" with conspicuously short vegetation which extends the visibility range for predator detection. Also related to the presence of burrows, active or abandoned, which provides for the rearing of young, hibernation and estivation, food caches, escape cover, and shelter from the elements.

Cover Value is a function of:

[V_3] The presence of burrows and the "openness" of the area within 137.2 m (150 yds) from the sample site.

(a) Grasses and forbs less than 0.3 m (1 ft.) tall, scattered (low density), and burrows abundant . . . . . (0.8 - 1.0 rating)

(b) Grasses and forbs between 0.3 - 0.6 m (1-2 ft.) tall, of medium density, runways present, and/or burrows present but scattered . . . . . (0.4 - 0.7 rating)

(c) Grasses and forbs taller than 0.6 m (2 ft.), dense, lacking runways, and/or burrows scarce or unavailable . . . . . (0.0 - 0.3 rating)

Cover Value [V_3] = _____

Interspersion - Related to the absence of interspersion between grassland, agricultural land, open rangeland, or any other open areas with dense shrubs

and trees. Ground squirrels prefer open areas with scattered trees, bushes, or inanimate objects (e.g., fence posts, stumps, mounds, rocks, etc.) for use as basking and "lookout" promontories.

Interspersion Value is a function of:

[V_4] The "open" character of the area within 137.2 m (150 yds) from the sample site and the presence of promontories.

(a) Sample site conspicuously open with well scattered, equally spaced promontories . . . . . (0.8 - 1.0 rating)

(b) Sample site conspicuously open with scattered inanimate promontories and small, moderately dense clumps of trees or bushes . . . . . (0.5 - 0.7 rating)

(c) Sample site moderately open with moderate interspersion of trees and shrubs . . . . . (0.3 - 0.4 rating)

(d) Sample site partially open with open grassy areas well interspersed with dense stands of trees and shrubs or area predominantly trees and shrubs . . . . (0.0 - 0.2 rating)

Interspersion Value [V_4] = _____

Habitat Suitability Index (HSI) Determination

For sample sites with free water available within 402 m (0.25 mi):

$$HSI\ (\leq 1.0) = [V_1 + V_2 + V_3 + V_4] \div 4$$

$$HSI = \_\_\_\_\_$$

For sample sites without free water available within 402 m (0.25 mi):

$$HSI\ (\leq 1.0) = [V_1 + V_3 + V_4] \div 3$$

$$HSI = \_\_\_\_\_$$

Other Considerations

In addition to those inventory characteristics identified as being important for the California ground squirrel, there may still be other pertinent evaluation criteria obvious only at an on-site inspection. All criteria identified as being unique to a specific site must be incorporated (and documented) into the appropriate life requisite category as each situation dictates and considered when determining the HSI.

If any criteria listed are not applicable in a particular situation, do not use in determining the life requisite value or the HSI.

SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

September 20, 2012

Document Number: 120920101519

Kevin T. Doyle
Tetra Tech,Inc
4 Espira Road
Santa Fe, NM 87508

Subject: Species List for Isabella Lake Dam Safety Modification Project EIS

Dear: Mr. Doyle

We are sending this official species list in response to your September 20, 2012 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area.* For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

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 December 19, 2012.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found here.

Endangered Species Division

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: 120920101519

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

Branchinecta lynchi
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Euproserpinus euterpe
Kern primrose sphinx moth (T)

Fish

Hypomesus transpacificus
delta smelt (T)

Amphibians

Rana draytonii
California red-legged frog (T)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Thamnophis gigas
giant garter snake (T)

Birds

Empidonax traillii extimus
Critical habitat, southwestern willow flycatcher (X)
southwestern willow flycatcher (E)

Gymnogyps californianus
California condor (E)

Vireo bellii pusillus
Least Bell's vireo (E)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides nitratoides
Tipton kangaroo rat (E)

Ovis canadensis californiana
Sierra Nevada (=California) bighorn sheep (E)

Sorex ornatus relictus
Buena Vista Lake shrew (E)
Critical habitat, Buena Vista Lake shrew (X)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Caulanthus californicus
California jewelflower (E)

Monolopia congdonii (=Lembertia congdonii)
San Joaquin woolly-threads (E)

Opuntia treleasei
Bakersfield cactus (E)

Pseudobahia peirsonii
San Joaquin adobe sunburst (T)

Candidate Species

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Mammals

Martes pennanti
fisher (C)

Quads Containing Listed, Proposed or Candidate Species:

BRECKENRIDGE MTN (238A)
MT. ADELAIDE (238B)
RIO BRAVO RANCH (239A)
OIL CENTER (239B)
OILDALE (240A)
STEVENS (240C)
TUPMAN (241D)
WALKER PASS (259A)
ONYX (259B)
CANE CANYON (259C)

WELDON (260A)
LAKE ISABELLA NORTH (260B)
LAKE ISABELLA SOUTH (260C)
ALTA SIERRA (261A)
GLENNVILLE (261B)
DEMOCRAT HOT SPRINGS (261C)

County Lists

Kern County

Listed Species

Invertebrates

Branchinecta conservatio
Conservancy fairy shrimp (E)

Branchinecta longiantenna
Critical habitat, longhorn fairy shrimp (X)
longhorn fairy shrimp (E)

Branchinecta lynchi
Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Euproserpinus euterpe
Kern primrose sphinx moth (T)

Fish

Hypomesus transpacificus
delta smelt (T)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana draytonii
California red-legged frog (T)

Critical habitat, California red-legged frog (X)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Thamnophis gigas
giant garter snake (T)

Birds

Charadrius alexandrinus nivosus
western snowy plover (T)

Empidonax traillii extimus
Critical habitat, southwestern willow flycatcher (X)
southwestern willow flycatcher (E)

Gymnogyps californianus
California condor (E)
Critical habitat, California condor (X)

Vireo bellii pusillus
Least Bell's vireo (E)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides nitratoides
Tipton kangaroo rat (E)

Ovis canadensis californiana
Sierra Nevada (=California) bighorn sheep (E)

Sorex ornatus relictus
Buena Vista Lake shrew (E)
Critical habitat, Buena Vista Lake shrew (X)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Caulanthus californicus
California jewelflower (E)

Eremalche kernensis
Kern mallow (E)

Monolopia congdonii (=Lembertia congdonii)
San Joaquin woolly-threads (E)

Opuntia treleasei
Bakersfield cactus (E)

Pseudobahia peirsonii
San Joaquin adobe sunburst (T)

Sidalcea keckii
Critical habitat, Keck's checker-mallow (X)
Keck's checker-mallow (=checkerbloom) (E)

Candidate Species

Amphibians

Rana muscosa
mountain yellow-legged frog (C)

Birds

Coccyzus americanus occidentalis
Western yellow-billed cuckoo (C)

Mammals

Martes pennanti
fisher (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

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 December 19, 2012.

APPENDIX D

CULTURAL RESOURCE CONSULTATION UPDATE

DOCUMENTATION OF TRIBAL GOVERNMENT INTERACTION

US Army Engineer District, Sacramento

Corps of Engineers

CHECK APPROPRIATE TYPE OF COMMUNICATION/MEETING: (Tribal and Interagency)

____ 1. Formal government-to-government consultation (DE or TL w/Tribal Council or Chair)

__X_ 2. Government-to-government & Section 106 info sharing (CW Staff, TL or PM w/Tribal Staff)

____ 3. Coordination of project work, staff work or proposal review (PM w/Tribal Staff)

TRIBE: Tubatulabal Tribe (CA): Robert Gomez, Betsy Johnson, Tina Guerrero, Josie Peterson and Louise Akers.

CORPS STAFF: Marci Jackson, Katie Huff, Richard Perry, Roxanne Bump and Mark Gilfillan

USFS STAFF: Rick Larson, Brenda Ehmann, Tim Kelly and Dirk Charley

DATE OF COMMUNICATION/MEETING: 22 August 2012 @1000

DATE OF FOLLOW-UP COMMUNICATION: On-going through PAO and monthly project SITREPs

CORPS PROJECT: Lake Isabella DSAP

SUBJECT MATTER: Update Tribe on project activities, alternatives, Section 106 and NAGPRA-PA and site visit to Patterson Way Road and South Fork Wildlife Area. Reference minutes from USFS notes dated August 22, 2012.

CONCLUSIONS: Topical Summary of Minutes expressed by Tubatulabals: 1) Economic opportunities for Tribe, 2) Cultural mitigation/interpretive site at South Fork, 3) Construction contract for local/tribal (Kern Valley) hiring language in IDIQ, 4) Hwy. 155/178 and CALTRANS cultural effort (Section 106) coordinated to tribes, 5) Programmatic Agreement (NAGPRA) curation and Action Plans with tribes, 6) Training opportunities to include tribal cultural monitors.

ASSIGNMENT(S): Corps staff to communicate response to Tubatulabal; 2) South Fork Wildlife Area/Patterson Way road overburden & leveling fill for interpretive center, 3) DSAP Contract language, 4) CALTRANS cultural work, and 5) PA (NAGPRA) Action Plans with USFS and Tribes.

PREPARED BY: GILFILLAN.MARK.ALLEN.1257532573 Digitally signed by GILFILLAN.MARK.ALLEN.1257532573 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=GILFILLAN.MARK.ALLEN.1257532573 Date: 2012.08.31 15:19:18 -06'00' DATE:_____

Preserving America's Heritage

July 30, 2012

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

REF: Lake Isabella Dam Safety Modification Project

Dear Ms. Kirchner:

Enclosed is the executed Programmatic Agreement for the referenced undertaking. By carrying out the terms of the Agreement, the Corps of Engineers will have fulfilled its responsibilities under Section 106 of the National Historic Preservation Act and the Council's regulations.

If you have any questions, please call Dr. Tom McCulloch at 202-606-8554 or via email at tmcculloch@achp.gov

Sincerely,

Tom M

Caroline D. Hall
Assistant Director
Federal Property Management Section
Office of Federal Agency Programs

Enclosure

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS, THE SEQUOIA NATIONAL FOREST, THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING THE
ISABELLA LAKE DAM SAFETY MODIFICATION STUDY PROJECT
KERN COUNTY, CALIFORNIA

WHEREAS, the U. S. Army Corps of Engineers, Sacramento District (Corps), is proceeding with the Isabella Lake Dam Safety Modification Study Project (Undertaking) as authorized under the Flood Control Act of 1944, P.L. 78-534, Chapter 665, Section 10, page 901. Dam Safety Modification Study projects are authorized by the Water Resources Development Act of 1986, P.L. 99-662, Title XII that provides the authority to make modifications to completed Corps of Engineers dam projects that have potential safety hazards; and

WHEREAS, the Corps has determined that the Undertaking may have an effect on properties that are either included in, or are eligible for inclusion in the National Register of Historic Places (NRHP) and has consulted with the California State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA); and

WHEREAS, the Isabella Lake Dam is on Sequoia National SQF (SQF) land. Therefore, the Corps has consulted with the SQF and has invited them to be a signatory to this Programmatic Agreement (PA); and

WHEREAS, the Corps, with the concurrence of SHPO and the Advisory Council on Historic Preservation (ACHP), has decided to comply with Section 106 of the NHPA for the Undertaking through the execution and implementation of a PA because the Corps cannot fully determine the effects of the Undertaking on historic properties (36 CFR §800.14(b)(1)(ii), and this agreement would addresses all phases and segments of the Undertaking ; and

WHEREAS, the SQF, and the Corps agreed that the Corps would assume the role as lead federal agency for the purposes of this Undertaking, as provided in 36 C.F.R. § 800.2(a)(2); and

WHEREAS, the Santa Rosa Rancheria Tachi Yokuts Tribe, the Tule River Tribe of the Tule River Indian Reservation, the Bishop Paiute Tribe, and the Tübatulabal Tribe have been contacted and afforded the opportunity to participate in the PA as concurring parties; and

WHEREAS, the ACHP was invited to participate in consultation and has agreed to participate in a letter dated September 30, 2010; and

WHEREAS, the Undertaking may occur on land that is all, or in part owned by the Corps, the SQF, and private property; and

WHEREAS, the Corps determined Isabella Lake Dam to be ineligible for inclusion in the National Register of Historic Places and SHPO concurred on September 27, 2010;

NOW, THEREFORE, the Corps, the SQF, the SHPO, and the ACHP agree that the proposed Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the Undertaking on historic properties and to satisfy the Corps' Section 106 responsibilities for all individual aspects of the Undertaking.

STIPULATIONS

The Corps shall ensure that the following measures are carried out:

Stipulation I
Area of Potential Effects Determination

A. The Corps has determined and documented the Area of Potential Effects (APE) for the Undertaking in consultation with SHPO. Modifications of the APE may be made by mutual agreement of the signatories without amending this Agreement.

B. The Corps has determined and documented the Area of Potential Effects (APE) for the Undertaking in consultation with the SQF and the SHPO for all properties on Federal land. The APE is on the Lake Isabella North, T 27 S, and R 32 E, and Lake Isabella South, T 26 S, and R 33 E. Both had minor revisions made to them in 1994. The third topographic map id the Weldon quadrangle, T 26 S, and R 33 E also revised in 1994. The Corps shall consult with the SHPO, and the SQF, and if appropriate, in a timely manner to amend the boundaries of the APE. A map of the APE is in Appendix 3.

C. The SHPO shall be notified in a timely manner of any modifications with the construction, right-of-way, and ancillary areas.

Stipulation II
Identification

A. The Corps has completed an updated records and literature search from all institutions that housed relevant documentation. The Corps also contracted with Basin Research Associates, Inc. for a records check. The final report entitled "Confirmation and Reevaluation of Cultural Resources Previously Identified in the Project Study Area, Isabella Lake Dam Safety Assurance Program, Kern County, California" was completed in February 2011.

B. The Corps, shall, pursuant to the Archeological Resources Protection Act of 1979, Section 4 (16.U.S.C. 470cc (a)), apply for a permit to conduct the excavation and removal of archeological resources on SQF land as required by SQF. This requirement shall be implemented for either evaluation pursuant to Stipulation 3(A) or Data Recovery pursuant to Stipulation VII. The SQF shall, at their discretion, retain "major"

responsibilities towards directing when, how, and where the evaluation testing or data recovery are planned.

C. The Corps will insure that form FS-2700-30 (Rev 05/06) Application for Permit for Archaeological Investigations is filed with the SQF and will obtain the necessary permit(s) prior to working on SQF land. The Corps will also insure continued coordination with the SQF Heritage Resource Manager regarding any additional necessary permits and protocols for conducting archeological work on SQF land.

D. The Corps will complete and report the results of all required intensive surveys of the Undertaking's APE in a manner consistent with the "Secretary of the Interior's Standards and Guidelines for Identification" (48 FR 44720-23) and take into account the National Park Service's publication, "The Archaeological Survey: Methods and Uses" (1978: GPO stock #024-016-00091). This will include areas not previously surveyed and areas where previous surveys are deemed by the Corps, in consultation with the SQF as necessary and the SHPO, to be inadequate. This will also include additional areas that may be affected by changes in the project design, borrow areas, haul roads, staging areas, extra work space, and other ancillary areas related to the Undertaking. If identified cultural resources do not need to be evaluated but can be determined eligible based on the results of the survey and prepared contexts and historic documentation, then the Corps may request the SQF, and the SHPO's concurrence with those determinations at that time. Reports produced as a result of intensive surveys will be submitted to the SQF, and the SHPO for review. The SQF and the SHPO shall have 45 calendar days after receipt to provide comments to the Corps.

E. Survey recordation shall include linear features, isolates, and re-recordation of previously recorded sites as necessary. The survey shall ensure that historical structures and buildings, and historical engineering features are recorded in addition to archeology sites. The types of properties to be recorded shall include, but not be limited to; commercial, residential, and ecclesiastical buildings, roads, trails, bridges, culverts, and agricultural features, including ditches. Recordation of historic structures and buildings shall be prepared using the State Historic Preservation Office, Historic Resources Inventory form, August 2004 revision.

F. Previously recorded sites will be updated using the California DPR 523 Site Record forms. Isolates will be numbered sequentially, plotted on a map and recorded on a single table within the report. Non-linear sites that extend outside of the APE will be examined in their entirety unless access to land is prohibited. In the event access cannot be gained, the Corps will consult with the SQF, and the SHPO regarding appropriate means of evaluating a given site. Linear resources (i.e., railroad, road, trail, ditch, etc.) that appear on General Land Office (GLO) plat maps or are known from other archival data to be potentially significant, or which have associated features or dateable artifacts will be recorded on DPR 523 site forms. Linear resources not mentioned on GLO plat maps or that appear on GLO plat maps but which are not associated with features or dateable artifacts, and so not appear to be significant on the basis of known archival data will be treated as "isolated road segments" and will be recorded in tabular form and collected

data will include at a minimum two (2) separate GPS points at both ends of the linear feature within the APE.

Stipulation III
Evaluation

A. The Corps will ensure that Evaluation Plans (EP) prepared for previously unevaluated cultural resources identified within the APE are consistent with the "Secretary of the Interior's Standards and Guidelines for Evaluation" (48 FR 44723-26). Individual EPs will be developed to address different categories of potentially eligible historic properties. A Discovery Evaluation Plan (DEP) and a Construction Monitoring Plan (CMP) will be developed as components of an EP. An EP will be used whenever the Corps, in consultation with the SQF, and the SHPO, determines that a cultural resource should be evaluated and use of the EP is essential to determine the boundaries and data potential of the site. Any archaeological testing will be limited to disturbing no more than 20 percent of the surface area of the resource and will be just sufficient to determine a site's eligibility for inclusion in the National Register.

B. The Corps will submit the EP for concurrent review to the SHPO, and appropriate Indian tribes. The Corps will also submit the EP for concurrent review to the SQF if the cultural resources to be evaluated should be on SQF's property. All reviewers shall have 45 calendar days after receipt to comment on the draft EP. The Corps will ensure that any comments received within that time period are taken into account and incorporated into the final EP. If the Corps cannot concur with comments made by the SQF and the SHPO and/or Indian tribes, the Corps will resolve the dispute in accordance with Stipulation XV. Failure of the SQF and the SHPO to comment within the specified time period shall not preclude the Corps from allowing the draft EP to be finalized and implemented in accordance with the terms of this stipulation. Within thirty (30) calendar days of finalizing the EP, the Corps shall provide a copy of the final document to the SQF, and the SHPO.

C. The Corps in consultation with the SHPO and the SQF, as appropriate, will ensure that determinations of eligibility are made in accordance with the criteria set forth in 36 CFR §60.4 for all properties within the APE, including additional areas that may be affected by changes in the project design, borrow areas, haul roads, staging areas, extra work space, and other ancillary areas related to the Undertaking. If the Corps, the SQF, , and the SHPO cannot agree on the National Register eligibility of a property, the Corps will obtain a determination from the Keeper of the National Register in accordance with 36 CFR Part 63. The determination of the Keeper shall be final for purposes of this PA.

Stipulation IV
Reporting

In accordance with Stipulation II(D) and Stipulation III(B), the Corps will prepare draft survey, and evaluation reports. The Corps will ensure those copies of draft survey and evaluation reports are submitted concurrently to the SHPO, the SQF, and other parties to this agreement for

a thirty (30) day period for review and comment. Failure by any reviewer to comment within this time period shall not preclude the Corps from allowing draft reports to be finalized. Within thirty (30) calendar days of finalizing the survey, and evaluation reports, the Corps shall provide all reviewers named in these stipulations copies of all final reports.

Stipulation V
Treatment of Confidential Information

To the extent consistent with the National Historic Preservation Act, Section 304, and the Archaeological Resources Protection Act, Section 9(a), cultural resources data from Corps/SQF managed lands will be treated as confidential by all Parties and is not to be released to any party not a Party to this agreement. In carrying out their responsibilities under this PA, the Federal Agency shall restrict disclosure of information in accordance with Section 304 of NHPA and implementing regulations, and other applicable non-disclosure provisions. Confidentiality concerns for properties that have traditional religious and cultural importance to the Tribes will be respected and will be protected to the extent allowed by law.

Stipulation VI
Qualifications

The Corps will ensure that archeological, historic, and architectural work conducted pursuant to this Agreement is carried out by, or under the direct supervision of a person or persons meeting qualifications set forth in the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61).

Stipulation VII
Determinations of Effect

The Corps will apply the Criteria of Adverse Effect pursuant to 36 CFR 800.5(a) (1) to all historic properties within the APE that will be affected by the Undertaking. Determinations of effect will be made in consultation with the SQF, and the SHPO and other interested parties.

Stipulation VIII
Preparation of Historic Property Treatment Plans

The Corps, in consultation with the SHPO, and/or the SQF shall ensure that a Historical Property Treatment Plan (HPTP) is developed for the mitigation of anticipated effects on historic properties that will result from the Undertaking and any related uses and activities.

A. Avoidance of adverse effects on historic properties is the preferred treatment approach. The HPTP will discuss and justify the chosen approaches to the treatment of project historic properties and those treatment options considered, but rejected. If preservation of part or all of any historic properties is proposed, the treatment plan will include discussion of the following:

1. Description of the area or portions of the historic properties to be preserved in-place, and an explanation of why those areas or portions of sites were chosen;
2. Explanation of how the historic properties will be preserved in-place, including both legal and physical mechanism for such preservation;
3. A plan for monitoring and assessing the effectiveness of mechanisms to preserve the historic properties; and
4. A plan for minimizing or mitigating future adverse effects on the historic properties if preservation in-place mechanisms prove to be ineffective.

B. When avoidance is not feasible, the Corps in consultation with the SQF and the SHPO shall ensure that its consultant(s) develops an appropriate treatment plan designed to lessen or mitigate project-related effects to historic properties. For properties eligible under criteria specified in 36 CFR §60.4(a)-(d), mitigation other than data recovery may be considered in the treatment plan (e.g., HABS/HAER recordation, oral history, historic markers, exhibits, interpretive brochures or publications, etc.). Where appropriate, treatment plans will include provisions (content and number of copies) for a publication for the general public.

C. When data recovery is proposed, the Corps in consultation with the SHPO and the SQF or as appropriate, shall ensure that its consultant(s) develops a data recovery plan that is consistent with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation and the ACHP's "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites" (ACHP May 18, 1999). Components to be included in data recovery plans are found in Appendix 2.

D. Each phase or segment specific treatment plan tier off of the HPTP prepared for the project, providing specific direction for the conduct of data recovery within any project segment. Components to be included in data recovery plans are found in Appendix 2.

E. The interested public, including Indian tribes will be invited to provide input on the identification, evaluation, and proposed treatment of historic properties. Depending on the specific nature of the Undertaking, this will be done through letters of notification, public meetings, and site visits.

Stipulation IX
Tribal Involvement

A. In consultation with the appropriate Indian tribes, the Corps will identify historic properties of traditional religious and cultural importance.

B. The Corps will seek comments from all potentially interested Indian tribes in light of the guidance provided in National Register Bulletin 38 in making determinations of eligibility for any Traditional Cultural Properties as these are defined in Bulletin 38. All reviewers shall have 30 calendar days after receipt to provide comments to the Corps. The Corps will ensure that any comments received during this time period are taken into

account and incorporated into the final survey and evaluation reports. Disputes shall be resolved by the Corps in accordance with Stipulation XVI.

Stipulation X
Public Involvement

Pursuant to Section 36 CFR §800.6(c)(2)-(3) of the ACHP's regulations, the Corps will consider requests by interested parties to become concurring parties to this Programmatic Agreement.

Stipulation XI
Review of Historic Property Treatment Plans

The Corps will ensure that draft HPTP's and Supplemental Treatment Plans (STP) are submitted concurrently to the SHPO, the SQF, and appropriate Indian tribes for review and comment. Reviewers shall have 30 calendar days after receipt of the draft HPTP to comment to the Corps. The Corps will ensure that any comments received during this time period are taken into account and incorporated into the final HPTP. The Corps will make every effort to resolve disputes that may arise from conflicting comments by the consulting parties via telephone conversations. In the event that disputes are not easily remedied, the Corps will resolve them in accordance with Stipulation XV Failure to comment within this time period will not preclude the Corps from allowing the HPTP to be finalized and implemented. If the Corps revises the draft HPTP as a result of comments, the Corps shall afford the SQF, and/or the SHPO and appropriate concurring parties the opportunity to review the revised documents for 30 calendar days. If no comments are received within 30 calendar days, the Corps will finalize the HPTP for implementation. Within thirty (30) calendar days of finalizing the HPTP, the Corps shall provide all reviewers a copy of the final HPTP.

Stipulation XII
Notices To Proceed With Construction

Notices to Proceed (NTP) may be issued by the Corps for individual construction segments, defined by the Corps in its construction specifications, under any of the following conditions:

1. The Corps, and/or the SQF and the SHPO have determined that there are no unevaluated cultural resources within the APE for a particular construction segment; and

2. The Corps, and/or the SQF and the SHPO have determined that there are no historic properties within the APE for a particular construction segment; or

3. The Corps after consultation with the SQF, and the SHPO and Concurring parties has implemented an adequate treatment plan for the construction segment, and

   (a) Through project redesign, unevaluated cultural resources can be avoided or;

(b) The fieldwork phase of the treatment option has been implemented and completed; and

(c) The Corps has accepted a summary of the fieldwork performed and a reporting schedule for that work.

Stipulation XIII
Discovery of Unknown Historic Properties

If potentially National Register eligible properties are discovered during construction, ground disturbing activities will cease until the provisions of 36 CFR §800.13(a), *Planning for subsequent discoveries* are met. The Corps shall consult with the SHPO within 24 hours of such a discovery and develop a plan in consultation with SHPO, the ACHP and the SQF. The SHPO shall review and comment on proposed treatment in accordance with Stipulation III (A).

Stipulation XIV
Curation

The Corps shall ensure that all artifacts and associated records resulting from identification, evaluation, and treatment efforts conducted under this PA are curated in accordance with 36 CFR Part 79, except as specified in Stipulation XIV. Archeological items and materials from privately owned lands to be returned to their owners should be maintained in accordance with 36 CFR 79 until any specified analyses are complete. Prior to engaging in any subsurface work, the Corps' consultant(s) shall identify a curation facility and in consultation with the Corps, the SQF and the facility develop a curation agreement for the acceptance and management of any artifact and records collections. The SQF shall retain ownership of all artifacts that are recovered from SQF land during the implementation of this Project by the Corps.

Stipulation XV
Tribal Consultation and Treatment of Human Remains

The Corps shall ensure that the Indian tribes identified above will be invited to participate in the development and implementation of the terms of this PA. The specific manner in which this tribal involvement will occur will be set forth in the HPTP.

A. The Corps will ensure that human remains, funerary items, items of cultural patrimony, and sacred objects encountered during the Undertaking that are located on state or private land are treated in accordance with the requirements of California State Health and Safety Code, Section 7050.5.

B. In the event that that human remains, funerary items, items of cultural patrimony, and sacred objects encountered during the Undertaking that are located on Corps, or SQF owned land, the protocols developed by the SQF, and approved by the Corps and the SQF shall be implemented. To that end, the SQF shall invite interested federally recognized Indian tribes to participate in the development of agreements and protocols to

facilitate procedures to address accidental discovery contingencies. This shall be completed prior to authorization to proceed with subsurface investigations.

Stipulation XVI
Dispute Resolution

A. Should any signatory to this PA object to plans provided for review pursuant to this PA or to actions proposed or carried out pursuant to this PA, that signatory shall notify the Corps of the objection and the basis for objection in writing within thirty (30) calendar days of receiving the plan. The Corps shall notify the other signatories to this PA of the objection within 30 calendar days of receipt and shall consult with the signatories to resolve the objection. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the ACHP in accordance with procedures specified in 36 CFR §800.7.

B. Any recommendation or comment provided by the ACHP will be understood to pertain only to the subject of the dispute. The Corps's responsibility to carry out all actions required by this PA that are not subject of the dispute shall remain unchanged.

Stipulation XVII
Amendments, Noncompliance, and Termination

A. If any signatory believes that the terms of this PA cannot be carried out or are not being met, or that an amendment to its terms should be made, that signatory will immediately consult with the other signatories to consider and develop amendments to this PA pursuant to 36 CFR §800.6(c)(7).

B If this PA is not amended as provided for in this stipulation, the Corps, the SQF, and the SHPO, may terminate it. The signatory proposing to terminate will provide a written explanation of the reasons for termination to all other signatories in accordance with 36 CFR §800.6(c)(8).

C. If this PA is terminated and the Corps determines that the Undertaking will proceed, the Corps shall comply with the requirements of 36 CFR §800.3- 800.6.

Stipulation XVIII
Duration of the PA

A. If the project has not been implemented within ten (10) years of the date of execution of the PA and the PA has not been terminated, the signatories shall consult on a date not less than 90 days prior to the tenth anniversary of this PA to reconsider its terms. Reconsideration may include continuation of the PA as originally executed, amendment, or termination. If the PA is terminated because the Undertaking no longer meets the definition of an "Undertaking" set forth in 36 CFR §800.16(y).

B. This PA will be in effect through the Corps's implementation of the Undertaking, and will terminate and have no further force or effect when the Corps, in consultation with the other signatories, determines that the terms of this PA have been fulfilled in a satisfactory manner and/or Corps involvement in the project has ended. The Corps will provide the other signatories with written notice of its determination and of termination of this PA.

Stipulation XIX
Effective Date

This PA shall take effect on the date that it has been fully executed by the Corps, the SQF, and the SHPO.

EXECUTION of this PA by the Corps, the SQF, and the SHPO, its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the Undertaking and its effects on historic properties, that the Corps has taken into account the effects of the Undertaking on historic properties, and that the Corps has satisfied its responsibilities under Section 106 of the National Historic Preservation Act and applicable implementing regulations for all aspects of the Undertaking.

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: _____ DATE: 15 MARCH 2012

TITLE: William J. Leady, P.E., Colonel, U.S. Army District Commander

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: 21 MAR 2012

TITLE: Milford Wayne Donaldson, FAIA, State Historic Preservation Officer

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: _____ DATE: _____

TITLE: John Fowler, Executive Director

SEQUOIA NATIONAL FOREST

BY: _____ DATE: _____

TITLE:

B. This PA will be in effect through the Corps' implementation of the Undertaking, and will terminate and have no further force or effect when the Corps, in consultation with the other signatories, determines that the terms of this PA have been fulfilled in a satisfactory manner and/or Corps involvement in the project has ended. The Corps will provide the other signatories with written notice of its determination and of termination of this PA.

Stipulation XIX
Effective Date

This PA shall take effect on the date that it has been fully executed by the Corps, the SQF, the SHPO, and the ACHP

EXECUTION of this PA by the ACHP, SHPO, Corps, and the SQF, and its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the Undertaking and its effects on historic properties, that the Corps has taken into account the effects of the Undertaking on historic properties, and that the Corps has satisfied its responsibilities under Section 106 of the National Historic Preservation Act and applicable implementing regulations for all aspects of the Undertaking.

U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT

BY: _____ DATE: _____

TITLE: William J. Leady, P.E., Colonel, U.S. Army District Commander

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

BY: _____ DATE: _____

TITLE: Milford Wayne Donaldson, FAIA, State Historic Preservation Officer

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: John M. Fowler DATE: 7/31/12

TITLE: John Fowler, Executive Director

SEQUOIA NATIONAL FOREST

BY: _____ DATE: 29 MAY 2012

TITLE: Kevin B. Elliott, Forest Supervisor

CONCURRING PARTIES:

SANTA ROSA RANCHERIA TACHI YOKUT TRIBE

BY: _____ DATE: _____

TITLE:

TULE RIVER TRIBE OF THE TULE RIVER INDIAN RESERVATION

BY: _____ DATE: _____

TITLE:

BISHOP PAIUTE TRIBE

BY: _____ DATE: _____

TITLE

TÜBATULABEL TRIBE

BY: Dan Miranda Beyer DATE: 3-8-2012

TITLE Tribal Chairwoman

Appendix 1
Standards and Guidelines for Research Designs

Research designs prepared for this Undertaking shall specify, at a minimum:

Appendix 1
Standards and Guidelines for Research Designs

Research designs prepared for this Undertaking shall specify, at a minimum:

- The property, or properties, or portions of properties where data recovery is to be carried out;
- Any property, or properties or portions of properties that will be destroyed with data recovery;
- The research questions to be addressed through the data recovery, with an explanation of their relevance and importance;
- The methods to be used, with an explanation of their relevance to the research questions;
- The methods to be used in analysis, data management, and dissemination of data, including a schedule;
- The proposed disposition of recovered materials and records;
- Proposed methods by which the parties to the Programmatic Agreement will be kept informed of the work and afforded the opportunity to participate; and
- A proposed schedule for the submission of progress reports to the California State Historic Preservation Officer.

Appendix 2
Historic Property Treatment Plans (HPTP) shall address:

- The historic properties or portions of historic properties where treatment will be implemented;
- Any historic properties or portions of historic properties that will be destroyed or altered without treatment;
- A research design that will contain the research questions and goals that are applicable to the project area as a whole and that will be addressed through data recovery, along with an explanation of their relevance and importance. These research questions and goals shall reflect the concepts of historic contexts as defined in National Register Bulletin 16. Historic contexts shall be prepared to provide the necessary background information to properly evaluate historical, engineering, and architectural properties;
- The field and analysis methods to be used, with an explanation of their relevance to the research questions;
- The methods to be used in data management and dissemination of data, including a schedule;
- The proposed disposition of recovered materials and records;
- Proposed methods for disseminating results of work to the interested public;
- Proposed methods by which appropriate Indian tribes and individuals, local governments, and other interested persons will be kept informed about implementation of the HPTP and afforded an opportunity to comment;
- A proposed schedule for submission of progress reports to the Corps, the SQF and the SHPO, and the ACHP;
- Methods and procedures for the recovery, analysis, treatment, and disposition of human remains, associated funerary items, and objects of cultural patrimony that reflect any concerns and/or conditions identified as a result of consultations between the Corps and any affected Indian Tribe (see Stipulation XIV);
- The historic properties to be affected in the specified project segment and the nature of those effects;
- The research questions identified in the HPTP that will be appropriate for the specified project segment and that will be addressed through data recovery, along with any explanation of their relevance to the overall research goals as established in the HPTP;

- The specific field work and analytical strategies identified in the HPTP, as well as any other strategies that will be used in the specified project segment;
- A proposed schedule for submission of progress, summary, and other reports to the Corps and;
- Qualifications of consultants employed to undertake the implementation of the HPTP.

Avoidance of adverse effects on historic properties is the preferred treatment approach. The HPTP will discuss and justify the chosen approaches to the treatment of project historic properties and those treatment options considered, but rejected. If preservation of part or all of any historic properties is proposed, the treatment plan will include discussion of the following:

1. Description of the area or portions of the historic properties to be preserved in-place, and an explanation of why those areas or portions of sites were chosen;
2. Explanation of how the historic properties will be preserved in-place, including both legal and physical mechanism for such preservation;
3. A plan for monitoring and assessing the effectiveness of mechanisms to preserve the historic properties; and
4. A plan for minimizing or mitigating future adverse effects on the historic properties if preservation in-place mechanisms prove to be ineffective.

Appendix 3
Map of the Area of Potential Effects

Appendix 4
Letter from SHPO Regarding NRHP Ineligibility of Isabella Lake Dam

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

September 27, 2010

In Reply Refer To: COE100825A

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
U.S. Army Engineer District
Sacramento Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Lake Isabella – Corrective Action 1 – Restore Auxiliary Dam at Left (East) Abutment Project, Kern County, California.

Dear Ms. Kirchner:

Thank you for submitting to my office, your letter and supporting documentation regarding the undertaking noted above. The U.S. Army Engineer District, Sacramento Corps of Engineers, is seeking my comments on the effects that the subject undertaking will have on historic properties, pursuant to 36 CFR Part 800 (as amended 8-05-04) regulations implementing Section 106 of the National Historic Preservation Act (NHPA). The proposed project, the Lake Isabella – Corrective Action 1 – Restore Auxiliary Dam at Left (East) Abutment Project, has been identified by the COE as an undertaking subject to review under Section 106 of the NHPA.

The project is designed to restore the height of the Lake Isabella Auxiliary Dam at its junction with the left abutment. The Lake Isabella Dam system is composed of both a Main Dam and an Auxiliary Dam, located directly east of the Main Dam. The existing ground elevation at the left abutment is approximately 2.5 feet lower than the designed top of the dam elevation. The proposed action will raise the abutment height through the construction of an earth embankment extending from the eastern tip of the Auxiliary Dam to the existing Highway 178 embankment, requiring the placement of fill material, aggregate base, stone protection, bedding, and rip-rap. The new embankment will be construction over an existing, abandoned asphalt access road.

The Area of Potential Effects (APE) consists of a total property of approximately 2.75 acres. Additionally, fill materials will be quarried from the Kelso Creek Canyon Pit Borrow Site. Identification efforts by the COE concluded that two built-environment historic properties were located within the project APE. These are the Lake Isabella Auxiliary Dam and the abandoned paved roadway at the construction site.

In addition to your letter of August 25, 2010 and attachments (maps, aerial photographs, and DPR 523 site records), you have submitted the following documents in support of your efforts to identify historic properties in the APE:

• *Cultural Resources Recordation and National Register Evaluation of Isabella Dam for the Lake Isabella Dam Safety Modification Project, Kern County, California* (Melissa Montag, U.S. Army Corps of Engineers Sacramento District: August 2010).

• *Memorandum for Record: Site Visit to Kelso Creek Canyon Community Pit Borrow Site, and Archeology Site CA-KER-23 Southeast of Weldon in Kern County for the Proposed Lake Isabella Auxiliary Dam Left Abutment Reconstruction Project* (Richard M. Perry, U.S. Army Corps of Engineers Sacramento District: August 16, 2010).

After reviewing your letter and supporting documentation, I have the following comments:

1) I concur that the APE has been appropriately determined in accordance with 36 CFR Parts 800.4(a)(1) and 800.16(d) and that the COE's efforts to identify and evaluate historic properties represent a reasonable and good faith effort pursuant to 36 CFR Part 800.4(b)(1).

2) I further concur that site CA-KER-7791H (05-13-54-796H, Old Asphalt Road) is *not* eligible for the National Register of Historic Places (NRHP) under any criteria.

3) I further concur that CA-KER-7792H, the Isabella Dam (including Isabella Main Dam and Isabella Auxiliary Dam), is *not* eligible for the NRHP under any criteria.

4) I further concur that your finding of No Historic Properties Affected is appropriate pursuant to 36 CFR Part 800.4(d)(1).

Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800.Thank you for seeking my comments and for considering historic properties in planning your project. If you require further information, please contact William Soule, Associate State Archeologist at phone 916-445-7022 or email wsoule@parks.ca.gov; and Amanda Blosser, State Historian, at phone 916-445-7048 or email ablosser@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

APPENDIX E

HEALTH RISK ASSESSMENT

Isabella Lake Dam Safety Modification Project

Health Risk Assessment: Preferred Alternative

September 2012

Prepared for:

US Army Corps of Engineers
Sacramento District

US Army Corps of Engineers®

Prepared by:

Insight Environmental Consultants, Inc.
Under Contract to
McIntosh and Associates and Tetra Tech, Inc.

Insight Environmental Consultants

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Note: HRA OUTPUT FILES not attached due to size. See contact information at end of this document to obtain ATTACHMENT 2.

LIST OF FIGURES

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CHAPTER 1
INTRODUCTION

This assessment discusses the potential health risks to the local community associated with the Isabella Lake Dam Safety Modification (DSM) Project. Specifically, this report addresses the potential for the Preferred Alternative to pose a significant risk to the long-term health of people who will live and work in close proximity to the project area during construction. Included in this report are: (a) the relevant established regulatory threshold standards used to evaluate potential health risk; (b) the methodology used to estimate the probability that an adverse health risk impact to nearby sensitive receptors could occur; and (c) a visual depiction of the modeled impact area for the Preferred Alternative.

1.1 PROJECT DESCRIPTION

The Isabella Lake Project incorporates two earthen embankment dams (the Main Dam and the Auxiliary Dam), outlet works, an un-gated spillway, highway realignment, a hydropower generation facility, associated conduit and a canal. The Project provides flood control and irrigation for the southern San Joaquin Valley and recreation and tourism for the local communities. The town of Lake Isabella, and metropolitan Bakersfield, with a combined population of approximately 300,000, are afforded flood protection benefits through the continued operation of the Project (Figure 1).

Isabella Lake is on National Forest System Lands, with recreation facilities and lands associated with the lake being managed by the US Department of Agriculture Forest Service (USFS). The continued operation and maintenance of the Main Dam and Auxiliary Dam are the responsibility of the Corps. Figure 2 illustrates the construction area and features associated with the Preferred Alternative.

Figure 1 Isabella Lake DSM Project Location

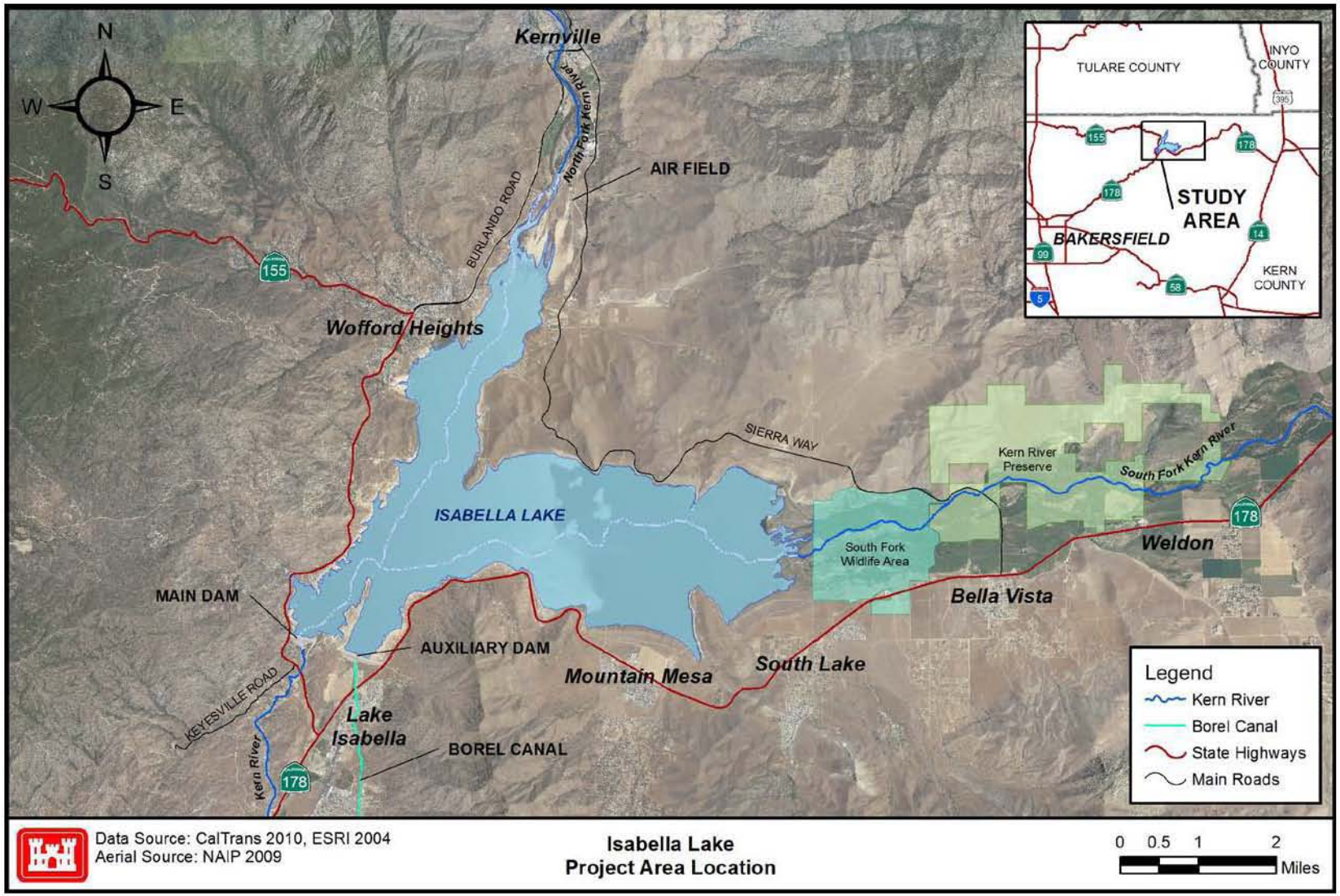
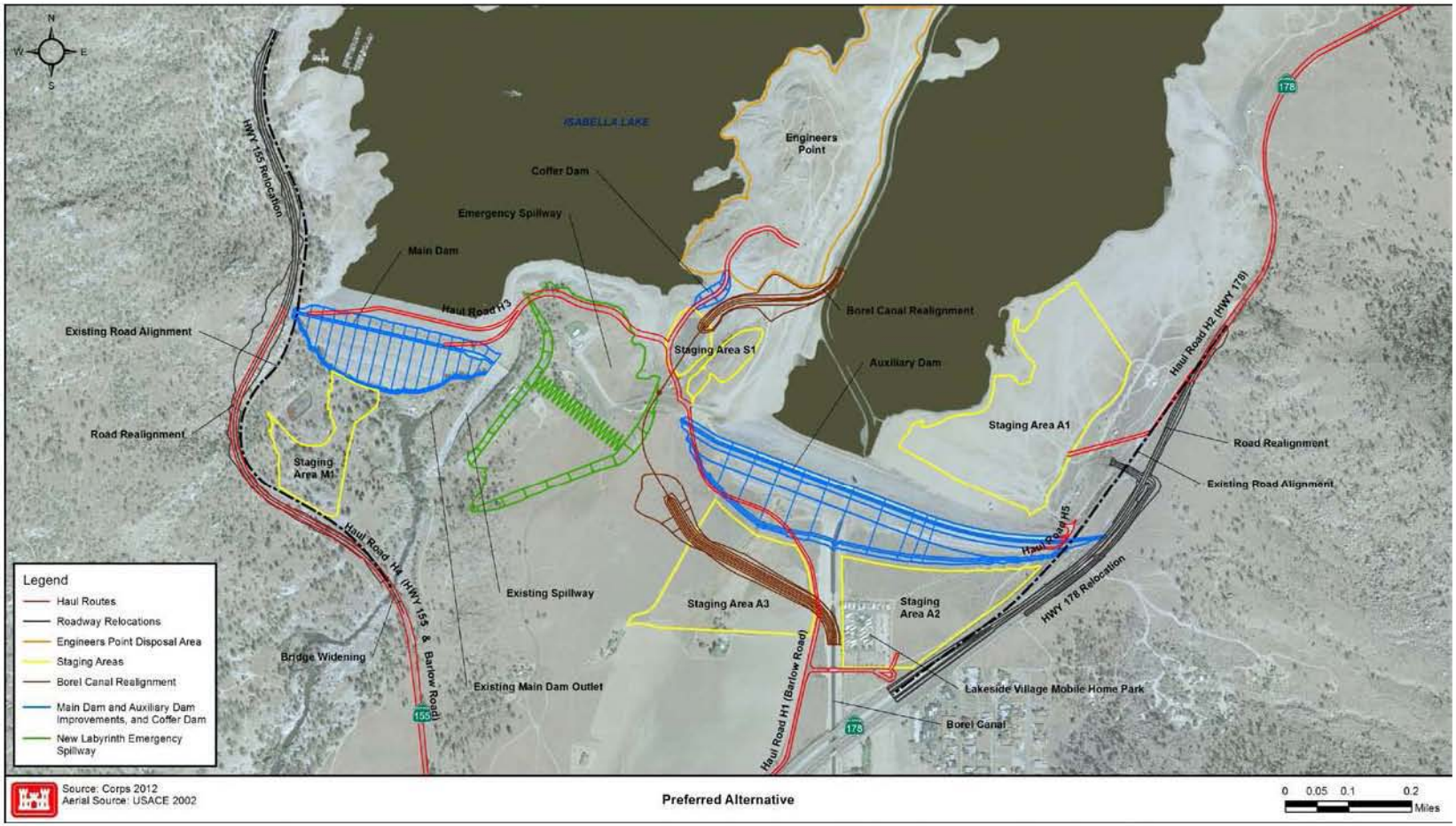


Figure 2 Preferred Alternative Site Plan



1.2 PREFERRED ALTERNATIVE EVALUATED

Under the Preferred Alternative, all of the dam safety deficiencies that are significant contributors to the risk of dam failure would be remediated. This alternative also represents the Corps' environmentally preferred risk management plan that would provide an adequate level of safety and result in the least adverse environmental impacts. Alternative Plan 4 was selected by the Corps as the Preferred Alternative based on the following:

- Alternative Plan 4 adequately meets tolerable risk guidelines and maximizes risk reduction downstream compared to the other Action Alternatives. These tolerable risk guidelines are described in Safety of Dams-Policies and Procedures ER 1110-2-1156, October 2011.
- Alternative Plan 4 conforms to the majority of essential Corps guidelines for design, construction, operation, and maintenance, as also described in ER 1110-2-1156.
- Alternative Plan 4 optimizes risk reduction, consequences, cost, and schedule compared to the other Action Alternatives, based on ALARP (as low as reasonably practicable) considerations, as also described in ER 1110-2-1156.
- Alternative Plan 4 incorporates a wider spillway and higher dam crests than the other Action Alternatives, which compared to the other action Alternatives, would ensure a higher level of downstream risk reduction for large storm/flood events that could overtop the existing dams.

CHAPTER 2
HEALTH RISK IMPACT METHODOLOGY

The Environmental Protection Agency (EPA) has determined that toxic particles in diesel exhaust may pose a risk to human health. These risks are assessed based on the likelihood of a project to cause any person who will live and work in close proximity to the project of contracting cancer, or a chronic non-cancerous ailment (e.g. heart disease, stroke, diabetes, arthritis) due to prolonged exposure to diesel exhaust. Emissions from the project, local weather, terrain, physical responses to diesel exhaust emissions and other factors are evaluated to determine the potential cancer and chronic ailment risk to local receptors.

2.1 HEALTH RISK EXPOSURE STANDARDS

2.1.1 Environmental Protection Agency Standards

The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing comprehensive evaluation of air toxics in the U.S. EPA developed the NATA as a state-of-the-science screening tool for State/Local/Tribal Agencies to prioritize pollutants, emission sources and locations of interest for further study in order to gain a better understanding of risks. While NATA results supports EPA's conclusion that diesel exhaust is likely to be a human carcinogen, EPA has concluded that the available data is not sufficient to develop a confident estimate of cancer unit risk. The cancer unit risk is a health assessment value that can be matched with environmental exposure data to estimate environmental risk. Therefore, EPA has not developed any regulatory thresholds for carcinogenic risk levels. On this basis, the thresholds established by the Eastern Kern Air Pollution Control District (EKAPCD) were used to determine carcinogenic health risk levels for anticipated emissions associated with implementation of the Preferred Alternative.

2.1.2 Eastern Kern APCD Standards

The DSM project site is within the Mojave Desert Air Basin (MDAB), which is under the jurisdiction of the EKAPCD. The guidelines used to determine the estimated health risk are discussed below.

Since EPA has not established cancer risk impact thresholds, EKAPCD's Rule 208.2, which provides criteria for determining significant environmental impacts was utilized. While this rule applies mostly to stationary sources within the District, the District also applies it to all sources of toxic air contaminants to establish the levels above which a project is deemed to have significant impacts. Section 208.2(II)(F) of the Rule establishes the carcinogenic risk level for air emissions considered to be significant as one in one-million for cancer risk, and a 0.2 chronic hazard index risk for non-cancerous ailments. A carcinogenic risk of one in one-million means that the probability of getting cancer is increased by one chance in a million with prolonged exposure to diesel emissions. The chronic hazard index is the ratio of the predicted local concentration divided by the expectable exposure level set by the California Office of Environmental Health Hazard Assessment (COEHHA).

2.2 MODELING METHODOLOGY

The most recent version of the ISCST3 model (recompiled for the Lakes ISC-AERMOD View interface) was used to predict the dispersion of emissions from the Preferred Alternative. All of the regulatory default ISCST3 model keyword parameters were selected. Elevated terrain options were used due to the complexity of the mountainous terrain in the project area. Diesel combustion emissions from the construction equipment and vehicles were modeled as several area sources rather than individual point sources. This was done because the use of an "area" source is a conservative method for modeling diesel particulate emissions. A more refined model using a combination of area, point, and line source would more likely lead to a reduced cancer risk impact. Additionally, the EPA-approved ISCST3 model was used instead of AERMOD because there is currently no approved AERMOD-ready meteorological data set for the project area within the EKAPCD. The closest meteorological data set available, from the Bakersfield Metropolitan Area, would not be considered representative of the project site and would result in unreliable predicted impacts. ISCST3 is typically a more conservative model compared to AERMOD when accurate meteorological data sets are available.

A unit emission rate of 1 g/sec was input to ISCST3. A discrete receptor grid was modeled in order to produce enough data points to generate isopleths of predicted risk. Hours between 6:00 pm and 6:00 am were turned off during the modeling process since construction activities would not occur during these hours. ISCST3 was used to generate ambient concentrations for the 1-hour, 4-hour, 6-hour, monthly and annual periods.

Plot files generated by ISCST3 were imported to HARP ONRAMP software wherein emission rates for the preferred alternative were assigned to adjust the ISCST3-predicted air concentrations calculated with unit emission rates. HARP ONRAMP was used to generate source, X/Q and emission import files for HARP.

HARP post-processing was used to assess the potential for excess cancer risk and chronic non-cancer effects using the most recent health effects data from the California EPA Office of Environmental Health Hazard Assessment (OEHHA). HARP site parameters were set to enable homegrown produce, dermal, soil ingestion and mother's milk pathways in addition to the inhalation pathway for carcinogenic risk. The deposition rate was set to 0.02 m/s. Risk reports were generated using the derived OEHHA analysis method for carcinogenic risk and non-carcinogenic chronic risk. Site parameters are included in the HARP output files. Total cancer risk was predicted for inhalation and non-inhalation pathways at each receptor. A hazard index was computed for chronic non-cancer health effects for each applicable endpoint and each receptor.

The HARP Program predicted a conservative estimate of increased individual carcinogenic risk that might occur as a result of continuous exposure over a 9-year period, since the construction emissions will only occur during a shorter time period, the total project construction emissions were divided by 9 in order to determine an annual average emissions exposure during 9 years to give an accurate prediction of exposure during the scheduled construction time period.

2.3 MODELING ASSUMPTIONS

The ISCST3 model (recompiled for the Lakes ISC-AERMOD View interface) allows selection of a number of criteria for input into the model. Four primary assumptions were made relative to modeling exposure to local receptors:

- Time of Day – The model was set to predict impacts based on operation of equipment within the project area using meteorological data only between the hours of 6:00 AM through 6:00 PM. This was based on information provided by the Corps indicating that all construction activities would occur during this time frame and that operations would not be conducted on a 24-hour/day basis.
- Terrain Selection –Mountainous areas demonstrate a different wind dispersion pattern. Therefore, the complex terrain option was selected and actual site topography was used to predict site dispersion.
- Rural Location Selected – The terrain, buildings, volume of paved area and property uses are different in rural locations as opposed to urbanized areas. Localized impacts vary significantly between these types of areas due to these factors. Rural dispersion parameters were used because the operation and the majority of the land surrounding the facility is considered "rural" under the Auer land use classification method[1].
- Area Source Depiction – The Preferred Alternative was modeled as multiple "area" sources. The "area" sources represent the different locations throughout the construction zone where the proposed equipment emissions would be emitted. Predicted emissions from proposed equipment were applied it to the selected areas in which they are assumed to be operating. Area sources include Staging Areas A1, A2, A1, and M1, Haul Roads H1, H3 and H6, Engineers Point, Existing Spillway, Emergency Spillway, Main Dam, Auxiliary Dam, Borel Canal, and Coffer Dam. As there would be a large number of "point sources" (engines) throughout the construction area, it was determined to be infeasible to run a model incorporating each of these point-sources although it is expected that this would result in even less off-site impacts than using the "area" sources depiction.

[1] Auer, Jr., A.H., Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology*, 17(5): 636-643, 1978.

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CHAPTER 3
HEALTH RISK IMPACTS

Employing the modeling assumptions noted above in Section 2.3, diesel combustion emissions from the construction equipment and vehicles proposed for the Preferred Alternative were modeled as several area sources. As noted, this is a conservative method for modeling diesel exhaust emissions. A more refined model using a combination of area, point, and line sources would more likely lead to a reduced cancer risk and impact a smaller area. Additionally, the ISCST3 model was used instead of AERMOD because, as stated before, there is currently no approved AERMOD-ready meteorological data set for the EKAPCD.

The assessment predicts a conservative estimate of increased individual carcinogenic risk that might occur as a result of continuous exposure over a 9-year period. Construction emissions are typically not found to pose a long-term health risk since they are "short-term" by nature. Since the construction emissions would only occur during a shorter time period, the total project construction emissions were divided by 9 in order to determine an annual average emissions exposure during 9 years to give an accurate prediction of exposure during the scheduled construction time period.

The maximum estimated chronic health index for non-cancerous ailments predicted by this assessment is 0.014, which is well below the EKAPCD significance standard of 0.2. Therefore, the air emissions associated with implementation of the Preferred Alternative are deemed to pose a less than significant chronic health risk for non-cancerous ailments.

The modeled isopleths of cancer risk to sensitive receptors (residences) within and in proximity to the construction area for the Preferred Alternative are presented as an isopleth maps in Attachment 1. As can be seen in the isopleth maps, the highest potential cancer risk impact within the construction area is 3.8 in one-million, in the center of the construction area for the Preferred Alternative. All of the residences within the construction area and vicinity are below the EKAPCD significance threshold of 1 in one-million for cancer risk.

Also as shown on the isopleth maps, the highest potential cancer risk to residential receptors within the construction area from prolonged exposure to air emissions during the multi-year construction period would at the Lakeside Village Mobile Home Park located south of the Auxiliary Dam and the residence directly west of the Lakeside Village. Most of the mobile home park is located in the 0.6 in one-million cancer risk isopleth, and the southernmost portion of the park and the residence to the west of the park located in the 0.4 in one-million cancer risk isopleth. Some residential receptors east of Highway 178 are also located within the 0.4 in one-million cancer risk isopleth. All other residential receptors in the project vicinity are located in areas that are lower than 0.4 in one-million cancer risk from prolonged exposure to air emissions associated with implementation of the Preferred Alternative.

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CHAPTER 4
REFERENCES

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CHAPTER 5
ATTACHMENTS

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ATTACHMENT 1 - MODELED ISOPLETHS

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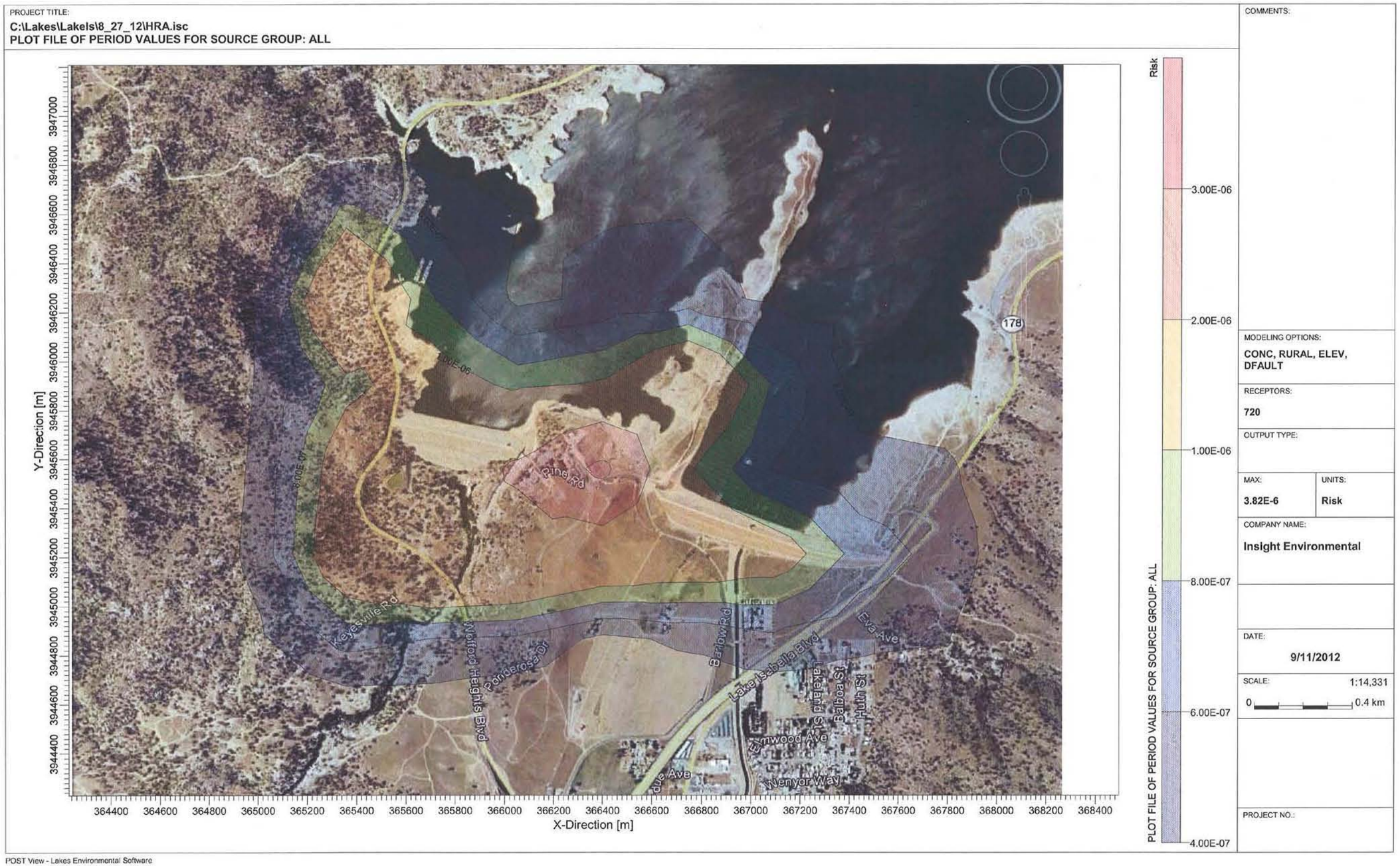
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368000
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178
Pine Rd
Keyesville Rd
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Ponderosa Dr
Barlow Rd
Lake Isabella Blvd
Lakeland St
Balboa St
Huth St
Eva Ave
Lynwood Ave
Manor Way
Risk
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2.00E-06
1.00E-06
8.00E-07
6.00E-07
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CONC, RURAL, ELEV, DFAULT
RECEPTORS:
720
OUTPUT TYPE:
MAX:
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UNITS:
Risk
COMPANY NAME:
Insight Environmental
DATE:
9/11/2012
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PROJECT NO.:
POST View - Lakes Environmental Software

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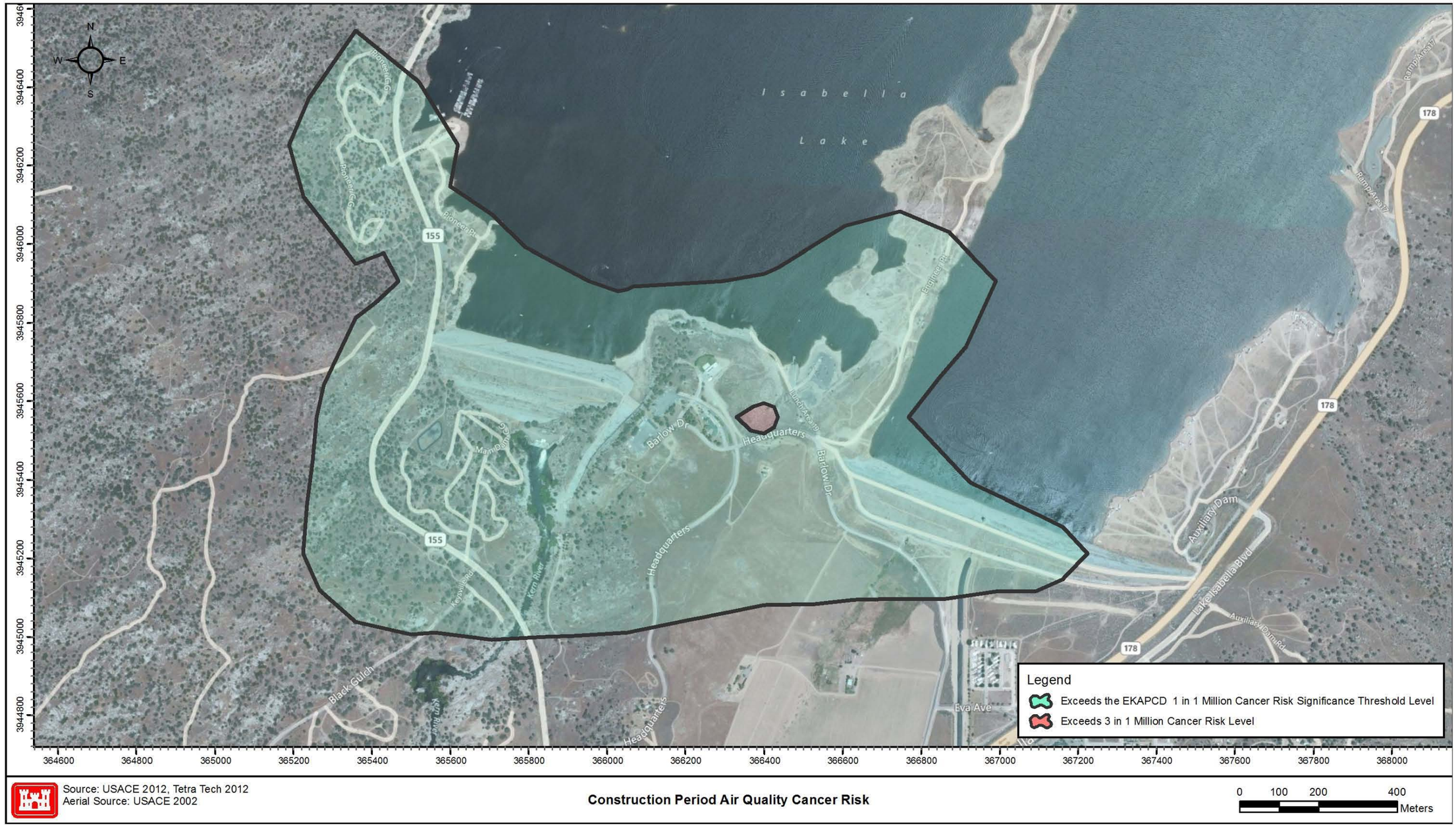

Source: USACE 2012, Tetra Tech 2012
Aerial Source: USACE 2002

Construction Period Air Quality Cancer Risk

0 100 200 400
Meters

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ATTACHMENT 2 – HRA OUTPUT FILES

Note: To obtain this Attachment, please contact the Sacramento District Public Affairs Office, 1325 J Street, Sacramento, CA 95814; Phone (916) 557-5101; email: isabella@usace.army.mil.

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APPENDIX F

AIR QUALITY ANALYSIS: PREFERRED ALTERNATIVE

Isabella Lake Dam Safety Modification Project

Air Quality Analysis: Preferred Alternative

September 2012

Prepared for:

U.S. Army Corps of Engineers,
Sacramento District

US Army Corps of Engineers

Prepared by:

Insight Environmental Consultants, Inc.
Under Contract to
McIntosh and Associates and Tetra Tech, Inc.

Insight Environmental Consultants

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LIST OF ATTACHMENTS (NOTE: ATTACHMENTS NOT INCLUDED; SEE CONTACT INFORMATION AT END OF DOCUMENT TO OBTAIN ATTACHMENTS)

Attachment

LIST OF ACRONYMS

Acronym or Abbreviation	Full Phrase
AAQS	Ambient Air Quality Standards
AB32	Assembly Bill 32 – California Greenhouse Gas Initiative
ACEC	Area of Critical Environmental Concern
AERMET	AERMOD Meteorological Processor
AERMOD	American Meteorological Society/EPA Regulatory Model
AIRMET	Airman's Meteorological Information
AP-42	EPA-Approved Compilation of Emissions Factors
AMS/EPA Model	American Meteorological Society/U.S. EPA Air Dispersion Model
AQIA	Air Quality Impact Analysis
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CAA	Clean Air Act (Federal)
CCAA	California Clean Air Act
CO	Carbon Monoxide (a criteria pollutant)
Corps, the	United States Army Corps of Engineers
DSM	Dam Safety Modification
EIS	Environmental Impact Statement
EKAPCD	Eastern Kern Air Pollution Control District
EMFAC2007	CARB-approved Equipment Emissions Model
EPA	United States Environmental Protection Agency
GHG	Greenhouse Gas
H_2S	Hydrogen Sulfide
HARP	Hotspot Analysis and Reporting Program
IRMM	Interim Risk Management Measure
ISCST3	Industrial Source Complex Short-Term Model
LBS/day	Pounds per day (may also be lbs/day)
MDAB	Mojave Desert Air Basin
$\mu g/m^3$	Micrograms per cubic meter
MM	Mitigation Measure
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_X	Nitrogen Oxides

LIST OF ACRONYMS *(continued)*

Acronym	Full Phrase
O_3	Ozone
OEHHA	California Office of Environmental Health Hazard Assessment
OFFROAD2007	CARB-approved Offroad Equipment Emissions Model
$PM_{2.5}$	Particulate Matter measuring 2.5 microns or less
PM_{10}	Particulate Matter measuring 10 microns or less
PPM	Parts per million
PSD	Prevention of Significant Deterioration
RCC	Roller-Compacted Concrete
ROG	Reactive Organic Gasses
SCE	Southern California Edison
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides
TAC	Toxic Air Contaminant
TPY	Tons per year
URBEMIS	CARB-Approved Urban Emissions Mathematical Model v.9.2.4
USFS	United States Forest Service
UTM	Universal Transverse Mercator

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CHAPTER 1
INTRODUCTION

The Isabella Lake Dam Safety Modification (DSM) Project has been proposed by the United States Army Corps of Engineers (Corps) in order to determine the most efficient and cost effective way to repair leaks in both the Main Dam and the Auxiliary Dam that may be exacerbated by future seismic movement of a geological fault that runs through the area. After completion and publication of the Draft Environmental Impact Statement (DEIS) the Corps completed evaluations of the alternatives evaluated in the DEIS, and selected a Preferred Alternative. Several refinements to the Preferred Alternative were made by the Corps since the release of the DEIS, in an ongoing effort to reduce environmental impacts, including air quality. These refinements are described in Chapter 2 of the Final EIS (FEIS; Corps 2012). The potential air quality impacts anticipated from implementation of the Preferred Alternative, including refinements, is the focus of this Air Quality Analysis.

1.1 PROJECT OVERVIEW

The Isabella Lake Dam Project provides flood control and irrigation for the southern San Joaquin Valley and recreation and tourism to the local lake communities (Figure 1). The town of Lake Isabella and Metropolitan Bakersfield, with a population of about 300,000, are afforded flood protection benefits through the continued operation of the dam and Isabella Lake. The Project incorporates the following primary elements: two earthen embankment dams (the Main Dam and the Auxiliary Dam), outlet works, an un-gated spillway, a hydropower generation facility, associated conduit and canal (Figure 2). The Project is located on National Forest System Lands with recreation facilities and lands associated with the lake being managed by the U.S. Department of Agriculture – Forest Service (USFS). The continued operation and maintenance of the Main Dam and Auxiliary Dam is the responsibility of the Corps.

1.2 PREFERRED ALTERNATIVE

From the five Action Alternatives evaluated in the DEIS, the Corps selected Alternative Plan 4, including the refinements described in Chapter 2 of the FEIS, as the Preferred Alternative to complete repairs and modification of the Isabella Lake Dam facilities. Under this alternative, all of the dam safety deficiencies that are significant contributors to the risk of dam failure would be remediated. The Preferred Alternative also represents the Corps' Environmentally Preferred risk management plan that would provide an adequate level of safety for the Project, with the least amount of environmental impacts practicable. The main features comprising the Preferred Alternative are shown in Figure 3. The remediation measures planned for each structure under the Preferred Alternative are described in the following paragraphs and figures.

Figure 1 Isabella Dam Project Location

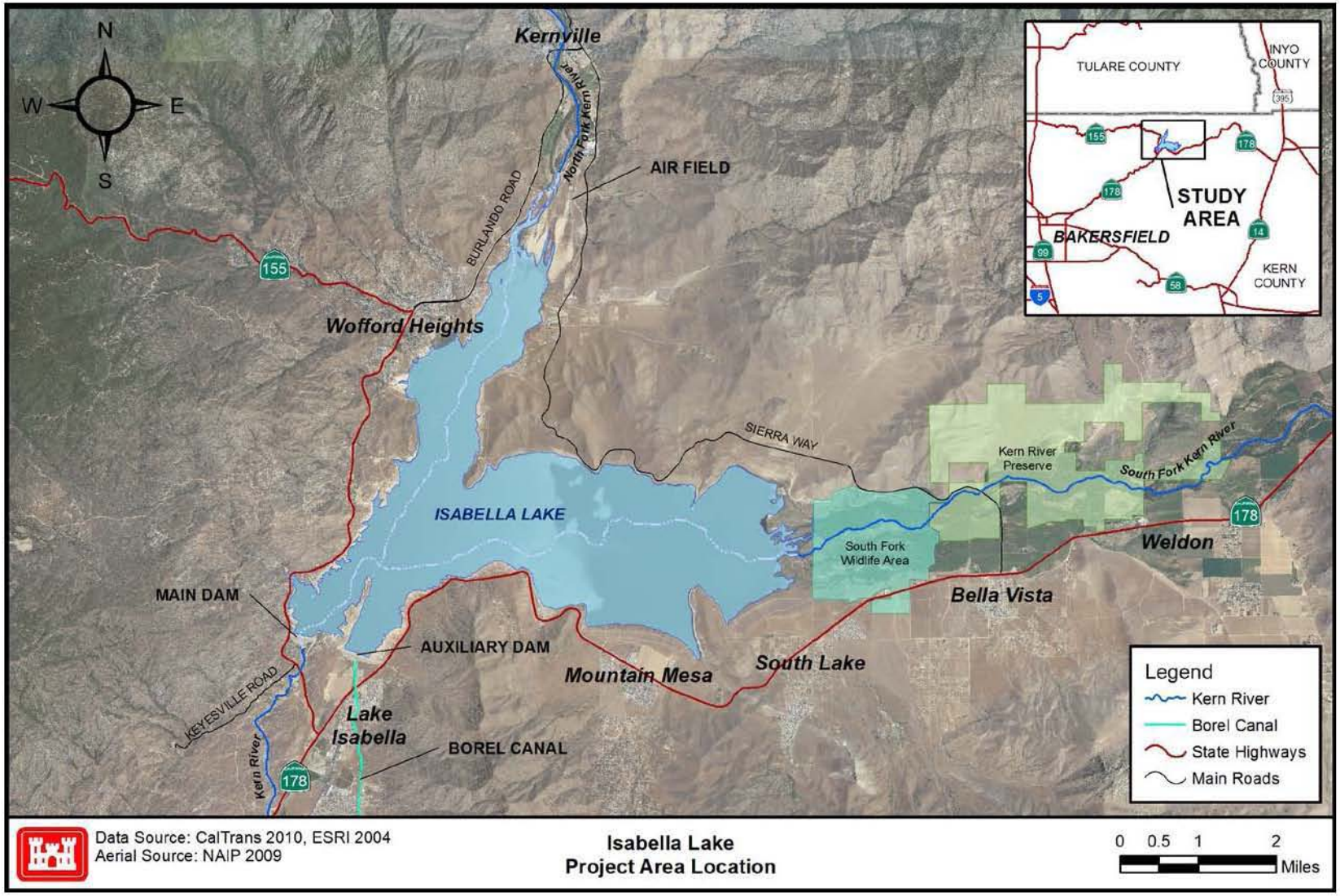


Figure 2 Isabella Dam Project Main Components

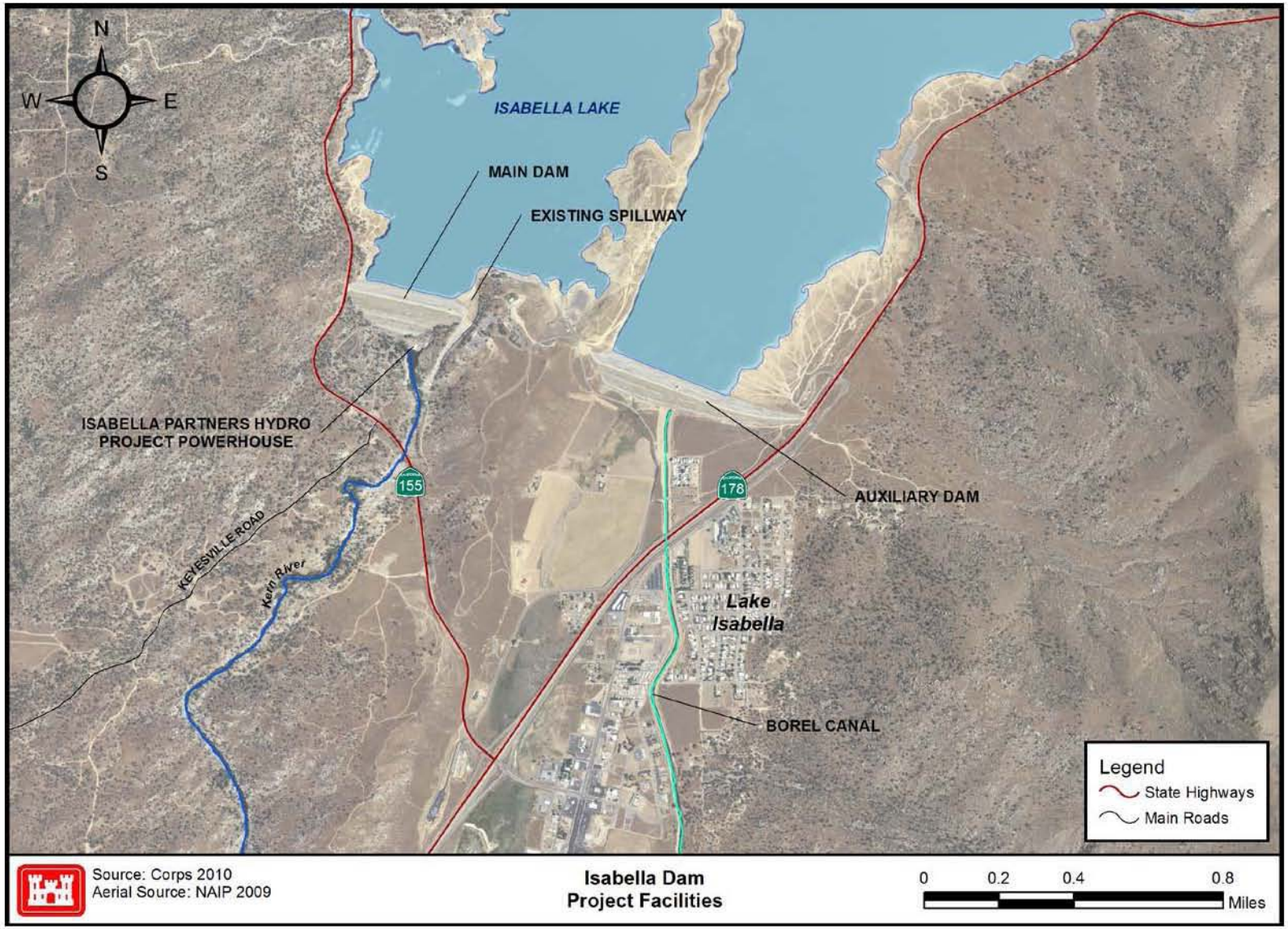
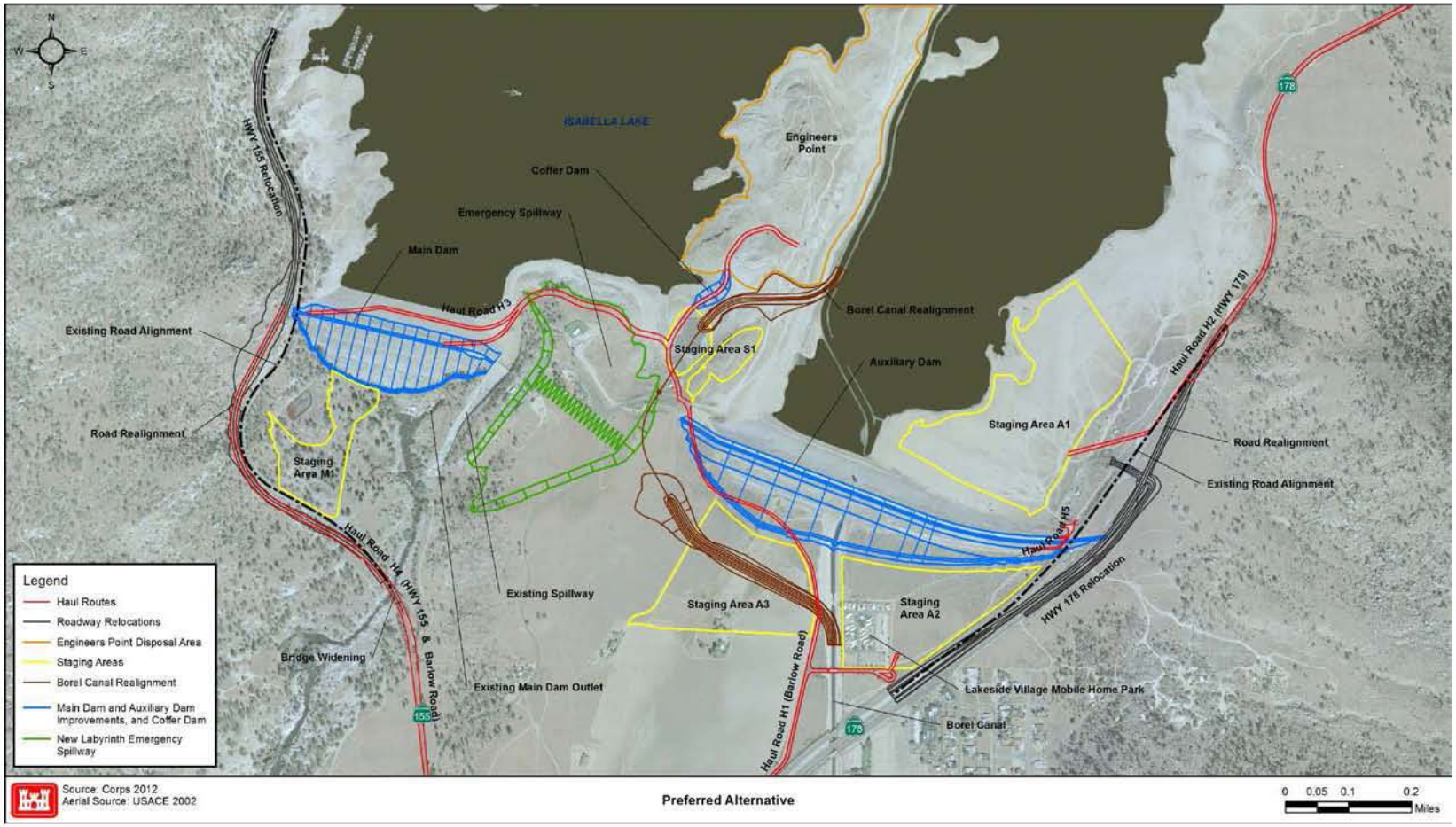


Figure 3 Preferred Alternative – Main Features



1.2.1 Main Dam

The Corps has determined that the deficiencies associated with the Main Dam could lead to potential differential settlement and seepage following a seismic event and/or overtopping during an extreme storm event (such as the Probable Maximum Flood (PMF). Under the Preferred Alternative the Project would be remediated so that it could safely pass flows of an extreme storm event and so that it could withstand an anticipated seismic event without leading to a failure (loss of reservoir). The following remediation measures would be included:

- Constructing a full height filter and drain on the downstream slope of the dam to accommodate a crest raise (expected to be approximately 16-foot) and to further protect the structure from transverse cracking and potential settlement cracking during a seismic event (Figure 4).
- Constructing a toe filter/drain system to capture and collect seepage.
- Constructing a crest raise (expected to be approximately 16-foot) to be able to safely pass an extreme flood event without overtopping.
- The Main Dam control tower and access to the existing facility would also be raised approximately 16-feet to match the increased dam crest elevation. Access to the raised tower would be provided by retaining walls and backfill material of the Main Dam.

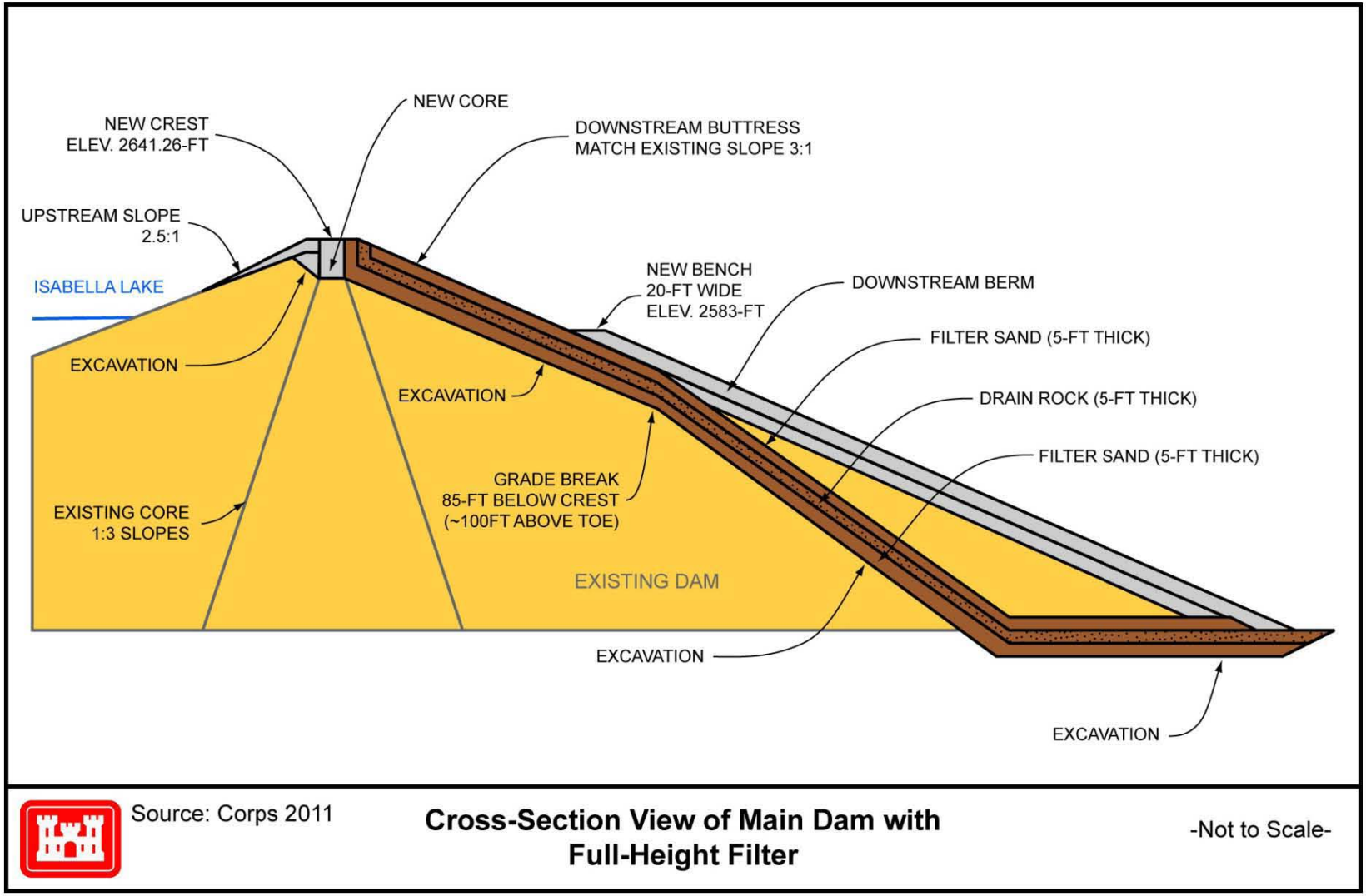
The majority of the various rock materials needed for the Main Dam remediation would come from the excavation of the proposed Emergency Spillway; discussed below. The sand material required for the full height filter and drain of the Main Dam would come from the excavation of the proposed Emergency Spillway, supplemented by sand from the Auxiliary Dam Recreation Area, if sufficient material is not able to be produced from the Emergency Spillway excavation. The Auxiliary Dam Recreation Area is on-site.

The Corps has determined that this alternative would require realigning a portion of Highway 155 that would require a cooperative effort between the Corps and Caltrans and would also require a separate National Environmental Policy Act (NEPA) analysis and document, anticipated during 2013.

1.2.2 Existing Spillway

Included in this alternative would be remediation of the deficiencies identified for the existing spillway (See Figure 3). The remediation includes (a) select concrete placement and surface treatment of the existing spillway chute to guard against erosion undermining of the right wall; (b) addition of anchors along the existing spillway wall and ogee crest for additional head during operation and to increase seismic stability; and (c) construction of an approximate 16-foot high retaining wall added to the crest along the right and left walls (closest to the Main Dam) to protect against potential erosion of the Main Dam during high outflows and to accommodate the crest raise. The concrete

Figure 4 Preferred Alternative - Main Dam



needed for all remediation measures on the existing spillway would be supplied by the ready-mix plant located in the South Lake area along Hwy 178.

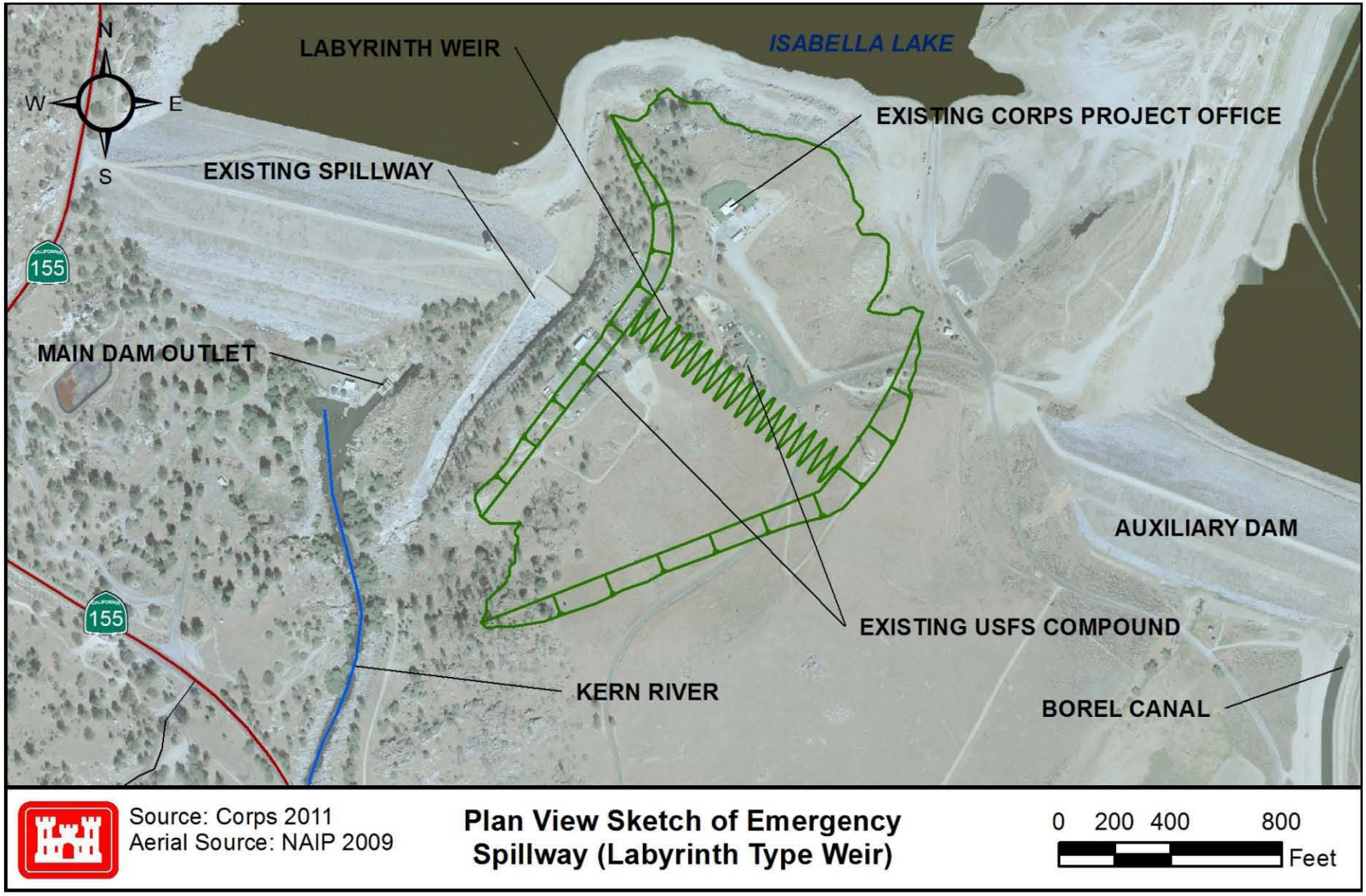
1.2.3 Emergency Spillway

The Corps has determined that the existing spillway along the east side of the Main Dam cannot safely pass an extreme storm event (such as the PMF). It is a requirement that all Corps dams be able to safely pass the PMF, with freeboard for wind and wave run-up. Therefore, this alternative includes the construction of a new "Emergency Spillway", approximately 900-feet-wide, that would be located approximately one-hundred feet east of the existing spillway (Figure 5). The additional spillway would be required to remediate the hydrologic deficiency (undersized capacity of the existing spillway) that could lead to overtopping of both dams, with failure of one or both dams which would cause extreme consequences downstream. This Emergency Spillway would function independently from the existing spillway, and would begin to function around elevation 2637.26 feet NAVD 88 (current elevation of the top of dam), which is 28.0 feet higher than existing spillway. The new emergency spillway would have a labyrinth type weir with v-shaped concrete baffles and a concrete apron. It would be designed to dissipate energy and control the rate of outflow through the spillway channel (see Figure 5).

This Emergency Spillway would function independently from the existing spillway. The crest elevation for the Main and Auxiliary Dam would be raised approximately 16 feet in order to provide for passage of the PMF without overtopping and minimize the increased incremental downstream consequences from passing additional flows. The crest raise would also provide approximately 4-feet of freeboard under the PMF event. Only in extreme storms would the reservoir rise to an elevation at which the Emergency Spillway would operate, with the annual probability of reaching this elevation being approximately 1 in 4,700. Outflows associated with pool elevations up to the 1 in 4,700 annual exceedance probability would be handled solely by the existing spillway. The emergency spillway would operate for frequencies at or near the current frequency of overtopping the dams in order to minimize downstream consequences. It is noted that routing of the PMF with the dams as currently constructed results in an overtopping of both dams by approximately 10 feet (non-fail condition), or a reservoir pool elevation of approximately 2,647 feet (NAVD 88). Under this alternative the PMF pool is estimated to be approximately 2,649 feet (NAVD 88), or an increased maximum pool elevation of 2 feet. This would only occur under the PMF flood event, which is estimated as having a 1 in 10,000 probability of occurrence in any given year.

The Corps has determined that construction of the Emergency Spillway would require controlled blasting during excavation to break up the rock-outcrops located in the proposed channel.

Figure 5 Preferred Alternative – Emergency Spillway



It is anticipated that excavated materials from the proposed Emergency Spillway would be used as the primary borrow material source to construction the modification features for the Preferred Alternative. The excavated materials likely would be crushed, screened and washed as needed to generate the various sands, gravels and rock required and either temporarily stockpiled or placed directly into permanent construction. The processing operation would likely be located at approved onsite location likely in vicinity of the proposed Emergency Spillway and adjacent to the Auxiliary Dam. The materials (various sized rocks) produced in the crushing operation would be stockpiled on-site in this staging area and delivered to the appropriate construction areas as needed. Any excess material would be disposed of on Engineers Point.

The concrete needed to construct the baffles and apron of the Labyrinth Weir would be produced by the Batch Plant set up on site in the vicinity of the Emergency Spillway. Cement and fly ash would come from an off-site source.

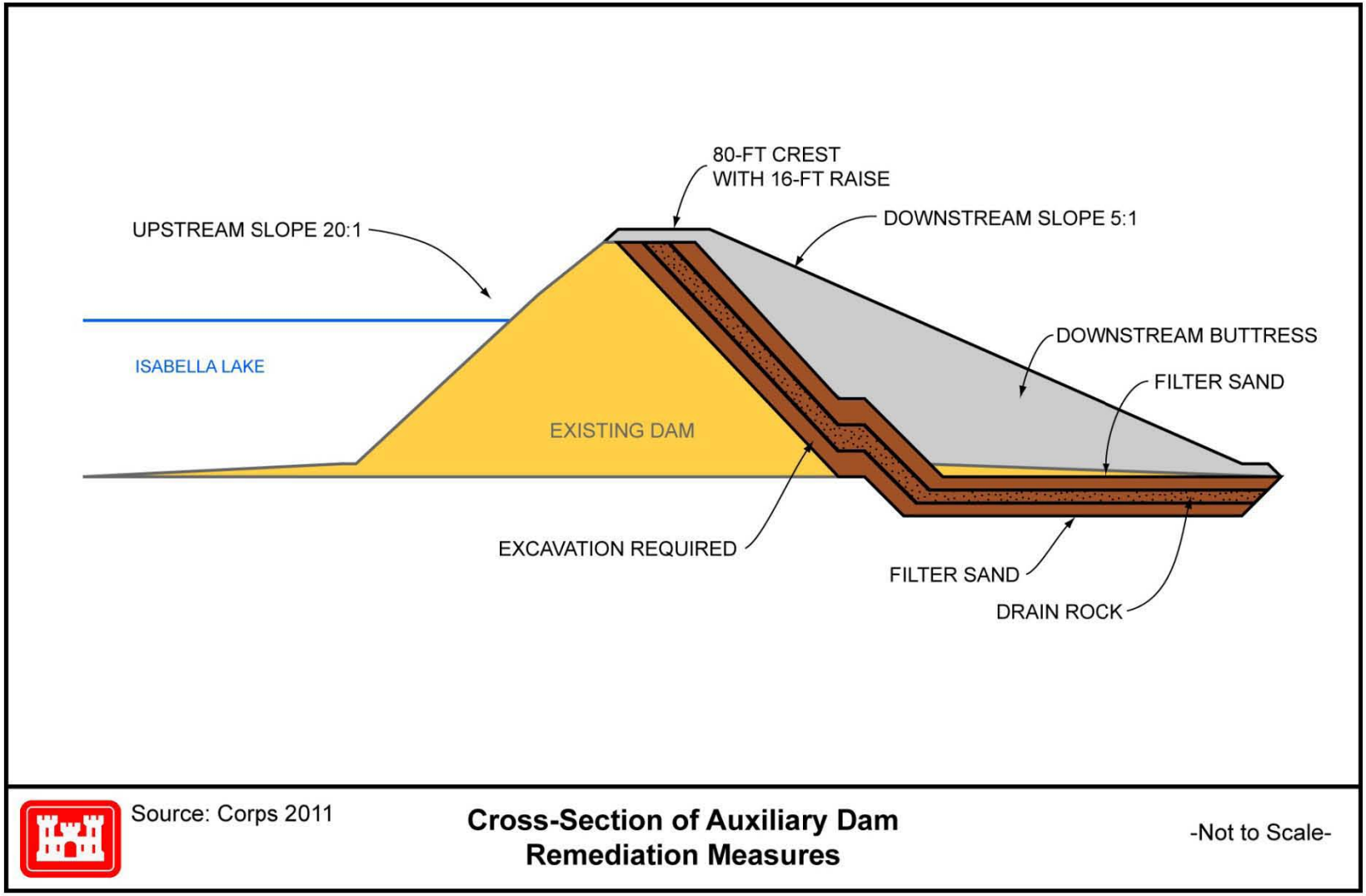
1.2.4 Auxiliary Dam

The Corps has determined that the seismic, seepage, and hydrologic deficiencies associated with the Auxiliary Dam pose an unacceptably high probability of failure of the dam. Under the Preferred Alternative the Auxiliary Dam would be remediated to withstand anticipated seismic events (including fault rupture), manage expected seepage, and survive extreme flood events. These remediation measures would include the following activities (Figure 6):

- Adding an 80-foot wide downstream buttress to the dam with a more gradual downstream slope (5:1) to increase stability of the dam, and a moderate-sized sand filter and drain rock system built into the downstream slope to better manage seepage and potential fault rupture.
- Removing the upper 25 to 30 feet of the liquefiable alluvial layer under the downstream slope of the dam and replace it with recompacted soil to reduce the potential for liquefaction during a seismic event.
- Constructing a crest raise to be able to safely pass an extreme storm event without overtopping. The height of the raise is expected to be approximately 16-foot high but may vary depending on final design.

The majority of the rock materials needed to complete the downstream buttress and upstream berm on the Auxiliary Dam would come from the excavation of the proposed Emergency Spillway. The sand material required to construct the filter on the downstream slope of the Auxiliary Dam is expected to come from the spillway excavation (crushed to size) but if necessary, it could come from the Auxiliary Dam Recreation Area. The concrete needed for Auxiliary Dam remediation measures would be supplied from the ready-mix plant on Hwy 178.

Figure 6 Preferred Alternative - Auxiliary Dam



1.2.5 Borel Canal

The Corps has determined that some of the problems associated with the Auxiliary Dam can be attributed to the existing Borel Canal conduit that passes perpendicular through the embankment of the Auxiliary Dam. The Borel Canal existed, in its present alignment from the North Fork Kern River, before the Auxiliary Dam was constructed. The Auxiliary Dam was built on top of the Borel Canal which has the first water rights to the flows out of the North Fork of the Kern River. Since the early 1900s, the canal has been supplying water via the canal to the Southern California Edison (SCE) power plant approximately six miles downstream of the Auxiliary Dam. The SCE has a water right to receive the first 605 cubic feet per second (cfs) of the North Fork Kern River flows into Isabella Lake through the Borel Canal.

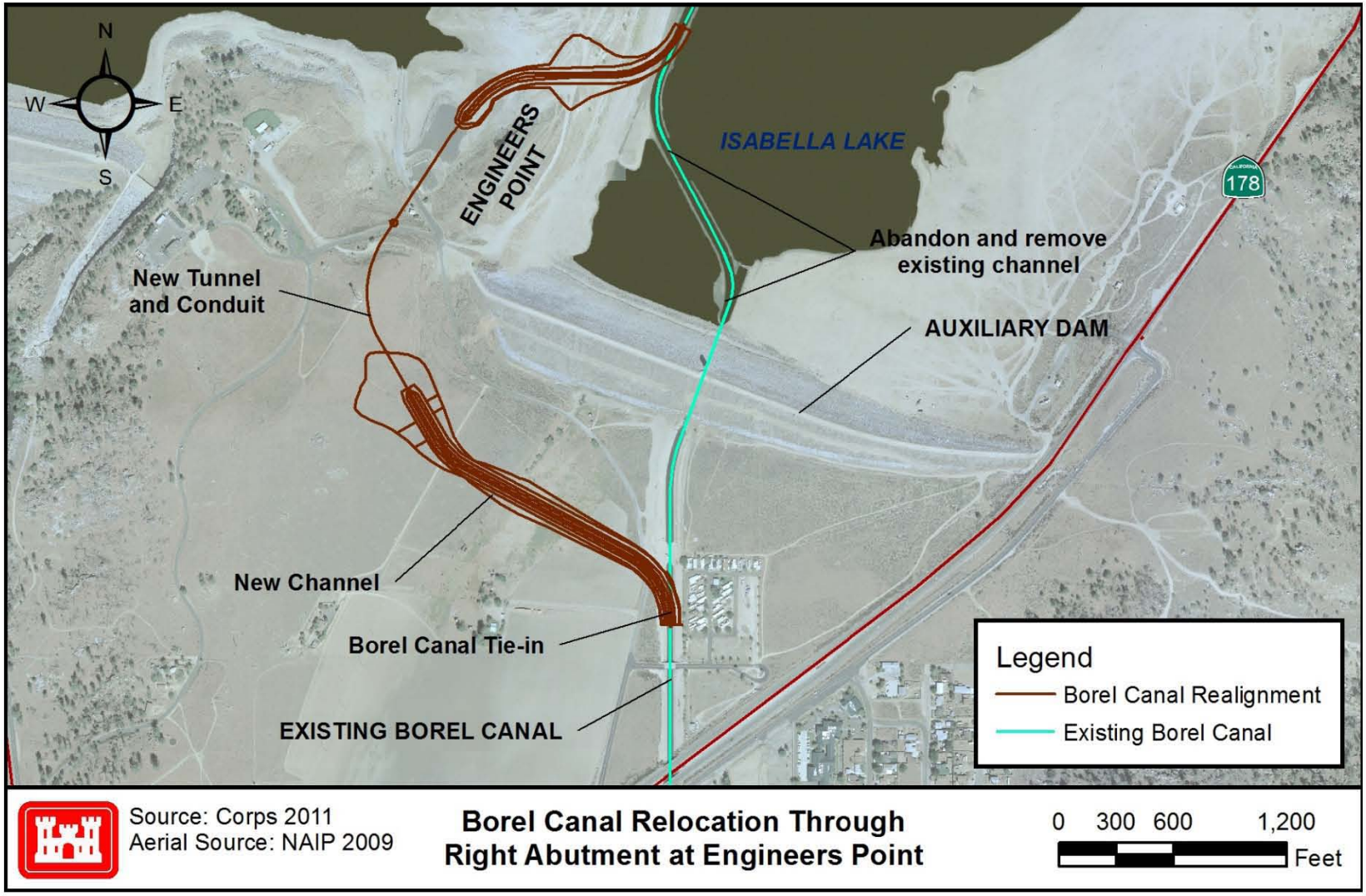
Under the Preferred Alternative the existing Borel Canal conduit through the Auxiliary Dam and control tower would be taken out of operation and abandoned. A replacement Borel Canal tunnel-conduit alignment would be constructed through the right abutment of the Auxiliary Dam outside of the Kern Canyon fault shear zone. The realigned canal and tunnel-conduit would connect the existing submerged Borel Canal in the lake (upstream of the Auxiliary Dam) to the existing exposed Borel Canal downstream of the Auxiliary Dam (Figure 7).

Also with this alternative, a temporary rock-fill coffer dam may be required (depending on reservoir elevation at the time of construction). The coffer dam is expected to be smaller than was required in the DEIS, and would be located on the west side of Engineers Point, to sufficiently dewater the area in order to construct the upstream portal and the tunnel-conduit (See Figure 3). There is a natural high ridge in Engineers Point that would protect against rising water on the Auxiliary Dam side; therefore a cofferdam is not necessary on the Auxiliary Dam side to protect the portal and tunnel-conduit excavation and construction.

The cofferdam is expected to be constructed in the wet without lowering the lake level, to take advantage of the flood control pool (lower elevations). The rock materials needed to construct the temporary coffer dam would come from the excavation of the proposed Emergency Spillway or from Engineers Point. The crest of the cofferdam would be set at the top of the restricted pool elevation 2,589.26-feet NAVD88. After construction of the coffer dam the lake would be allowed to rise to within four feet below the cofferdam crest (2,585.26-feet NAVD 88) to allow for storage of snow melt during the spring season.

The Corps has determined that the lake level would have to be lowered to an approximate elevation of 2,543-feet NAVD 88(72,237 acre-feet) for a four-to-six month period during fall-winter 2020, to allow time to tie in the relocated canal and tunnel-conduit into the existing canal upstream of the Auxiliary Dam. This is the portion of proposed realignment that would be located east of the Engineers Point ridge, and therefore would

Figure 7 Preferred Alternative – Borel Canal Relocation



be subject lake level fluctuations on the Auxiliary Dam side. The work required during this time includes completing the construction of the upstream approach channel. Also required during this lowered construction pool would be the demolition of the existing Borel Canal between the new upstream tie-in and Auxiliary Dam. Scheduling these actions during fall-winter would take advantage of the naturally occurring lower lake levels, and would be outside the summer high recreation season on the lake.

After the construction of the upstream portal and tie-in to the existing canal in the lake, the temporary coffer dam would be removed, if it would not be required in order to maintain access to Engineers Point.

The concrete needed for the upstream portal, the tunnel lining, the downstream portal, and the connection to the existing Borel Canal would be supplied from the ready-mix plant on Hwy 178.

1.2.6 Realignment of Highway 178

Hwy 178 would be realigned to the south of the Auxiliary Dam to accommodate the 16-foot raise on the left abutment (See Figure 3). The relocation length would be approximately 0.8 miles. The realignment would begin in the 4-lane freeway section near PM R43.8 which is about 0.9 mile east of Route 155. The alignment would then swing south of the existing highway location and Lake Isabella Boulevard in order to allow room for the Auxiliary Dam extension. The maximum shift is about 215 feet southeast of the existing highway centerline. The alignment would then curve back to meet the existing highway near PM 45.8, which is about 1,500 feet northeast of the present Lake Isabella Boulevard/Dam Road intersection or 1.7 miles east of Route 155. The Lake Isabella Boulevard/Dam Road connection would be reconstructed at its existing location.

1.2.7 Realignment of Highway 155

Hwy 155 would also be modified to accommodate the 16-foot raise on the right abutment of the Main Dam (See Figure 3). Two options are currently being considered for Hwy 155. The first option would include realign Hwy 155 to the west of the Main Dam. The realignment would begin upstream of the Main Dam and would shift to the west, but parallel to the current highway alignment to the bridge at the Kern River. The length of relocation would be approximately one mile. The maximum shift of the alignment would be about 120 feet to the west. The realignment would require a modification and widening of the existing bridge across the Kern River to stay within Caltrans standard requirements. This realignment would also result in the loss of some camp sites along Hwy 155 to the north of the Main Dam. The realignment would also include an uphill climbing lane.

The second option for Hwy155 would not include realignment of the highway and would not change the grade and elevation of the roadway over the right abutment of the Main Dam. The second option would include about a flood gate on the right abutment near

existing centerline of the Main Dam. The flood gate would be used to close off the low point for extreme flood events and would prevent travel on Hwy 155 for those rare events. The gate structure would include a concrete gravity retaining wall adjacent to the Main Dam and a concrete support wall near the existing rock face cut. The gate would either consist of a permanent swing gate or a gate that would be stored on the abutment and erected when needed. Access to this gate during extreme flood events may be limited, which could have a significant impact on the reliable operation of the gate.

Currently, the preferred option for modifying Highway 155 is the roadway realignment. However, if during the engineering design phase of the proposed project it is determined that another option for modifying Highway 155 is preferred, supplemental tiered NEPA documentation would be prepared as necessary.

1.2.8 Rock Material Disposal Area on Engineers Point

The Corps has determined since the release of the DEIS that an unused rock material disposal area (approximately 54 acres) would be established on Engineers Point, to receive the unused rock material from the Emergency Spillway excavation. This disposal area refinement would be served by an additional haul road spur connection from haul road H1 (See Figure 3). This refinement of disposing of the unused rock material from the Emergency Spillway on Engineers Point allows the Corps to forego constructing an Upstream Berm on the Auxiliary Dam, as was proposed in the DEIS. This berm construction would have required lowering the lake level to the construction pool elevation (2,543 feet NAVD 88; 72,237 acre-feet) for a nine-month period. This refinement significantly reduces the potential impacts on recreation, water quality, and fisheries described in the DEIS.

1.3 CONSTRUCTION SCHEDULE

The Corps anticipates that the Preferred Alternative to complete repairs and modification of the Isabella Lake Dam facilities and required modifications to Highway 155 and Highway 178, consisting of the activities described in section 1.2 above, would be completed based on a schedule spanning a total of nearly eight years. The required roadway modifications for Highways 155 and 178 would be completed nearly one year prior to the actual start-up of the DSM portion of the proposed project. Table 1.3-1 provides an annual listing of major construction activities for each year.

Table 1.3-1
Anticipated Construction Schedule

Year	Construction Activities
CALTRANS HIGHWAY WIDENING AND BRIDGE WORK (November 2014 through March 2016)	
2014	Highways 155 and 178 Realignment / Highway 155 Bridge
2015	Highways 155 and 178 Realignment / Highway 155 Bridge
2016	Highways 155 and 178 Realignment (ends 1Q/2016)
ISABELLA LAKE DSM CONSTRUCTION WORK (January 2017 through February 2022)	
2017	Staging Area Set-up, Haul Route Construction, Engineering Point A Preparation, Emergency Spillway Preparation, Auxiliary Dam Foundation Preparation
2018	Emergency Spillway Preparation, Auxiliary Dam Foundation and Embankment Preparation. Auxiliary Dam Buttress Preparation, Staging Area, Existing Spillway, Emergency Spillway Labyrinth
2019	Emergency Spillway Labyrinth, Auxiliary Dam DS, Staging Areas, Haul Route Construction, Existing Spillway, Emergency Spillway Apron and Excavation, Main Dam Excavation, Foundation and Buttress, Auxiliary Dam Buttress, Borel Canal Upstream Coffer Dam and Tunnel
2020	Main Dam Foundation and Buttress, Emergency Spillway, Borel Canal Upstream Coffer Dam and Tunnel, Upstream Portal, Borel Canal Control Tower, Concrete Canal Lining, Borel Canal Access Roads, Borel Canal Coffer Dam Removal
2021	Borel Canal Control Tower, Concrete Canal Lining, Borel Canal Access Roads, Borel Canal Coffer Dam Removal, Spoils and Engineers Point Topsoil
2022	Demobilization and Site Restoration

1.4 CONSTRUCTION ASSUMPTIONS

The Corps provided a detailed construction and equipment schedule for use in estimating the emissions impacts for the preferred alternative. These data included estimated dates, duration of operation, equipment types (equipment size in some instances), general hours of operation, description of basic activities and the various phases each would be working on (See Attachment B). Estimates of the required workforce were made including where they would likely originate. Based on the projected start date for the proposed project, the types of equipment to be used during construction and the existing Diesel Emissions Standards established by the California Air Resources Board and EPA, it was assumed that the bulk of construction equipment would be diesel powered and that the vast majority would be Tier 4 engines. On May 11, 2004, EPA signed the final rule introducing Tier 4 emission standards, which are to be phased in over the period of 2008 – 2015. As work on the Preferred Alternative is not scheduled to start until 2017 it was assumed that all heavy and off-road emissions sources would be classified as Tier 4. In most cases, Federal non-road regulations also apply in California, whose authority to set emission standards for a new non-road engine is limited. The federal Clean Air Act Amendments of 1990 (CAA) preempt California's authority to control emissions from

new farm and construction equipment under 175 hp[1] and require California to receive authorization from the EPA for controls over other off-road sources.[2]

Stationary sources such as rock crushing and bulk concrete plant operations were assumed to be electrified and would have no engines associated with their operation. As such, their primary contribution to emissions would be from PM_{10} as opposed to combustion emissions. All construction equipment that is required to be permitted through the EKAPCD due to equipment service, size, rating or length of operation was assumed to be permitted prior to arrival at the site. Operational restrictions that result in emissions reductions are noted as mitigation measures herein and are assumed to be operational restrictions during construction. Additional assumptions related to construction equipment operation, speeds and idling are provided in the emissions details in the Attachments to this Air Quality Analysis.

1.5 HIGHWAY 155 AND HIGHWAY 178 REALIGNMENT AND BRIDGE WIDENING ASSUMPTIONS

Construction for the realignment of both Highway 155 and Highway 178 and widening of the Highway 155 Bridge is being coordinated between the Corps and Caltrans. The Highway 155 realignment and bridge widening are slated to start in November 2014. The realignment is estimated to take 12 months and the Highway 155 Bridge Widening is estimated to take 9 months. Both are slated to start in November 2014. The Highway 178 realignment is also slated to begin in November 2014 and is expected to be completed in 6 months.

Caltrans determined the timing and scope of the work required to complete the realignments and bridge widening and provided the Corps with construction, timing and emission impacts estimates. Caltrans' emissions estimates were made using the Sacramento AQMD Construction Emissions Spreadsheet. Caltrans' projected total emissions were reported for calendar year 2014 even though these emissions would be spread over the entire construction period. Therefore, in order to more realistically present the scope of emissions impacts posed by Caltrans' projects in conjunction with the proposed DSM project, this analysis assumed that Caltrans' emissions would be spread equally over the construction period stipulated in their construction plans. These estimates have been utilized in the preparation of this Air Quality Analysis.

[1] CAA Section 209(e)(1)(A)
[2] CAA Section 209(e)(2)(A)

CHAPTER 2
EXISTING CONDITIONS

The California Air Resources Board (CARB) has divided California into regional air basins according to topographic drainage features. The proposed project site is located off of State Highway 178 near the community of Lake Isabella and is within the Mojave Desert Air Basin (MDAB) that is under the jurisdiction of the Eastern Kern Air Pollution Control District (EKAPCD), formerly the Kern County Air Pollution Control District. The Kern River Valley forms a subsection of the MDAB with specific attainment levels and strategies specific to the locale. The entire Preferred Alternative would take place within the Kern River Valley.

2.1 TOPOGRAPHY AND METEOROLOGY

Air pollution in the Basin is generated by vehicle traffic and heavy industry. However, the topography, geography, meteorology, and climate conditions contribute to the air quality of the Basin.

The proposed project site is located in northeastern portion of the Basin in the Kern River Valley, at the Main Dam and Auxiliary Dam of Lake Isabella and surrounded by the Sequoia National Forest. The climate of the area is affected by its terrain and geographical location. The proposed project site is located in the Valley with mountains to the north, south, east and west at the mountainous western extent of the Mojave Desert.

The climate of the project area is generally a Mediterranean climate with hot dry summers and cold wet winters. The mean maximum summer temperatures in July and August approach 100°F. Winter temperatures are more moderate, with mean maximum temperatures in the 60s and lows in the 30s.

Large-scale regional weather patterns in the Basin are generally influenced by moderately intense anticyclonic circulation (i.e., associated with high pressure systems). During the summer, a large subtropical high-pressure system off the coast of California (Pacific High), in combination with the rain shadow produced by the coastal ranges and the mountain ranges that border the Mojave Desert to the west and south, keeps the Mojave Desert sunny and dry. However, the presence of a thermal low-pressure area above the Mojave Desert promotes atmospheric transport from the Los Angeles Basin. During the winter months, the strength of the Pacific high-pressure area wanes, and frontal systems may pass through the area producing rain.

The average annual precipitation in Lake Isabella is approximately 12 inches with the majority of the precipitation occurring between November and April. Typically, precipitation falls as rain at elevations below about 5,000 feet and as snow at higher elevations. The proposed project site is located at an elevation of approximately 2,654 feet.

The most significant large-scale phenomena affecting air quality in the Basin are the transport winds from the southwest. These winds are responsible for bringing Ozone (O_3) and other pollutants through the Cajon Pass from the Los Angeles Basin to the Mojave Desert Air Basin. Pollutant transport into the Basin is the primary reason for the periods of National and California Ozone (O_3) standard violations. Therefore, air pollution emissions from coastal areas are carried inland to the Basin during the day; however, weak nighttime conditions allow pollutants to stagnate inland. This wind pattern is only interrupted by winter storms and infrequent but strong northeasterly "Santa Ana" winds from the mountains and the desert.

2.2 AMBIENT AIR QUALITY STANDARDS

2.2.1 Federal and State Standards

Both the Federal Government and State of California have established ambient air quality standards for several different pollutants, a summary of which is provided in Table 2.2-1. For some pollutants, separate standards have been set for different time periods. Most standards have been set to protect public health. For other pollutants, standards have been based on some other value (such as protection of crops, protection of materials, or avoidance of nuisance conditions).

Table 2.2-1
Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standards[1]	California Standards[2]
Ozone (O_3)	8 Hours	0.075 ppm (147 µg/m^3)	0.07 ppm (137 µg/m^3)
	1 Hour	--[3]	0.09 ppm (180 µg/m^3)
Carbon Monoxide (CO)	8 Hours	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	0.03 ppm (56 µg/m^3)
	1 Hour	100 ppb	0.18 ppm (338 µg/m^3)
Sulfur Dioxide (SO_2)	Annual Average	0.03 ppm (80 µg/m^3)	--
	24 Hours	0.14 ppm (365 µg/m^3)	0.04 ppm (105 µg/m^3)
	1 Hour	--	0.25 ppm (655 µg/m^3)
Particulate Matter (PM_{10})	Annual Arithmetic Mean	--[4]	20 µg/m^3
	24 Hours	150 µg/m^3	50 µg/m^3
Particulate Matter Fine ($PM_{2.5}$)	Annual Arithmetic Mean	15 µg/m^3	12 µg/m^3
	24 Hours	35 µg/m^3 (replaced)[5]	--
Sulfates	24 Hours	--	25 µg/m^3
Lead	Calendar Quarter	1.5 µg/m^3	--
	30-day Average	--	1.5 µg/m^3
	Rolling 3-month Average	0.15 µg/m^3	--

Table 2.2-1
Federal and California Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standards[1]	California Standards[2]
Hydrogen Sulfide (H_2S)	1 Hour	--	0.03 ppm (42 µg/m^3)
Vinyl Chloride (chloroethene)	24 Hours	--	0.01 ppm (26 µg/m^3)
Visibility-Reducing Particles (VRPs)	8 Hours	--	(see Note 6)

Notes:
[1] The National Ambient Air Quality Standards, other than O_3 and those based on annual averages are not to be exceeded more than once a year. The O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
[2] The California Ambient Air Quality Standards for O_3, CO, SO_2 (1-hour and 24-hour standards), NO_2, PM_{10}, and $PM_{2.5}$ are values not to be exceeded. All other California standards shown are values not to be equaled or exceeded.
[3] One-hour ozone standard revoked effective June 15, 2005.
[4] Annual PM_{10} standard revoked effective December 17, 2006.
[5] The 1997 $PM_{2.5}$ standards were replaced by the 2006 $PM_{2.5}$ standards, effective December 18, 2006. The 2008 $PM_{2.5}$ Plan, due to the U.S. Environmental Protection Agency (EPA) in April 2008, addresses attainment of the 1997 $PM_{2.5}$ standards. For this reason, the SJVAPCD continues to list the 1997 24-hour $PM_{2.5}$ standard.
[6] Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amounts to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70%. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.
Abbreviations:
ppm = parts per million; ppb = parts per billion; mg/m^3 = milligrams per cubic meter;
µg/m^3= micrograms per cubic meter.

2.2.2 Regional and Local Standards

The CARB operates the local meteorological and air quality monitoring stations in the vicinity of the project site. Table 4.3-2 lists the air quality attainment status for the MDAB.

Areas can be classified as being in attainment (air pollutant levels consistently below the standard) or as nonattainment (levels of air pollutant consistently violate the standard). Areas that do not meet the standards shown in Table 2.2-1 are classified as nonattainment areas. The determination of whether an area meets the state and federal standards is based on air quality monitoring data. Some areas are unclassified, which means no monitoring data are available. Unclassified areas are typically treated as being in attainment. Because the attainment/nonattainment designation is pollutant specific, an area may be classified as a nonattainment area for one pollutant and an attainment area for another. Similarly, because the state and federal standards differ, an area could be classified as an attainment area for the federal standards of a pollutant and as a nonattainment area for the state standards of the same pollutant.

As shown in Table 2.2-2, the MDAB is currently in nonattainment for the eight-hour federal standard for ozone, and serious nonattainment for the federal standard for PM_{10} in the Cummings Valley portion of the District.

Table 2.2-2
Mojave Desert Air Basin Designation/Classifications

	Designation / Classification			
Pollutant	**EKAPCD**	**Kern River/ Cummings Valley[1,2]**	**Indian Wells Valley[3,4,5]**	**State Standards**
Ozone - One hour	Attainment[6,7]	Part of EKAPCD Area	Part of EKAPCD Area	Moderate Nonattainment
Ozone - Eight hour[8]	Nonattainment	Part of EKAPCD Area	Unclassifiable/ Attainment	Nonattainment
PM_{10}	Unclassifiable/ Attainment	Serious Nonattainment	Attainment Maintenance	Nonattainment
$PM_{2.5}$	Unclassifiable/ Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Unclassified
Carbon Monoxide	Unclassifiable/ Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Unclassified
Nitrogen Dioxide	Unclassified	Part of EKAPCD Area	Part of EKAPCD Area	Attainment
Sulfur Dioxide	Unclassified	Part of EKAPCD Area	Part of EKAPCD Area	Attainment
Lead Particulates	Unclassifiable/ Attainment	Part of EKAPCD Area	Part of EKAPCD Area	Attainment

[1]Kern River Valley, Bear Valley and Cummings Valley were previously included in the federally designated San Joaquin Valley PM_{10} Serious/Nonattainment Area, but were made a separate nonattainment area in 2008.
[2]Kern River Valley, Bear Valley and Cummings Valley are included in EKAPCD for all NAAQS other than PM_{10}.
[3]Indian Wells Valley is a separate planning area from the rest of EKAPCD for PM_{10} NAAQS.
[4]Indian Wells Valley is a separate area for the 1997 and 2008 8-hour ozone NAAQS (0.08 and 0.075 ppm).
[5]Indian Wells Valley is included in EKAPCD for all NAAQS other than PM_{10} and 8-hour ozone.
[6]1-hour ozone NAAQS was revoked effective June 15, 2004.
[7]EKAPCD was in attainment for 1-hour ozone NAAQS at time of revocation; the proposed Attainment Maintenance designation's effective date was June 21, 2004, therefore it did not become effective.
[8]Includes both 1997 and 2008 8-hour Ozone NAAQS (0.08 and 0.075 ppm), and State 8-hour standard (0.070 ppm).

2.3 REGIONAL AIR QUALITY

The EKAPCD has identified quantitative emission thresholds for NO_X, PM_{10}, SO_X and reactive ROG to determine whether the potential air quality impacts of a project may produce a significant impact. The air quality threshold for NO_X and ROG is 25 tons per year and 137 lbs/day for indirect vehicular emissions only. The threshold of SO_X is 27 tons per year and the threshold for PM_{10} is 15 tons per year, established as the limit at which an impact to the MDAB may occur. For CO and $PM_{2.5}$, no regional emission thresholds have been established.

Additionally, the EKAPCD's Guidelines for Implementation of the CEQA (GICEQA) considers construction emissions and operational emissions as separate and distinct in that construction emissions are considered short-term impacts and temporary in nature while operational and area source emissions are considered long-term.

2.4 LOCAL AIR QUALITY

To assess local air quality impacts, the significance thresholds are based on the state CO standards, shown previously in Table 2.2-1, which are 20 parts per million (ppm) for 1-hour CO concentration levels and 9 ppm for 8-hour CO concentration levels. If CO concentration levels with the proposed project would be less than the standards, and then there would be no significant impact on local air quality. If future CO concentrations with the proposed project would be above the standards, then the increase due to the proposed project would determine if the impact would be significant or less than significant. If the proposed project would result in an increase of 1 ppm or more for the 1-hour averaging time or 0.45 ppm or more for the 8-hour averaging time, then the proposed project would have a significant impact on local air quality.

2.5 AMBIENT AIR MONITORING

Ambient air pollutant concentrations are measured at nine air quality monitoring stations within the Basin. The monitoring stations nearest to the project site are the Ridgecrest Monitoring Station, approximately 40 miles to the east, and the Mojave Monitoring Station, approximately 42 miles to the south. However, these stations do not monitor for all criteria pollutants; only O_3, PM_{10}, and $PM_{2.5}$ data. The closest station monitoring for all criteria pollutants (except SO_2) is the Lancaster Monitoring Station, approximately 66 miles to the south. The ARB Air Quality Statistics website provides summaries of air quality data collected by the air quality monitoring stations. The number of times that the NAAQS and CAAQS were exceeded for each parameter for the three most recent years is available, 2009 through 2011.[3]

Due to its location and similarity of terrain, the Ridgecrest monitoring site is expected to provide data that are most representative of the project site. However, only PM_{10} and $PM_{2.5}$ are monitored at this location. The next closest stations, i.e., NO_2 and SO_2 data from the Trona Monitoring Station (approximately 50 miles to the east), CO data from the Lancaster Station, and O_3 data from the Mojave Station, were chosen to be representative for this air quality impact assessment of the proposed project. Table 2.5-1 summarizes the air quality data for the most recent 3 years from these stations.

The proposed project would be a source of O_3 precursor pollutant emissions (i.e., NO_X and VOC). The project site is in an area that is in attainment with the national 1-hour O_3 standard and nonattainment with the national 8-hour O_3 standard, and moderate nonattainment for the California 1- hour standard and nonattainment for the California 8-hour O_3 standards. The national 8-hour O_3 standard was exceeded 57 days at the Mojave and Trona stations during the 2009–2011 period.

[3] CARB's Website: www.arb.ca.gov/adam/topfour/topfourdisplay.php

Table 2.5-1
Background Ambient Air Quality Data

Pollutant Standard	2009	2010	2011
Carbon Monoxide (CO) – Lancaster Station			
Maximum 8-Hour concentration (ppm)	1.00	1.23	1.33
Days Exceeding NAAQS 8-hour (>9pppm)	0	0	0
Days Exceeding CAAQS 8-hour (>9pppm)	0	0	0
Nitrogen Dioxide (NO_2) – Lancaster and Trona Stations			
Maximum 1-Hour concentration (ppm)	0.065	0.056	0.058
Annual Average (ppm)	0.004	0.012	0.012
Days Exceeding CAAQS 1-hour	0	0	0
Ozone (O_3)– Trona and Mojave Stations			
Maximum 1-Hour concentration (ppm)	0.101	0.092	0.101
Maximum 8-Hour concentration (ppm)	0.084	0.083	0.092
Days Exceeding CAAQS 1-hour (>0.09pppm)	3	0	2
Days Exceeding NAAQS 8-hour (>0.08pppm)	34	3	20
Particulate Matter (PM_{10}) – Ridgecrest, Mojave, and Trona Stations			
National Maximum 24-Hour concentration (µg/m^3)	186.6	96.3	143.4
National Annual Average concentration (µg/m^3)	23.9	20.8	24.4
Days Exceeding NAAQS 24-hour (>150 µg/m^3)	1	0	0
Days Exceeding CAAQS 24-hour (>50 µg/m^3)	2	0	20
Particulate Matter ($PM_{2.5}$) – Ridgecrest, Mojave, and Lancaster Stations			
Maximum 24-Hour concentration (µg/m^3)	20.0	19.5	50.0
National Annual Average concentration (µg/m^3)	7.7	5.0	6.2
Days Exceeding NAAQS 24-hour (>65 µg/m^3)	0	0	1

Source: CARB 2012

The project area is classified as Serious/Nonattainment of the national 24-hour PM_{10} standard and Nonattainment for the California 24-hour PM_{10} standard. The national PM_{10} standard was exceeded once (at Trona) at these sites during the 2009 to 2011 period.

The project area is Unclassifiable/Attainment for the California 24-hour $PM_{2.5}$ standard and is classified as unclassified for the national $PM_{2.5}$ standard. The national $PM_{2.5}$ standard was exceeded once (at Lancaster) at these sites during the 2009 to 2011 period.

The project area is classified as in attainment for the applicable national standards for NO_2 and SO_2 and unclassified for CO The national and California standard for these pollutants was not exceeded at these sites during the 2009 to 2011 period.

2.6 SENSITIVE RECEPTORS

Some land uses are considered more sensitive to air pollution than others due to the types of persons or activities involved. Sensitive air quality receptors include children, the

elderly, and the acutely and chronically ill, especially those with cardio-respiratory diseases. Residential areas are also considered sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Recreational land uses are considered moderately sensitive to air pollution. Although exposure periods are generally short, exercise places a high demand on respiratory functions, which can be impaired by air pollution.

The sensitive air quality receptors (e.g., local residences, schools, hospitals, churches, and recreational facilities) in proximity to the project area (within 6 miles) include schools (public and private), a daycare center and a hospital. These are shown below in Table 2.6-1.

Table 2.6-1
Sensitive Receptors Located ≤ 6 Miles from Proposed DSM Project

Receptor	Type of Facility	Distance from Project (miles)	Direction from Project
Child Discovery Center	Preschool	0.75	SE
Rio Vista Community Day School	6-8 Public	1.03	SE
Summit Continuation High School	9-12 Public	2.40	S
Woodrow Wallace Elementary School	K-8 Public	2.42	SE
Kern Valley High School	9-12 Public	2.47	SE
Kern Valley Hospital	Hospital	4.01	E
Rosewall Christian Academy	1-12 Private	4.14	SE

Receptors within 6 miles of the project site could be subject to cumulative impacts from all projects within 6 miles occurring concurrently with the proposed Project.

2.7 COMMON AIR POLLUTANTS

The following is a general description of the physical and health effects from the governmentally regulated air pollutants shown in Table 2.2-1.

2.7.1 Ozone

Ozone occurs in two layers of the atmosphere. The layer surrounding the earth's surface is the troposphere. Here, at ground level, tropospheric, or "bad," ozone is an air pollutant that damages human health, vegetation, and many common materials. It is a key ingredient of urban smog. The troposphere extends to a level about 10 miles up where it meets the second layer, the stratosphere. The stratospheric, or "good," ozone layer extends upward from about 10 to 30 miles and protects life on earth from the sun's harmful ultraviolet rays.

"Bad" ozone is what is known as a photochemical pollutant. It needs ROG, NO_X, and sunlight. ROG and NO_X are emitted from various sources throughout Kern County. Significant ozone formation generally requires an adequate amount of precursors in the

atmosphere and several hours in a stable atmosphere with strong sunlight. To reduce ozone concentrations, it is necessary to control the emissions of these ozone precursors.

Ozone is a regional air pollutant. It is generated over a large area and transported and spread by the wind. As the primary constituent of smog, ozone is the most complex, difficult to control, and pervasive of the criteria pollutants. Unlike other pollutants, it is not emitted directly into the air by specific sources but is created by sunlight acting on other air pollutants (the precursors), specifically NO_X and ROG. Sources of precursor gases number in the thousands and include common sources such as consumer products, gasoline vapors, chemical solvents, and combustion byproducts of various fuels. Originating from gas stations, motor vehicles, large industrial facilities, and small businesses such as bakeries and dry cleaners, the ozone-forming chemical reactions often take place in another location, catalyzed by sunlight and heat. Thus, high ozone concentrations can form over large regions when emissions from motor vehicles and stationary sources are carried hundreds of miles from their origins.

Health Effects

While ozone in the upper atmosphere protects the earth from harmful ultraviolet radiation, high concentrations of ground-level ozone can adversely affect the human respiratory system. Many respiratory ailments, as well as cardiovascular disease, are aggravated by exposure to high ozone levels. Ozone also damages natural ecosystems, such as forests and foothill communities, agricultural crops, and some human-made materials, such as rubber, paint, and plastic. High levels of ozone may negatively affect immune systems, making people more susceptible to respiratory illnesses, including bronchitis and pneumonia. Ozone also accelerates aging and exacerbates pre-existing asthma and bronchitis. Recent evidence has, for the first time, linked the onset of asthma to exposure to elevated ozone levels in exercising children (McConnell et al. 2002:359, 386–391). Active people who work or play outdoors appear to be more at risk from ozone exposure than those with a low level of activity. In addition, the elderly and those with respiratory disease are also considered sensitive populations for ozone.

Ozone is a powerful oxidant—it can be compared to household bleach, which can kill living cells (such as germs or human skin cells) upon contact. Ozone can damage the respiratory tract, causing inflammation and irritation, and induce symptoms such as coughing, chest tightness, shortness of breath, and worsening of asthmatic symptoms. Ozone in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. Exposure to levels of ozone above the current ambient air quality standard leads to lung inflammation, lung tissue damage, and a reduction in the amount of air inhaled into the lungs. Elevated ozone concentrations also reduce crop and timber yields, damage native plants, and damage materials such as rubber, paints, fabric, and plastics (CARB and American Lung Association of California 2007).

2.7.2 Reactive Organic Gases

Hydrocarbons are organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases, including volatile organic compounds (VOCs) and ROGs, which include all hydrocarbons except those exempted by CARB. Therefore, ROGs are a set of organic gases based on state rules and regulations. VOCs are similar to ROGs in that they include all organic gases except those exempted by federal law. The list of compounds exempt from the definition of a VOC is presented in District Rule 1102.

Both VOCs and ROGs are emitted from incomplete combustion of hydrocarbons or other carbon-based fuels. Combustion engine exhaust, oil refineries, and oil-fueled power plants are the primary sources of hydrocarbons. Another source of hydrocarbons is evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

Health Effects

The primary health effects related to hydrocarbons stem from ozone (see discussion above). High levels of hydrocarbons in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. There are no separate federal or California ambient air quality standards for ROG. Carcinogenic forms of ROG are considered TACs. An example is benzene, which is a carcinogen. The health effects of individual ROGs are described under the "Toxic Air Contaminants" heading below.

2.7.3 Carbon Monoxide

CO is emitted by mobile and stationary sources as a result of incomplete combustion of hydrocarbons or other carbon-based fuels. CO is an odorless, colorless, poisonous gas that is highly reactive.

CO is a byproduct of motor vehicle exhaust, which contributes more than 66% of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95% of all CO emissions. These emissions can result in high concentrations of CO, particularly in local areas with heavy traffic congestion. Other sources of CO emissions include industrial processes and fuel combustion in sources such as boilers and incinerators. Despite an overall downward trend in concentrations and emissions of CO, some metropolitan areas still experience high levels of CO.

Health Effects

CO enters the bloodstream and binds more readily to hemoglobin, the oxygen-carrying protein in blood, than oxygen, thereby reducing the oxygen-carrying capacity of blood and reducing oxygen delivery to organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Healthy individuals are also affected but only at higher levels of exposure. Exposure to CO can cause chest pain in heart patients, headaches, and reduced mental alertness. At high concentrations, CO can cause heart difficulties in people with chronic diseases and can impair mental abilities. Exposure to elevated CO levels is associated with visual impairment, reduced work

capacity, reduced manual dexterity, poor learning ability, difficulty performing complex tasks, and, with prolonged enclosed exposure, death.

The adverse health effects associated with exposure to ambient and indoor concentrations of CO are related to the concentration of carboxyhemoglobin in the blood. Health effects observed may include an early onset of cardiovascular disease; behavioral impairment; decreased exercise performance of young, healthy men; reduced birth weight; sudden infant death syndrome; and increased daily mortality rate (Fierro et al. 2001:10).

Most of the studies that evaluate the adverse health effects of CO on the central nervous system examine high-level poisoning. Such poisoning results in symptoms ranging from common flu and cold symptoms (shortness of breath on mild exertion, mild headaches, and nausea) to unconsciousness and death. Hexter and Goldsmith report an association between daily death rate and exposure to ambient CO in Los Angeles County. They postulate a concentration of 20.2 ppm (the highest daily concentration recorded during a 4-year period) contributed to 11 out of 159 deaths (Hexter and Goldsmith 1971:172, 265–266).

2.7.4 Oxides of Nitrogen

NO_X is a family of highly reactive gases that are primary precursors to the formation of ground-level ozone; they react in the atmosphere to form acid rain. NO_X is emitted from solvents and combustion processes in which fuel is burned at high temperatures, principally motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers. A brownish gas, NO_X is a strong oxidizing agent that reacts in the air to form corrosive nitric acid as well as toxic organic nitrates.

NO_X is an ozone precursor that combines with ROG to form ozone (see the discussion of ozone above for the health effects of ozone).

Health Effects

Direct inhalation of NO_X can also cause a wide range of health effects. NO_X can irritate the lungs, cause lung damage, and lower resistance to respiratory infections such as influenza. Short-term exposures (e.g., less than 3 hours) to low levels of nitrogen dioxide (NO_2) may lead to changes in airway responsiveness and lung function in individuals with pre-existing respiratory illnesses. These exposures may also increase respiratory illnesses in children. Long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause irreversible lung damage. Other health effects are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure may lead to eye and mucus membrane aggravation, along with pulmonary dysfunction. NO_X can cause fading of textile dyes and additives, deterioration of cotton and nylon, and corrosion of metals due to the production of particulate nitrates. Airborne NO_X can also impair visibility.

NO_X contributes to a wide range of environmental effects both directly and indirectly when combined with other precursors in acid rain and ozone. Increased nitrogen inputs to

terrestrial and wetland systems can lead to changes in plant species composition and diversity. Similarly, direct nitrogen inputs to aquatic ecosystems such as those found in estuarine and coastal waters can lead to eutrophication (a condition that promotes excessive algae growth, which can lead to a severe depletion of dissolved oxygen and increased levels of toxins that are harmful to aquatic life). Nitrogen, alone or in acid rain, also can acidify soils and surface waters. Acidification of soils causes the loss of essential plant nutrients and increased levels of soluble aluminum, which is toxic to plants. Acidification of surface waters creates low pH conditions and levels of aluminum that are toxic to fish and other aquatic organisms. NO_X also contributes to visibility impairment.

2.7.5 Sulfur Dioxide

SO_2 is a colorless, irritating gas with a "rotten egg" smell that is formed primarily by the combustion of sulfur-containing fossil fuels. Historically, SO_2 was a pollutant of concern in Kern County, but with the successful implementation of regulations, the levels have been reduced significantly. In fact, the latest Kern County data from CARB demonstrates that the highest 1-hour concentration for SO_2 was 0.011 ppm. With the California Ambient Air Quality Standard (CAAQS) being 0.25 ppm, therefore, SO_2 concentrations are only about 4% of the standard.

Health Effects

High concentrations of SO_2 can result in temporary breathing impairment for asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated SO_2 levels during moderate activity may result in breathing difficulties that can be accompanied by symptoms such as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer term exposures to high concentrations of SO_2, in conjunction with high levels of particulate matter; include aggravation of existing cardiovascular disease, respiratory illness, and alterations in the lungs' defenses. SO_2 also is a major precursor to $PM_{2.5}$, which is a significant health concern and a main contributor to poor visibility. (See also the discussion of the health effects of particulate matter below.)

SO_2 not only has a bad odor, it can irritate the respiratory system. Exposure to high concentrations for short periods of time can constrict the bronchi and increase mucous flow, making breathing difficult. SO_2 can also irritate the lung and throat at concentrations greater than 6 ppm in many people, impair the respiratory system's defenses against foreign particles and bacteria when exposed to concentrations less than 6 ppm for longer time periods, and enhance the harmful effects of ozone (combinations of the two gases at concentrations occasionally found in the ambient air appear to increase airway resistance to breathing).

SO_2 tends to have more toxic effects when acidic pollutants, liquid or solid aerosols, and particulates are also present. Effects are more pronounced among "mouth breathers" (e.g., people who are exercising or who have head colds).

SO_2 easily injures many plant species and varieties, both native and cultivated. Some of the most sensitive plants include various commercially valuable pines, legumes, red and black oaks, white ash, alfalfa, and blackberry.

Increases in SO_2 concentrations accelerate the corrosion of metals, probably through the formation of acids. SO_2 is a major precursor to acidic deposition. Sulfur oxides may also damage stone and masonry, paint, various fibers, paper, leather, and electrical components.

Increased SO_2 also contributes to impaired visibility. Particulate sulfate, much of which is derived from SO_2 emissions, is a major component of the complex total suspended particulate mixture.

2.7.6 Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter pollution consists of very small liquid and solid particles floating in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. Particulate matter is a mixture of materials that can include smoke, soot, dust, salt, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles and industrial sources undergo chemical reactions in the atmosphere. PM_{10} refers to particles less than or equal to 10 microns in aerodynamic diameter. $PM_{2.5}$ refers to particles less than or equal to 2.5 microns in aerodynamic diameter and are a subset of PM_{10}.

In the western United States, there are sources of PM_{10} in both urban and rural areas. PM_{10} and $PM_{2.5}$ are emitted from stationary and mobile sources, including diesel trucks and other motor vehicles; power plants; industrial processes; wood-burning stoves and fireplaces; wildfires; dust from roads, construction, landfills, and agriculture; and fugitive windblown dust. Because particles originate from a variety of sources, their chemical and physical compositions vary widely.

Health Effects

PM_{10} and $PM_{2.5}$ particles are small enough—about one seventh the thickness of a human hair or smaller—to be inhaled and lodged in the deepest parts of the lung where they evade the respiratory system's natural defenses. Health problems begin as the body reacts to these foreign particles. Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis, and respiratory illnesses in children. Recent mortality studies have shown a statistically significant direct association between mortality and daily concentrations of particulate matter in the air. PM_{10} and $PM_{2.5}$ can aggravate respiratory disease and cause lung damage, cancer, and premature death. Sensitive populations, including children, the elderly, exercising adults, and those suffering from chronic lung disease such as asthma or bronchitis, are especially vulnerable to the effect of PM_{10}. Non-health-related effects include reduced visibility and soiling of buildings.

Attaining the California particulate matter standards would annually prevent about 6,500 premature deaths, or 3% of all deaths. These premature deaths shorten lives by an average of 14 years. This is roughly equivalent to the same number of deaths (4,200 to 7,400) linked to secondhand smoke in 2000. In comparison, motor vehicle crashes caused 3,200 deaths, and 2,000 deaths resulted from homicide. Attaining the California particulate matter and ozone standards would annually prevent 4,000 hospital admissions for respiratory disease, 3,000 hospital admissions for cardiovascular disease, and 2,000 asthma-related emergency room visits. Exposure to diesel particulate matter causes about 250 excess cancer cases per year in California (CARB and American Lung Association of California 2007).

A recent study provides evidence that exposure to particulate air pollution is associated with lung cancer. This study found that residents who live in an area that is severely affected by particulate air pollution are at risk of lung cancer at a rate comparable to nonsmokers exposed to secondhand smoke. This study also found an approximately 16% excess risk of dying from lung cancer due to fine-particulate air pollution (Pope et al. 2002).

Another study shows that individuals with existing cardiac disease can be in a potentially life-threatening situation when exposed to high levels of ultrafine air pollution. Fine particles can penetrate the lungs, cause the heart to beat irregularly, or cause inflammation, which could lead to a heart attack (Peters et al. 2001).

Currently, 57% of California's population lives in areas that exceed the federal $PM_{2.5}$ air standard, while 90% lives in areas that exceed California's $PM_{2.5}$ air standard (CARB and American Lung Association of California 2007).

2.7.7 Sulfates

Sulfates (SO_4^{-2}) are particulate products from combustion of sulfur-containing fossil fuels. When sulfur monoxide or SO_2 is exposed to oxygen, it precipitates out into sulfates (SO_3 or SO_4). Data collected in Kern County identified sulfate levels that are significantly less than the applicable health standards.

Sulfates are the fully oxidized ionic form of sulfur. Sulfates occur in combination with metal and/or hydrogen ions. In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to SO_2 during the combustion process and subsequently converted to sulfate compounds in the atmosphere. The conversion of SO_2 to sulfates takes place comparatively rapidly and completely in urban areas of California because of regional meteorological features.

Health Effects

CARB's sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include a decrease in oxygen intake, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary

disease. Sulfates are particularly effective in degrading visibility and, because they are usually acidic, can harm ecosystems and damage materials and property (CARB 2009b).

2.7.8 Lead

Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Historically, lead was used to increase the octane rating in automobile fuel. However, because gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels and that use has been mostly phased out, the ambient concentrations of lead have dropped dramatically.

Health Effects

Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Lead can also be deposited on the leaves of plants, presenting a hazard to grazing animals and humans through ingestion (EPA 2007a).

2.7.9 Hydrogen Sulfide

H_2S is associated with geothermal activity, oil and gas production, refining, sewage treatment plants, and confined animal feeding operations.

Health Effects

Exposure to low concentrations of H_2S may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics. Exposure to higher concentrations (above 100 ppm) can cause olfactory fatigue, respiratory paralysis, and death. Brief exposures to high concentrations of H_2S (greater than 500 ppm) can cause a loss of consciousness. In most cases, the person appears to regain consciousness without any other effects. However, in many individuals, there may be permanent or long-term effects such as headaches, poor attention span, poor memory, and poor motor function. No health effects have been found in humans exposed to typical environmental concentrations of H_2S (0.00011–0.00033 ppm). Deaths due to breathing in large amounts of H_2S have been reported in a variety of different work settings, including sewers, animal processing plants, waste dumps, sludge plants, oil and gas well drilling sites, and tanks and cesspools.

2.7.10 Vinyl Chloride

Vinyl chloride monomer is a sweet-smelling colorless gas at ambient temperature. Landfills, publicly owned treatment works, and polyvinyl chloride (PVC) production are the major identified sources of vinyl chloride emissions in California. PVC can be

fabricated into several products, such as pipes, pipe fittings, and plastics. In humans, epidemiological studies of occupationally exposed workers have linked vinyl chloride exposure to development of a rare cancer, liver angiosarcoma, and have suggested a relationship between exposure and lung and brain cancers. There are currently no adopted ambient air standards for vinyl chloride.

Health Effects

Short-term exposure to vinyl chloride has been linked with the acute health effects listed below (Agency for Toxic Substances and Disease Registry 2010; U.S. Department of Health and Human Services 1993). Acute exposure of humans to high levels of vinyl chloride via inhalation in humans has resulted in effects on the central nervous system, such as dizziness, drowsiness, headaches, and giddiness. Vinyl chloride is reported to be slightly irritating to the eyes and respiratory tract in humans. Acute exposure to extremely high levels of vinyl chloride has caused loss of consciousness, lung and kidney irritation, inhibition of blood clotting in humans, and cardiac arrhythmias in animals. Tests involving acute exposure of mice have shown vinyl chloride to have high acute toxicity from inhalation exposure. Long-term exposure to vinyl chloride concentrations has been linked with the chronic health effects listed below (Agency for Toxic Substances and Disease Registry 2010; U.S. Department of Health and Human Services 1993; EPA 2007b).

Liver damage may result in humans from chronic exposure to vinyl chloride through both inhalation and oral exposure. A small percentage of individuals occupationally exposed to high levels of vinyl chloride in air have developed a set of symptoms termed "vinyl chloride disease," which is characterized by Raynaud's phenomenon (fingers blanch and numbness and discomfort are experienced upon exposure to the cold), changes in the bones at the end of the fingers, joint and muscle pain, and scleroderma-like skin changes (thickening of the skin, decreased elasticity, and slight edema).

Central nervous system effects (including dizziness, drowsiness, fatigue, headache, visual and/or hearing disturbances, memory loss, and sleep disturbances) as well as peripheral nervous system symptoms (peripheral neuropathy, tingling, numbness, weakness, and pain in fingers) have also been reported in workers who are exposed to vinyl chloride.

Several reproductive/developmental health effects from vinyl chloride exposure have been identified and are listed below (Agency for Toxic Substances and Disease Registry 2010; U.S. Department of Health and Human Services 1993).

Several case reports suggest that male sexual performance may be affected by vinyl chloride. However, these studies are limited by lack of quantitative exposure information and possible co-occurring exposure to other chemicals.

Several epidemiological studies have reported an association between vinyl chloride exposure in pregnant women and an increased incidence of birth defects, while other studies have not reported similar findings.

Epidemiological studies have suggested an association between men occupationally exposed to vinyl chloride and miscarriages during their wives' pregnancies, although other studies have not supported these findings.

Long-term exposure to vinyl chloride has also been identified as a cancer risk (Agency for Toxic Substances and Disease Registry 2010; U.S. Department of Health and Human Services 1993; EPA 2000). Inhaled vinyl chloride has been shown to increase the risk of a rare form of liver cancer (angiosarcoma) in humans. Animal studies have also shown that vinyl chloride, via inhalation, increases the incidence of angiosarcoma.

2.8 VISIBILITY REDUCING PARTICLES

This standard is a measure of visibility. CARB does not have a measuring method with enough accuracy or precision to designate areas in the state as attainment or nonattainment areas with respect to visibility. The entire state is labeled as unclassified.

2.9 TOXIC AIR CONTAMINANTS

"Hazardous air pollutants" (HAPs) is the term used by the federal CAA to describe a variety of pollutants generated or emitted by industrial production activities. Called TACs under the California Clean Air Act of 1988 (CCAA), 10 have been identified through ambient air quality data as posing the most substantial health risk in California (see discussion of each below). Direct exposure to these pollutants has been shown to cause cancer, birth defects, damage to the brain and nervous system, and respiratory disorders.

TACs do not have ambient air quality standards because no safe levels can be 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 (Assembly Bill [AB] 2588 [Connelly 1987]) 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.

A brief discussion of the characteristics and health effects of each TAC is provided below.

2.9.1 Acetaldehyde

Acetaldehyde is both emitted into the atmosphere directly and formed in the atmosphere from photochemical oxidation. Sources include combustion processes such as exhaust from mobile sources and fuel combustion from stationary internal combustion engines, boilers, and process heaters. Approximately 76% of acetaldehyde emissions are from mobile sources, with area sources such as residential wood combustion accounting for approximately 17% of total emissions.

Health Effects
Acetaldehyde is classified as a federal HAP and as a California TAC. Acetaldehyde is a carcinogen that also causes chronic non-cancer toxicity in the respiratory system. The primary acute effect of inhalation exposure to acetaldehyde is irritation of the eyes, skin, and respiratory tract in humans. At higher exposure levels, erythema, coughing, pulmonary edema, and necrosis may also occur (EPA 2007c).

2.9.2 Benzene

Benzene is highly carcinogenic and occurs throughout California. Approximately 84% of the benzene emitted in California comes from motor vehicles, including evaporative leakage and unburned fuel exhaust; currently, the benzene content of gasoline is less than 1%.

Health Effects
Benzene also has non-cancer health effects. Brief inhalation exposure to high concentrations can cause central nervous system depression. Acute effects include central nervous system symptoms of nausea, tremors, drowsiness, dizziness, headache, intoxication, and unconsciousness (EPA 2008). Exposure to liquid and vapor may irritate the skin, eyes, and upper respiratory tract in humans. Redness and blisters may result from dermal exposure.

2.9.3 1,3-Butadiene

The majority of 1,3-butadiene emissions comes from incomplete combustion of gasoline and diesel fuels. Mobile sources account for 83% of total statewide emissions. Area-wide sources such as agricultural waste burning and open burning contribute to approximately 13% of statewide emissions. Approximately 67% of 1,3-butadiene emissions are from mobile sources.

Health Effects
In California, 1,3-butadiene has been identified as a carcinogen. Butadiene vapors cause neurological effects at very high levels such as blurred vision, fatigue, headache, and vertigo. Dermal exposure of humans to 1,3-butadiene causes a sensation of cold, followed by a burning sensation, which may lead to frostbite (EPA 2009).

2.9.4 Carbon Tetrachloride

The primary sources of carbon tetrachloride in California include chemical and allied product manufacturers and petroleum refineries.

Health Effects
In California, carbon tetrachloride has been identified as a carcinogen. Carbon tetrachloride is also a central nervous system depressant and mild eye and respiratory tract irritant. EPA has classified carbon tetrachloride as a Group B2 probable human carcinogen (EPA 2007d).

2.9.5 Chromium, Hexavalent

Chromium plating and other metal finishing processes are the primary sources of hexavalent chromium emissions in California. Approximately 65% of hexavalent chromium emissions are from stationary sources, such as electrical generation facilities, aircraft and parts manufacturing plants, and fabricated-metal manufacturing facilities.

Health Effects

In California, hexavalent chromium has been identified as a carcinogen. There is epidemiological evidence that exposure to inhaled hexavalent chromium may result in lung cancer. The principal acute effects are renal toxicity, gastrointestinal hemorrhage, and intravascular hemolysis (EPA 2007e).

2.9.6 Para-Dichlorobenzene

The primary sources of para-dichlorobenzene include consumer products such as non-aerosol insect repellents and solid/gel air fresheners. These sources contribute 99% of the statewide para-dichlorobenzene emissions.

Health Effects

In California, para-dichlorobenzene has been identified as a carcinogen. Acute exposure to 1,4-dichlorobenzene via inhalation results in irritation to the eyes, skin, and throat in humans. In addition, long-term inhalation exposure may affect the liver, skin, and central nervous system in humans (e.g., cerebellar ataxia, dysarthria, weakness in limbs, and hyporeflexia) (EPA 2007f).

2.9.7 Formaldehyde

Formaldehyde is both emitted into the atmosphere directly and formed in the atmosphere as a result of photochemical oxidation. Formaldehyde is a product of incomplete combustion. One of the primary sources of formaldehyde is vehicular exhaust. Formaldehyde is also used in resins, many consumer products (as an antimicrobial agent), and fumigants and soil disinfectants.

Health Effects

The major toxic effects caused by acute formaldehyde exposure via inhalation are eye, nose, and throat irritation and effects on the nasal cavity. Other effects seen from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. In California, formaldehyde has been identified as a carcinogen (EPA 2007g).

2.9.8 Methylene Chloride

Methylene chloride is used as a solvent, a blowing and cleaning agent in the manufacture of polyurethane foam and plastic, and a solvent in paint-stripping operations. Paint removers account for the largest use of methylene chloride in California (approximately 82%).

Health Effects

Case studies of methylene chloride poisoning during paint-stripping operations have demonstrated that inhalation exposure to extremely high levels can be fatal to humans. Acute inhalation exposure to high levels has resulted in effects on the central nervous system, including decreased visual, auditory, and psychomotor functions, but these effects are reversible once exposure ceases. The major effects from chronic inhalation exposure are effects on the central nervous system, such as headaches, dizziness, nausea, and memory loss. California considers methylene chloride to be carcinogenic (EPA 2007h).

2.9.9 Perchloroethylene

Perchloroethylene is used as a solvent, primarily in dry cleaning operations; it is also used in degreasing operations, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, and laboratory solvents.

Health Effects

In California, perchloroethylene has been identified as a carcinogen. Perchloroethylene vapors are irritating to the eyes and respiratory tract. Following chronic exposure, workers have shown signs of liver toxicity as well as kidney dysfunction and neurological disorders (EPA 2007i).

2.9.10 Diesel Particulate Matter

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

Health Effects

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 TAC evaluated by the California Office of Environmental Health Hazard Assessment (OEHHA). CARB estimates that about 70% of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

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 also 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. In California, diesel exhaust particles have been identified as a carcinogen (California OEHHA and the American Lung Association 2005; CARB 2008).

2.9.11 Airborne Fungus (Valley Fever)

Valley Fever, or coccidioidomycosis, is caused by the microscopic fungus coccidioides immitis (*C. immitis*), which grows in arid soil in parts of Kern County and other parts of America. Infection occurs when the spores of the fungus become airborne and are inhaled. The fungal spores become airborne when contaminated soil is disturbed by human activities, such as construction and agricultural activities; and by natural phenomenon, such as wind storms, dust storms, and earthquakes.

Health Effects

About 60% of infected persons have no symptoms. The remainder develops flu-like symptoms that can last for a month and tiredness that can sometimes last for several weeks. A small percentage of infected persons (< 1%) can develop disseminated disease that spreads outside the lungs to the brain, bone, and skin. Without proper treatment, Valley Fever can lead to severe pneumonia, meningitis, and even death. Symptoms may appear between 1 and 4 weeks after exposure (County of Los Angeles 2004).

A diagnosis of Valley Fever is made through a sample of blood or other body fluid or biopsy of the affected tissue. It is treatable with anti-fungal medicines and is not contagious. Once recovered from the disease, the individual is protected against further infection. Persons at highest risk from exposure are those with compromised immune systems, such as those with HIV, and those with chronic pulmonary disease. Farmers, construction workers, and others who engage in activities that disturb the soil are at highest risk for Valley Fever. Infants; pregnant women; diabetics; people of African, Asian, Latino, or Filipino descent; and the elderly may be at increased risk for disseminated disease. Historically, people at risk for infection are individuals not already immune to the disease and whose jobs involve extensive contact with soil dust, such as construction or agricultural workers and archeologists (County of Los Angeles 2004). The disease also has been known to infect animals. Infections occur most often in summer.

Valley Fever cases may be caused by soils containing fungal spores that become disturbed by wind erosion, vehicular transportation, construction, or farming. Even natural phenomena such as earthquakes or wildfires may disturb soils containing the fungi, and high winds, such as Santa Anas, may disperse the small infectious particles miles from their place of origin (*Los Angeles Daily News* 2004).

It is thought that during drought years the number of organisms competing with *C. immitis* decreases, and the *C. immitis* remains alive but dormant. When rain finally occurs, the arthrocondia germinate and multiply more than usual because of a decreased number of other competing organisms. Later, the soil dries out in the summer and fall, and the fungi can become airborne and potentially infectious (Kirkland and Fierer 1996).

Hans Einstein, M.D., notes that the disease is "serious, and can be fatal. It exacts a tremendous toll in personal and community resources. Valley Fever can't be eliminated, like smallpox and polio, but it can be controlled. We believe we have the basic knowledge, tools, and people to develop a vaccine" (Einstein 2009).

Persons at risk for Valley Fever should avoid exposure to dust and dry soil in areas where Valley Fever is common. Areas with high Valley Fever rates are called hyper-endemic. Approximately 10%–50% of people living in endemic disease regions are seropositive and considered immune. In any given year, about 3% of people who live in an area where coccidiodomycosis is common will develop an infection (County of Los Angeles 2004). The areas of Kern County that have the most incidents of Valley Fever exposure are northeast Bakersfield, Lamont-Arvin, Taft, and Edwards Air Force Base. The Valley Fever fungus has been identified in soil samples taken near the California State University, Bakersfield campus.

2.9.12 Asbestos

Ultramafic serpentinized rock is closely associated with asbestos and composed of the following minerals:

- antigorite; $(Mg, Fe)_3Si_2O_5(OH)_4$;
- clinochrysotile; $Mg_3Si_2O_5(OH)_4$;
- lizardite; $Mg_3Si_2O_5(OH)_4$;
- orthrochrysotile; $Mg_3Si_2O_5(OH)_4$; and
- parachrsotile; $(Mg, Fe)_3Si_2O_5(OH)_4$.

Chysotile minerals are more likely to form serpentinite asbestos; however, serpentinite is uncommon to sedimentary soil found in the project area. Asbestos occurs in certain geologic environments, none of which are common in the project area.

Health Effects

Asbestos can adversely affect humans only in its fibrous form, and these fibers must be broken and dispersed into the air and then inhaled. During geological processes, the asbestos mineral can be crushed, causing it to become airborne. It also enters the air or water from the breakdown of natural deposits. Constant exposure to asbestos at high levels on a regular basis may cause cancer in humans. The two most common forms of cancer are lung cancer and mesothelioma, a rare cancer of the lining that covers the lungs and stomach.

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CHAPTER 3
REGULATORY SETTING

3.1 FEDERAL

3.1.1 U.S. Environmental Protection Agency

The 1977 federal CAA and 1990 revisions require EPA to identify National Ambient Air Quality Standards (NAAQS) to protect the public health and welfare (see Table 4.3-1). In June of 1997, EPA adopted new PM_{10} federal standards and an additional standard for suspended particulate matter at or below PM_{10} to $PM_{2.5}$.

On March 12, 2008, EPA implemented a new 8-hour standard for ozone. The new primary 8-hour standard is 0.075 ppm, and the new secondary standard is set at a form and level identical to the primary standard. The previous primary and secondary standards were an identical 8-hour standard, set at 0.08 ppm. On April 12, 2010, EPA implemented a new 1-hour standard for NO_2 of 100 parts per billion (ppb).

In accordance with the 1990 CAA Amendments), EPA classified air basins (or portions thereof) as either in attainment or nonattainment areas for each criteria air pollutant based on whether or not the NAAQS have been achieved. The CAA also required each state to prepare an air quality control plan (State Implementation Plan [SIP]). The 1990 amendments additionally required states containing areas that violate NAAQS to revise their SIPs to incorporate additional control measures to reduce air pollution. The EPA has the responsibility to review all SIPs to determine if they conform to the mandates of the CAA amendments and would achieve air quality goals when implemented.

TACs (HAPs under federal regulations) are regulated through federal and state controls on individual sources. Federal law defines HAPs as non-criteria air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. The 1977 CAA required the EPA to identify National Emission Standards for Hazardous Air Pollutants (NESHAPs) to protect public health and welfare.

The 1990 CAA amendments offer a technology-based approach to reducing air toxics. Since the amendments were approved 188 chemicals have been designated as HAPs and are regulated under a two-phase strategy. The first phase involves requiring facilities to install maximum achievable control technology (MACT), which includes measures, methods, and techniques, such as material substitutions, work practices, and operational improvements, aimed at reducing toxic air emissions. MACT is the lowest emission rate, or highest level of control demonstrated, on average by the top-performing companies in the source category. MACT standards already exist for the 174 source categories: 166 major sources and 8 area sources. Under the air toxics program, facilities having similar operating processes are grouped into categories. These MACTs were promulgated in four "bins" of years: 1992, 1994 (39 categories), 1997 (62 categories), and 2000 (67 categories). As of August 2003, MACT standards have been made for 174 source categories and their subcategories.

3.1.2 Greenhouse Gas/Global Warming

On April 2, 2007, in Massachusetts v. USEPA, *549* US 497, the US Supreme Court found that GHGs are air pollutants and are therefore covered by the CAA. The court held that the EPA must determine if emissions of GHGs from new motor vehicles cause or contribute to air pollution, which may reasonably be anticipated to endanger public health or welfare, or if the science is too uncertain to make a reasoned decision. In making these decisions, the EPA is required to follow the language of Section 202(a) of the CAA. The US Supreme Court decision resulted from a petition for rulemaking under Section 202(a) filed by more than a dozen environmental, renewable energy, and other organizations.

On April 17, 2009, the administrator signed the Endangerment and Cause or Contribute Findings for GHGs under Section 202(a) of the CAA. The EPA provided a 60-day public comment period, which ended June 23, 2009, and received more than 380,000 public comments. These included both written comments and testimony at two public hearings in Arlington, Virginia, and Seattle, Washington. The EPA carefully reviewed, considered and incorporated public comments and has now issued its final findings.

The EPA found that six GHGs taken in combination endanger both the public health and the public welfare of current and future generations. The EPA also found that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to air pollution that endangers public health and welfare under CAA Section 202(a). These findings were based on careful consideration of the full weight of scientific evidence and a thorough review of numerous public comments received on the proposed findings published April 24, 2009. These findings became effective on January 14, 2010.

3.2 STATE

3.2.1 California Air Resources Board (CARB)

CARB, a department of the California Environmental Protection Agency (Cal/EPA), oversees air quality planning and control throughout California by administering the SIP. Its primary responsibility lies in ensuring implementation of the 1989 amendments to the CCAA and responding to the federal CAA requirements and regulating emissions from motor vehicles sold in California. It also sets fuel specifications to reduce vehicular emissions further.

The State of California has also established a set of Ambient Air Quality Standards (CAAQS) similar to the Federal standards (see Table 3.7.1). These standards apply to the same criteria pollutants as the Federal CAA; they also include sulfate, VRPs, H_2S, and vinyl chloride and are more stringent than the Federal standards.

The MDAB is designated as a nonattainment area for the State ozone and PM_{10} standards. Concentrations of all other pollutants meet State standards.

CARB is also responsible for regulations pertaining to Toxic Air Contaminants (TACs). AB 2588 was enacted in 1987 as a means to establish a formal air toxics emission inventory risk quantification program. AB 2588, as amended, establishes a process that requires stationary sources to report information regarding the types and quantities of certain substances that their facilities routinely release into the MDAB. Each air pollution control district ranks the data into high, intermediate, and low priority categories. When considering the ranking, the potency, toxicity, quantity, volume, and proximity of the facility to receptors are given consideration by an air district.

CARB also has on- and off-road engine emission-reduction programs that would indirectly affect the proposed project's emissions through the phasing in of cleaner on- and off-road engines. For example the state recently enacted a new regulation for the reduction of diesel particulate matter and criteria pollutant emissions from in-use off-road diesel-fueled vehicles. This regulation provides target emission rates for particulate matter and NO_X emissions for owners of fleets of diesel-fueled off-road vehicles. It applies to equipment fleets of three specific sizes, and the target emission rates are reduced over time. In addition, CARB's Portable Equipment Registration Program allows owners or operators of portable engines and associated equipment to register their units under a statewide program, with specified emission requirements, without having to obtain individual permits from local air districts (13 CCR Article 4.8, Chapter 9, Section 2449).

Particulate pollution, including sulfates, nitrates, organics, soot, fine soil dust, and particles, contribute to the regional haze that impairs visibility, in addition to affecting public health. California's efforts to achieve State and Federal air quality standards for health benefits would also improve visibility (CARB 2010a).

The Federal Clean Air Act of 1977 set a long-term goal of improving visibility to achieve natural conditions in selected national parks and wilderness areas of the United States, known as Class 1 Areas, by 2064. California has 29 mandatory Class 1 Areas managed by either the National Parks Service or the USFS. (CARB 2010a)

In 1999, the EPA promulgated a regional haze regulation that calls for States to establish goals and emission reduction strategies to make initial improvements in visibility at their respective Class 1 Areas. The ARB prepared a Regional Haze Plan (RH Plan) for California, demonstrating reasonable progress in reducing haze by 2018, the first benchmark year on the path to natural visibility by 2064 (CARB 2010a).

The EPA funded five Regional Planning Organizations throughout the country to coordinate regional haze rule-related activities among States in each region. California belongs to the Western Regional Air Partnership (WRAP), the consensus organization of western States, tribes, and Federal agencies, which oversees analyses of monitoring data and preparation of technical reports regarding regional haze in the western United States (CARB 2010a).

3.3 LOCAL

3.3.1 Eastern Kern Air Pollution Control District (EKAPCD)

The Eastern Kern Air Pollution Control District (EKAPCD) has regulatory authority over the air emissions from the proposed Isabella DSM Project, The EKAPCD has primary responsibility for regulating stationary sources of air pollution in its jurisdictional boundaries. To this end, the EKAPCD implements air quality programs required by State and Federal mandates, enforces rules and regulations based on air pollution laws, and educates businesses and residents about its role in protecting air quality. The EKAPCD is also responsible for managing and permitting existing, new, and modified sources of air emissions within the MDAB.

In 1991, due to the absence of ozone monitoring data collected in East Kern, EKAPCD's planners had no choice but to use Barstow monitoring data in preparation of the plan. This resulted in utilization of a design value of 0.11 ppm. The California Ambient Air Quality Standard (CAAQS) for ozone is 0.09 ppm, established East Kern as a "moderate" nonattainment area.

In 1993 amendments of the Act combined with ozone monitoring data collected at Mojave have resulted in EKAPCD remaining a "moderate" nonattainment area. 1993 amendments to the CCAA (Section 40921.5) require a District to assign its degree of nonattainment based upon actual monitoring data "minus" impact of transported ozone (Section 40925).

An analysis of 1993 and 1994 smog season data conducted during preparation of the District's Federal Clean Air Act Attainment Demonstration revealed there are no self-generated exceedances of the ozone CAAQS, all exceedances occurred during transport days. It can be concluded that the actual EKAPCD's design value is lower than 0.11 ppm. The California Air Resources Board staff agrees with this analysis. Triennial revisions to EKAPCD's Plan made in 1994 reflect these findings.

Ambient ozone levels have been reduced by implementing retrofit controls for volatile organic compounds (VOCs) and oxides of nitrogen (NO_X) on Eastern Kern County's stationary sources, but the ozone CAAQS can be attained only when inflowing air from upwind air districts does not contain ozone and ozone precursors in sufficient quantities to cause exceedances. In 1995, EKAPCD utilized California Health and Safety Code, Section 40925(b) to delete control measures inappropriate for an area overwhelmingly impacted by transport. EKAPCD's 1994 Federal Clean Air Act Amendments Ozone Attainment Demonstration projected attainment with NAAQS by 1999; Mojave monitoring data show the federal ozone NAAQS of 0.12 ppm has been attained. Consequently, EKAPCD has been redesignated to attainment for the federal one-hour ozone NAAQS. However, attainment with ozone CAAQS and the new ozone eight-hour NAAQS of 0.08 ppm has not occurred. Due to ozone CAAQS exceedances being cause by overwhelming transport, Section 40925(c) (comprehensive plan revision) did not apply to EKAPCD, but did apply to upwind districts.

Due to reductions in EKAPCD pollutant emissions and upwind emissions, East Kern's ozone air quality has significantly improved since 1987. EKAPCD is recognized by CARB staff as a nonurbanized, moderate ozone nonattainment District overwhelmingly impacted by upwind transport. Much progress has been made to reduce ozone precursor emissions. Mandates and intent of the California Clean Air Act have been fulfilled and EKAPCD's Attainment Plan has been revised to reflect new statutory mandates and additional knowledge pertaining to source of air quality standards exceedances.

Ambient ozone levels have been reduced by implementing retrofit controls for VOCs and NO_X on eastern Kern County's stationary sources, but the ozone CAAQS can be attained only when inflowing air from upwind air districts does not contain ozone and ozone precursors in sufficient quantities to cause exceedances. In 1995, EKAPCD used California Health and Safety Code, Section 40925(b), to delete control measures inappropriate for an area overwhelmingly impacted by transport. EKAPCD's 1994 Federal Clean Air Act Amendments Ozone Attainment Demonstration projected attainment with NAAQS by 1999; Mojave monitoring data show the Federal ozone NAAQS of 0.12 ppm has been attained. Consequently, the EKAPCD has been redesignated as in attainment for the Federal one-hour ozone NAAQS. However, the ozone CAAQS and the new ozone eight-hour NAAQS of 0.08 ppm have not been attained. Due to ozone CAAQS exceedances being cause by overwhelming transport, Section 40925(c) (comprehensive plan revision) did not apply to the EKAPCD but did apply to upwind districts.

The EKAPCD has primary responsibility for regulating stationary sources of air pollution situated within its jurisdictional boundaries. The EKAPCD implements air quality programs required by State and Federal mandates, enforces rules and regulations based on air pollution laws, and educates businesses and residents about its role in protecting air quality.

The EKAPCD is also responsible for managing and permitting existing, new, and modified sources of air emissions within the MDAB and establishing rules and regulations to ensure compliance with local, State, and Federal air quality regulations. The following rules established by EKAPCD may be applicable to the proposed project:

- ***Rule 201 (Permits Required, Amended May 2, 1996)***
  This rule requires that an Authority to Construct (ATC) permit (a new source review permit) and a Permit to Operate (PTO) be obtained prior to constructing, altering, replacing, or operating any device which emits or may emit air contaminants. Equipment that is scheduled to be on-site for more than one-year, equipment with emissions control devices or equipment that is specifically required to be permitted within the EKAPCD under a prohibitory rule must be so permitted prior to being operated.

- ***Rule 202 (Exemptions, Amended January 8, 2004)***
  This rule specifies criteria that emission units must meet in order to be exempt from District permit requirements. The rule also specifies the record keeping requirements to verify the exemption and outlines the compliance schedule for emission units that lose the exemption after installation. This rule applies to any source that emits or may emit air contaminants.

- ***Rule 208 (Standards for Granting Applications, Amended September 17, 1998)***
  This rule sets forth the standards that must be met in order for a permit to be issued by the Air District. The rule applies to any activity required to obtain a permit according to Rule 201 (Permits Required).

- ***Rule 210-1 (New and Modified Stationary Source Review Rule, Amended May 4, 2000)***
  This rule provides for the review of new and modified stationary sources of air pollution and to provide mechanisms including emission trade-offs by which authority to construct such sources may be granted without interfering with the attainment or maintenance of ambient air quality standards. The rule generally requires that new or modified equipment include best available control technology (BACT) and the emission increase above specified thresholds be offset.

- ***Rule 201-1 (Title V Federally Mandated Operating Permits, Amended March 11, 2004)***
  This rule mainly applies to major stationary sources of air contaminants and to major sources of HAPs. Major sources of air contaminants are generally considered to be sources that emit 100 tons per year of a regulated air pollutant, without considering fugitive emissions. To be considered major for HAPs a source must emit 10 tpy or more of a single HAP or 25 tpy or more of HAPs in aggregate.

- ***Rule 401 (Visible Protection, Amended November 29, 1993)***
  This rule prohibits the emissions of visible air contaminants to the atmosphere. The rule applies to any source operation which emits or may emit air contaminants.

- ***Rule 419 (Nuisance, April 18, 1972)***
  This rule protects the health and safety of the public. The rule applies to any source which emits or may emit air contaminants or other materials. The rule prohibits the discharge from any source whatsoever emissions of air contaminants or other materials which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public; or which endanger the comfort, repose, health or safety of any such person or the public; or which cause or have a natural tendency to cause injury or damage to business or property.

- ***Rule 404-1 (Particulate Matter Concentration, Amended January 24, 2007)***
  This rule establishes a particulate matter emission standard. This rule applies to any source operation which emits or may emit dust, fumes, or total suspended particulate matter. The rule prohibits the release or discharge into the atmosphere from any single source operation, dust, fumes, or total suspended particulate matter emissions in excess of 0.1 grain per cubic foot of gas at dry standard conditions.

- ***Rule 402 (Fugitive Dust, Amended November 3, 2004)***
  This rule reduces the amount of respirable particulate matter (PM_{10}) emitted from significant man-made fugitive dust sources and in an amount sufficient to maintain National Ambient Air Quality Standards. Rule 419 shall still be used to prevent/correct specific public nuisances and health hazards.

- ***Rule 210-7 (Federal General Conformity, Adopted October 13, 1994)***
  Provisions of Code of Federal Regulations (CFR), Title 40, Chapter I, Subchapter C, Parts 6 and 51 in effect (date of adoption) are hereby adopted by reference and made a part hereof. All Federal actions shall comply with applicable standards, criteria, and requirements set forth therein.

3.3.2 General Conformity for Federal Actions

Section 176(c) of the Clean Air Act prohibits Federal entities from taking actions in nonattainment or maintenance areas which do not conform to the State Implementation Plan (SIP) for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). The purpose of "conformity" is to 1) ensure that Federal activities do not interfere with emissions budgets within the affected SIP; 2) ensure such actions do not cause or contribute to new violations and 3) ensure attainment and maintenance of the NAAQS. In November of 1993 the U. S. Environmental Protection Agency (EPA) promulgated two sets of regulations to implement Section 176(c). On November 24, 1993, the EPA promulgated the Transportation Conformity Regulations, applicable to highway and mass transit actions, to establish the criteria and procedures for determining that transportation plans, programs and projects which are funded under Title 23 U.S.C. or the Federal Transit Act, conform with the SIP (58 FR 62188). On November 30, 1993, the EPA promulgated the General Conformity Regulations which applies to all other Federal actions to ensure that such actions also conform to applicable SIPs (58 FR 63214).

Under General Conformity, all Federal actions are covered unless exempted (i.e. actions covered by transportation conformity, actions with de minimis emissions, exempt actions listed by rule, or actions covered by a Presumed to Conform listing. Conformance can be demonstrated in any one of five ways:

1. Showing that proposed emissions increases are included in the SIP;

2. Provision that the State would agree to include the proposed emission increases in the SIP;
3. Demonstrating that there would be new violations of NAAQS and/or increase in frequency/severity of violations;
4. Identification and provision of emissions offsets; or
5. Avoidance, Minimization and/or Mitigation Measures.

Some emissions are excluded from conformity determination, such as those already subject to new source review; those covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) or compliance with other environmental laws, actions not reasonable foreseeable, and those for which the Agency has no continuing program responsibility.

EKAPCD Rule 210.7 – Federal General Conformity Rule adopted the provisions of CFR Title 40, Chapter 1, Subchapter C, Parts 6 and 51 effective October 13, 1994 stating that all Federal actions shall comply with applicable standards, criteria and requirements set forth therein.

At issue for the Isabella Lake DSM Project (i.e. implementing the Preferred Alternative) is the potential for an increase in total NO_X emissions in excess of de minimis levels during project construction. The project would result in no change to the current operational (long-term) emissions of all criteria pollutants, thus no consideration of these emissions are required. General conformity de minimis levels are presented below in Table 3.3.3-1.

Table 3.3.3-1
General Conformity De Minimis Levels[1]

Pollutant	Attainment Status	Tons Per Year
Ozone (VOC or NO_X)	Ozone Nonattainment Area Outside an Ozone Transport Region	100
PM_{10}	Serious Nonattainment	70

Source: IEC 2012, EKAPCD
[1] 40 CFR Part 51§51.853

If implementing the Preferred Alternative can be demonstrated to result in emissions impacts below the de minimis levels listed above in Table 3.3.3-1, the project can be said to be in conformity with the CAA and no further demonstration is required. This in fact is the case, as discussed in the next Chapter (Chapter 4) of this analysis report.

CHAPTER 4
ENVIRONMENTAL EFFECTS

This chapter describes the potential impacts on air quality, greenhouse gas and global warming from the Preferred Alternative. It describes the methods used to determine the impacts, lists the various mitigation measures applied to reduce these impacts and provides the thresholds used to conclude whether an impact would be significant.

4.1 METHODOLOGY

Short-term construction-related impacts, as well as impacts from TACs, were assessed in accordance with EKAPCD recommended methods. Where quantification was required, project-generated emissions were modeled using the CARB-approved EMFAC2011 and CalEEMod Version 2011.1.1 (CalEEMod) computer programs as recommended by EKAPCD. CalEEMod incorporates ARB's EMFAC2007 model for on-road vehicle emissions and the OFFROAD2007 model for off-road vehicle emissions. CalEEMod is designed to model emissions for land development projects and allows for the input of project-specific information.

With the exception of Caltrans' Highway 155 Widening and Bridge Work and Caltrans' Highway 178 Widening Work[4], all emissions were modeled based on specific information provided by the Corps, reasonable assumptions, and, in some cases, default CalEEMod settings to estimate reasonable worst-case emissions that would be generated by the Preferred Alternative. However, due to the limitations of the CalEEMod program construction operating days and hours per day may have been adjusted from the provided construction schedule. The main factor in determining emissions from CalEEMod is total operating hours and acres disturbed in the correct year of construction. This analysis was able to stay consistent with these factors within the limitations of the CalEEMod program.

The following construction sources and activities were analyzed for emissions, including the following assumptions:

- Onsite construction equipment exhaust for the Staging Areas, Existing Spillway, Emergency Spillway, Auxiliary Dam, Main Dam, and Borel Canal Construction emissions were estimated using CalEEMod and Highway 155 and 178 construction emissions were estimated using the Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model. A detailed

[4] CalTrans calculated emissions from these two state highway projects using the Sacramento Metropolitan Air Quality Management District (SMAQMD) Construction Emissions Spreadsheet. This program utilizes CARB-approved EMFAC 2007 On-Road and Off-Road emissions factors as well as EPA AP-42 equipment emissions factors to estimate emissions. The CalTrans-supplied emissions were incorporated into the emissions impacts presented in this report. It was presumed that all equipment proposed by CalTrans would at least meet minimal state emissions standards for each type and class of equipment.

construction equipment listing is provided in Attachment E and electronic input files for CalEEMod are provided on electronic Attachment F.

- Equipment exhaust was estimated to occur during years 2017 Staging Areas A1 and A2, Haul Roads H3 and H6 and Engineering Point A; 2018 for Staging Area M1; 2019 for Staging Area A3 and Haul Road H1; and 2022 for all Staging Areas and Haul Roads. Equipment exhaust would also occur at various times during construction when spoils and other material are brought to and from the Staging Areas and Haul Roads. Estimated equipment includes dozers, scrapers, highway trucks, graders, mechanic trucks, fuel and lube trucks, pickup trucks, chippers, rollers, miscellaneous equipment and water trucks.
- Equipment exhaust was estimated to occur during years 2018 and 2019 for the Existing Spillway. Estimated equipment include drills, cranes, generators, concrete pumps, mechanic trucks, fuel and lube trucks, pickup trucks, concrete trucks and concrete vibrators.
- Equipment exhaust was estimated to occur during years 2017 through 2019 for the Emergency Spillway. Estimated equipment include drills, cranes, generators, concrete pumps, mechanic trucks, fuel and lube trucks, pickup trucks, concrete trucks, dozers, scrapers, water trucks, highway trucks, chippers, miscellaneous equipment, off-highway trucks, excavators, backhoes, graders, rollers, loaders, air compressors, forklifts, man lifts, pumps, concrete mixers, water blasters, float machines, welders and concrete vibrators.
- Equipment exhaust was estimated to occur during years 2019 and 2020 for the Main Dam. Estimated equipment include mechanic trucks, fuel and lube trucks, pickup trucks, dozers, scrapers, water trucks, highway trucks, off-highway trucks, graders, rollers and loaders.
- Equipment exhaust was estimated to occur during years 2017 through 2019 for the Auxiliary Dam. Estimated equipment include mechanic trucks, fuel and lube trucks, pickup trucks, dozers, scrapers, water trucks, highway trucks, off-highway trucks, graders, rollers and loaders.
- Equipment exhaust was estimated to occur during years 2019 through 2021 for the Borel Canal. Estimated equipment include mechanic trucks, fuel and lube trucks, pickup trucks, dozers, water trucks, highway trucks, off-highway trucks, rollers, cranes, pile drivers, concrete mixer trucks, excavators, drills, pumps, shotcrete sprayers, concrete vibrators, air compressors, generators, welders, articulated trucks, forklifts, flatbed trucks, concrete saws, compactors, paving machine placer, paving machine trimmer and loaders.
- Equipment exhaust was estimated to occur during years 2014 through 2016 for Highways 155 and 178 Construction. Estimated equipment include dozers, scrapers, signal boards, excavators, graders, loaders, plate compactors, trenchers, pavers, paving equipment, rollers and other construction equipment.

- Construction employees' vehicular emissions were estimated using EMFAC2011 based on miles traveled.
- An average of 200 employees per day was assumed.
- Employees were estimated to travel a roundtrip distance of 94 miles per day during 260 working days per year.
- Concrete Batch Plant fugitive PM emissions were estimated using an engineering analysis of a recently permitted concrete batch plant in the EKAPCD.
- It was assumed that the plant would produce 27,262 cubic yards, 2 tons per cubic yard.
- The assumed mix of materials for the concrete was 3.38% cement, 7.37% fly ash, 4.22% water, 56.00% coarse aggregates, 29.01% sand, and 0.03% water reducer.
- Fabric collectors and water was assumed to be used for control measures.
- Crushing Plant fugitive emissions were estimated using AP 42 Chapter 11, Table 11.19.2-2.
- Fugitive crushing plant emissions were estimated to occur during 2017 and 2018.
- In order to remain conservative, if there was any ground disturbance during a sub construction phase the entire acreage of that area was input as disturbed area in CalEEMod.
- GHG exhaust emissions were estimated using CalEEMod and Emfac2011.

As the Preferred Alternative consists of repairs and modification of existing structures, the Corps anticipates **t**here would be no changes to the facility operations or personnel. Consequently, facility operations emissions would remain unchanged. These emissions are already included in the EKAPCD Emissions Inventory since the dam and associated facilities have been in place since the 1950s. For this reason, and with the agreement of the EKAPCD, this analysis did not further delineate operational emissions associated with the Isabella Lake Dam facilities.[5]

4.2 EKAPCD THRESHOLDS OF SIGNIFICANCE

EKAPCD has established thresholds of significance to evaluate the potential impact of a proposed project on the District's ability to continue to comply with State and Federal air quality regulations. EKAPCD has determined that a project would have a significant adverse impact on air quality if it would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality standard;

[5] Email correspondence from David Jones, APCO, EKAPCD on 8/29/2012 to R. Hunter, IEC.

- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable Federal or state ambient air quality standard (including emissions which exceed quantitative thresholds for ozone precursors). Specifically, would implementation of the project exceed any of the following thresholds:
  - Stationary Sources – as determined by District Rules:
    - 25 tons per year,
  - Operational and Area Sources:
    - Reactive Organic Gases (ROG): 25 tons per year,
    - Oxides of Nitrogen (NO_X): 25 tons per year,
    - Oxides of Sulfur (SO_X): 27 tons per year,
    - Particulate Matter (PM_{10}): 15 tons per year, and
    - Carbon Dioxide Equivalent (CO2e): 25,000 tons per year;
    - Expose sensitive receptors to substantial pollutant concentrations; or
    - Cause the creation of objectionable odors affecting a substantial number of people.

4.3 ANALYSIS OF PREFERRED ALTERNATIVE

4.3.1 Projected Emissions

Construction

Construction of the Preferred Alternative would result in emissions of the air pollutants ROG, NO_X, CO, PM_{10}, $PM_{2.5}$, and SO_X. Emissions would result from fuel combustion and exhaust from construction equipment as well as vehicle traffic, and grading. Emissions estimates are based on equipment and running hours provided by the Corps for implementing the Preferred Alternative (See attachment B).

Tables 4.3-1 and 4.3-2 present the total project-related unmitigated and mitigated annual and daily air emissions from construction. "Unmitigated" emissions are emissions from various sources that are uncontrolled and represent the "gross" emissions that can be produced from a particular piece of equipment, activity, time period or project. "Mitigated" emissions represent the "net" emissions from a particular piece of equipment, activity, time period or project, after various types of controls or emission-reducing measures are considered. Both types of emissions are presented herein to demonstrate the level of controls being placed on construction equipment and activities in order to reduce these impacts to the greatest extent possible while allowing completion of the proposed project.

The EKAPCD thresholds of significance are also included in Tables 4.3.1 and 4.3.2 as well as information regarding whether annual and daily construction emissions for ROG, NO_X, SO_X, $PM_{2.5}$ and PM_{10} would exceed those thresholds. EKAPCD applies these thresholds to both on-site and off-site ("indirect") construction emissions. Indirect emissions are those associated with mobile sources (cars, trucks, etc.) that occur away from the actual construction site. Indirect emissions are included in the emissions volumes noted in Table 4.3-1 and are presented separately as required by EKAPCD, in Table 4.3-2. As shown in below, temporary emissions during construction would exceed EKAPCD NO_X thresholds for the year 2015. All other years and pollutants remain below the significant thresholds.

Table 4.3-1
Estimated Construction Emissions (*)

	Criteria Pollutants (tons/yr)					
Construction Year	**ROG**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
UNMITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	15.68	122.15	73.29	0.26	10.10	6.39
2018 Emissions	3.42	23.08	23.88	0.02	5.79	2.37
2019 Emissions	10.07	62.92	50.37	0.14	7.10	5.26
2020 Emissions	6.65	38.92	37.31	0.11	4.41	2.98
2021 Emissions	0.80	3.81	13.57	0.01	0.22	0.12
2022 Emissions	0.48	2.11	12.14	0.00	0.23	0.09
EKAPCD SIGNIFICANCE THRESHOLDS	*25*	*25*	*--*	*27*	*15*	*--*
Exceed Threshold?	*No*	*Yes*	*No*	*No*	*No*	*No*
MITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	7.50	16.65	124.88	0.26	2.22	1.82
2018 Emissions	1.54	3.83	30.57	0.02	3.69	0.93
2019 Emissions	4.55	10.47	78.48	0.14	2.88	2.14
2020 Emissions	3.38	8.60	57.08	0.11	1.60	0.98
2021 Emissions	0.61	1.92	15.26	0.01	0.12	0.04
2022 Emissions	0.42	1.46	12.39	0.00	0.09	0.03
EKAPCD SIGNIFICANCE THRESHOLDS	*25*	*25*	*--*	*27*	*15*	*--*
Exceed Threshold?	*No*	*Yes*	*No*	*No*	*No*	*No*

(*) See Attachments for emissions modeling details.

Table 4.3-2
Estimated Maximum Daily Indirect Construction Emissions(*)

	Criteria Pollutants (lbs/day)					
Construction Year	**ROG**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
UNMITIGATED						
2014 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2015 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2016 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2017 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2018 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2019 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2020 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2021 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2022 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
EKAPCD SIGNIFICANCE THRESHOLDS	*137***	*137***	--	--	--	--
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*
MITIGATED						
2014 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2015 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2016 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2017 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2018 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2019 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2020 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2021 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
2022 Emissions	2.96	10.45	89.46	0.00	0.09	0.08
EKAPCD SIGNIFICANCE THRESHOLDS	*137***	*137***	--	--	--	--
Exceed Threshold?	*No*	*No*	*No*	*No*	*No*	*No*

* See Attachments for modeling details.
**Indirect vehicle trips emissions only

Operations

The operational emissions were not calculated for the DSM Project as the operational emissions would remain unchanged as a result of the Preferred Alternative. Therefore, operational emissions would not exceed EKAPCD significance thresholds.

4.3.2 Projected Health Risks

Since the release of the DEIS, a Health Risk Assessment (HRA) was conducted by the Corps in order to determine if diesel emissions associated with implementation of the Preferred Alternative (including refinements) would cause significant health risk to local sensitive receptors (i.e. residences). Details of the modeling of the diesel emissions can be found in the HRA report (Corps 2012d). Results of the modeling conducted for the

HRA indicate the maximum estimated chronic health index for non-cancerous ailments predicted is 0.014, which is well below the EKAPCD significance standard of 0.2. Therefore, the diesel emissions associated with implementation of the Preferred Alternative would pose a less than significant chronic health risk for non-cancerous ailments.

An isopleth map is also included in the HRA depicting areas with potential cancer risk from prolonged exposure to diesel emissions during the multi-year construction period for the Preferred Alternative. With regard to potential cancer risk to residences in the project area, all residences are located in areas below the EKAPCD significance risk level of one-chance-in-one-million. As illustrated in the isopleth map provided as Figure 2 in the HRA, the highest level of potential cancer risk to residences within the project area from prolonged exposure to diesel air emissions would at the Lakeside Village Mobile Home Park located south of the Auxiliary Dam and the residence directly west of the Lakeside Village. Most of the mobile home park is located in the 0.6 in one-million cancer risk isopleth, and the southernmost portion of the park and the residence to the west of the park are located in the 0.4 in one-million cancer risk isopleth. Some residential receptors east of Highway 178 are also located within the 0.4 in one-million cancer risk isopleth. All other residential receptors in the project vicinity are located in areas that are lower than 0.4 in one-million cancer risk from prolonged exposure to diesel air emissions associated with implementation of the Preferred Alternative.

4.3.3 Visibility Analysis

Visibility impact analyses are not usually conducted for area sources. The recommended analysis methodology was initially intended for stationary sources of emissions which were subject to the Prevention of Significant Deterioration (PSD) requirements in 40 CFR Part 60. Since the proposed project's operational emissions are predicted to be significantly less than the PSD threshold levels, an impact at any Class 1 area within 100 kilometers of the proposed project including Edwards Air Force Base, China Lake Naval Weapons Station and the entire R-2508 Airspace Complex is extremely unlikely. Furthermore, based on various controls, compliance with EKAPCD rules, included mitigation measures and the proposed project's predicted operational emissions; the proposed project is not expected to have any adverse impact to visibility at any Class 1 Area.

4.3.4 General Conformity Determination

Under General Conformity, all Federal actions are covered unless exempted (i.e. actions covered by transportation conformity, actions with de minimis emissions, exempt actions listed by rule, or actions covered by a Presumed to Conform listing). As shown previously in Table 3.3.3-1 and below in Table 4.3-3, implementation of the Preferred Alternative falls below the de minimis emission levels established under 40 CFR Part 51§51.853, and therefore, is considered exempt from a General Conformity analysis.

Table 4.3-3
Estimated Construction Emissions

	Criteria Pollutants (tons/yr)					
Construction Year	**ROG**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
UNMITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	15.68	122.15	73.29	0.26	10.10	6.39
2018 Emissions	3.42	23.08	23.88	0.02	5.79	2.37
2019 Emissions	10.07	62.92	50.37	0.14	7.10	5.26
2020 Emissions	6.65	38.92	37.31	0.11	4.41	2.98
2021 Emissions	0.80	3.81	13.57	0.01	0.22	0.12
2022 Emissions	0.48	2.11	12.14	0.00	0.23	0.09
FEDERAL DE MINIMIS THRESHOLDS	--	*100*	--	--	*70*	--
Exceed Threshold?	--	*Yes*	--	*--o*	*No*	--
MITIGATED						
2014 Emissions	0.67	4.60	6.28	0.00	1.34	0.40
2015 Emissions	3.98	27.51	37.58	0.00	8.01	2.38
2016 Emissions	0.99	6.86	9.37	0.00	2.00	0.59
2017 Emissions	7.50	16.65	124.88	0.26	2.22	1.82
2018 Emissions	1.54	3.83	30.57	0.02	3.69	0.93
2019 Emissions	4.55	10.47	78.48	0.14	2.88	2.14
2020 Emissions	3.38	8.60	57.08	0.11	1.60	0.98
2021 Emissions	0.61	1.92	15.26	0.01	0.12	0.04
2022 Emissions	0.42	1.46	12.39	0.00	0.09	0.03
FEDERAL DE MINIMIS THRESHOLDS	--	*100*	--	--	*70*	--
Exceed Threshold?	--	*N o*	--	--	*No*	--

4.3.5 Greenhouse Gas Emissions

The primary source of GHG emissions from the construction of the Preferred Alternative would be mobile sources. Not all GHGs exhibit the same ability to induce climate change; therefore, GHG contributions are commonly quantified in carbon dioxide equivalencies. The CO_2e portions of GHGs from the proposed project were estimated using the CalEEMod and EMFAC2011 programs and California Climate Action Registry – Intergovernmental Panel on Climate Change (IPCC) Emissions Factors. The estimated GHG emissions for each construction year are provided in Table 4.3-4, and the calculations can be found in Attachment E.

Mitigation measures that are incorporated into this report reduce CO2 using control measures such as limiting engine idling time on mobile sources, electrification of as many devices as practicable, restricting most construction implements to using newer engines, etc., from the uncontrolled levels. These reductions represent the most reasonable control available. EKAPCD's GHG reporting limit is based on portable and

Table 4.3-4
Estimated Greenhouse Gas Emissions

Construction Year	CO_2 (tons/ year)	CH_4 (tons/ year)	N_2O (tons/ year)	CO_2e (tons/year)
2014 Construction	844	-	-	844
2015 Construction	5,049	-	-	5,049
2016 Construction	1,258	-	-	1,258
2017 Construction	32,529	1.28	0.03	32,567
2018 Construction	15,056	0.34	0.05	15,076
2019 Construction	15,344	0.76	0.00	15,360
2020 Construction	10,637	0.51	0.00	10,647
2021 Construction	829	0.03	0.00	830
2022 Construction	173	0.00	0.00	173
EKAPCD SIGNIFICANCE THRESHOLDS	--	--	--	25,000
Exceed Threshold?	*No*	*No*	*No*	*Yes*

stationary source emissions. Projects with significance (or reporting) levels over 25,000 tons/year of CO2e are required to reduce GHG emissions to the extent practicable but are not treated as a "major" source unless these emissions reach 100,000 tons/year.

As shown in Table 4.3-4, emissions during construction would exceed CO_2e EKAPCD thresholds for the year 2017. All other years remain below the significant thresholds. Modeling outputs can be found in Attachments C and D and emissions calculation tables can be found in Attachments A.

4.3.6 Cumulative Impacts

Cumulative Regional Air Quality Impacts

A review of the Kern County Planning Department records indicates that there are 12 tentatively planned projects within a six-mile radius of the proposed project (see Table 4.3-9 below). Projects that are planned but their submittal has not been deemed complete for review by the county are not included in this analysis as there is no way to know or ascertain if their submittal would ever be completed or changes would be made to the submittal.

The most recent, certified Mojave Desert Air Basin Emission Inventory data available from the California Air Resources Board (CARB) is based on data gathered for the 2008 annual inventory.6 These data would be used to assist the EKAPCD in demonstrating attainment of Federal 1-hour Ozone Standards. Table 4.3-5 provides a comparative look at the impacts proposed by the DSM Project to the Mojave Desert Air Basin Emissions Inventory.

[6] Kern County Air Pollution Control Emissions for Aggregated Stationary, Area-Wide, Mobile and Natural Sources

As shown in Table 4.3-5, the emissions posed by the DSM Project's worst case construction year upon the air basin appear to be insignificant since basin emissions would be barely impacted if the proposed project is approved and would pose an even smaller impact for all other years of construction.

Table 4.3-5
Comparative Analysis Based on Mojave Desert Air Basin 2008 Inventory

	Pollutant (tons/year)				
Emissions Inventory Source	**ROG**	**NO_X**	**CO**	**SO_X**	**PM_{10}**
Mojave Desert Air Basin – 2008	48,289	100,448	192,172	3,577	76,358
2017 Construction Emissions	7.50	16.65	124.88	0.26	2.22
Proposed Project's % of MDAB	0.016	0.017	0.065	0.01	0.003

Tables 4.3-6 through 4.3-8 provide CARB Emissions Inventory Projections for the year 2020 for both the Mojave Desert Air Basin (MDAB) and the Kern County portion of the air basin. Looking at the MDAB Emissions predicted by the CARB year 2020 emissions inventory, the Kern County portion of the air basin is a moderate source of the emissions. The proposed Implementation of the Preferred Alternative appears to pose is an extremely minute source of the total emissions in both Kern County and the entire MDAB.

As shown in the preceding tables, the worst case construction year for the implementation of the Preferred Alternative would result in a small impact on regional ozone and PM_{10} formation and would result in an even smaller impact for all other construction years. When the mitigation measures described in Chapter 5 and compliance with applicable EKAPCD rules are considered, along with the fact that these emissions are temporary, short-term construction emissions, the regional contribution to these cumulative impacts would be almost negligible. It is reasonable to conclude; therefore, that implementation of the Preferred Alternative is not cumulatively significant with regard to regional impacts.

Table 4.3-6
Emission Inventory Mojave Desert Air Basin 2020 Projection – Tons per Year

	ROG	**NO_X**	**PM_{10}**
Total Emissions	48,508	75,591	83,512
Percent Stationary Sources	14.52	45.96	24.73
Percent Area-Wide Sources	15.04	1.10	66.69
Percent Mobile Sources	40.78	51.56	4.37
Percent Natural Sources	29.64	1.35	4.19
Total Stationary Source Emissions	7,044	34,748	20,659
Total Area-Wide Source Emissions	7,300	839	55,699
Total Mobile Source Emissions	19,783	38,982	3,650
Total Natural Source Emissions	14,381	1,022	3,504

Source: California Air Resources Board (www.arb.ca.gov/app/emsinv/emssumcat.php)
Note: Total may not add due to rounding.

Table 4.3-7
Emission Inventory Mojave Desert Air Basin – Kern County Portion 2020 Projection – Tons per Year

	ROG	NO_X	PM_{10}
Total Emissions	13,687	18,870	13,249
Percent Stationary Sources	4.26	54.73	23.96
Percent Area-Wide Sources	5.86	0.57	54.26
Percent Mobile Sources	22.40	42.16	10.74
Percent Natural Sources	67.20	2.51	11.29
Total Stationary Source Emissions	584	10,329	3,175
Total Area-Wide Source Emissions	803	109	7,190
Total Mobile Source Emissions	3,066	7,957	1,423
Total Natural Source Emissions	9,198	474	1,496

Source: California Air Resources Board (www.arb.ca.gov/app/emsinv/emssumcat.php)
Note: Total may not add due to rounding.

Table 4.3-8
2020 Emissions Projections – Proposed Project, Kern County, and Mojave Desert Air Basin

	ROG	NO_X	PM_{10}
2017 Construction Emissions	7.5	16.65	2.22
Kern County	13,687	18,870	13,249
Mojave Desert Air Basin	48,508	75,591	83,512
Proposed Project Percent of Kern County	0.05%	0.09%	0.02%
Proposed Project Percent of MDAB	0.02%	0.02%	0.003%
Kern County Percent of MDAB	28.21	24.96	15.86

Source: California Air Resources Board (www.arb.ca.gov/app/emsinv/emssumcat.php)
Notes: The emission estimates for Kern County and the MDAB are based on 2020 Projections. The proposed project emission estimates are for the proposed incremental emissions increase that is not already included in the Mojave Desert Air Basin Emissions Inventory. Project emissions are based on 2008 emissions estimates to present the most conservative comparison. The proposed project's emissions are expected to decline as cleaner, less polluting vehicles replace vehicles with higher emissions.

Cumulative Localized Air Quality Impacts

A review of the current Kern County Planning Department records indicates that, at the time this analysis was completed, there were twelve (12) tentatively planned construction projects within a six-mile radius of the proposed project that have been approved or have been submitted and deemed complete for processing by staff.

Table 4.3-9 provides a geographical reference to demonstrate the construction activity in the project area. The projects reported by Kern County did not include enough data in order to estimate emissions from the projects. However, this is of no particular consequence since the NO_X emissions during construction year 2015 for the Preferred Alternative (with mitigation) exceed EKAPCD significance thresholds, and is considered significant and unavoidable at the project level. Therefore, the implementation of the Preferred Alternative is also considered significant and unavoidable as to cumulative impacts.

Table 4.3-9
Project Area Cumulative Construction Projects[1]

Name	Project Location	Case Type	Description	Acreage
Nelms Surveying for Eugene & Linda Heins	NW of Evans Road and Adams Road	ZCC	ZC to E (1/2) RS MH	N/A
Price, Nicholas & Sandra by Delmarter & Deifel	E/S Caliente Bodfish S of Havilah	ZCC	ZC to A	43.40
Beatty, Rusty/Nelms Surveying	N/S Sirretta@ Scodie	CUP	RV Park & Campground on River	9.50
Crowder Ronald Gene Jr. by GPS Services	E/S Sierra Way @ Bowman Road	ZCC	ZC to A	N/A
Robinson, John	11006 Kernville Rd.	ZCC	ZC to C-2	0.00
Woo, Hi Joon/Dewalt Corp.	Lake Isabella Blvd.	CUP	RV Park	10.00
Crowder Ronald Gene Jr by GPS Services	E/S Sierra Way @ Bowman Road	ZZ	ZC to A	0.00
Chesney, Joe	NWC Kernville Rd. @ Buena Vista	ZCC	ZC to A	2.76
Chesney, Joe	NWC Kernville Rd. @ Buena Vista	CUP	Whitewater Raft Take Out	2.76
Wagner Daniel & Jennifer by GPS Services	E/S Sierra Way N of Kernville Rd	GPA	GPA to 5.5 & 5.5/2.4	5.87
Monds, Kenneth	#8 Park Way, Wofford Heights	ZCC	ZC to C-2	0.00
Jeffery Krausse	3615 Shure St.	PD	PD for a church in an existing building	0.00

Notes: Not enough information is known to calculate emissions.
[1]Data provided by the Kern County Planning and Community Development Department and is current as of 8/29/2012.

CHAPTER 5
SUMMARY OF FINDINGS AND MITIGATION

This chapter describes the impact findings based on the analysis relating to air quality for implementing the Preferred Alternative, and includes measures to mitigate potentially significant impacts occurring during construction.

5.1 CONSTRUCTION

During construction of the Preferred Alternative, the mitigated project emissions would exceed the significance threshold for NO_X established by the EKAPCD (see Table 4.3-1 for year 2015[7] above) and is unavoidable. This would be the case even with implementation of the recommended mitigation measures listed below. On this basis, construction of the Preferred Alternative would be considered to impede compliance with applicable air quality plans. The Corps would implement all feasible mitigation measures to reduce these impacts as much as practicable.

5.1.1 Construction Mitigation Measures

Implementation of the following mitigation measures are recommended to help to reduce air quality impacts during construction of the Preferred Alternative:

- Prepare a Dust Control Plan (DCP) compliant with EKAPCD Rule 402, approved by EKAPCD prior to construction activities being started. The DCP should take into account all sources of PM emissions including, but not limited to, potential lakebed wind erosion. The DCP should provide adequate controls to ensure that wind-blown PM is controlled to the extent reasonably possible. The DCP should also consider development of a traffic management plan to maintain traffic flow and minimize vehicle travel on unpaved roads. The DCP should also consider installation of real-time PM_{10} monitors, i.e. Beta Attenuation Monitor (BAM) or Tapered Element Oscillating Microbalance (TEOM) monitor to ensure that local communities are not adversely impacted by PM_{10} emissions.
- Sufficiently water all soil excavated or graded to prevent excessive dust. Watering should occur as needed with complete coverage of disturbed soil areas. Watering should take place a minimum of twice daily on unpaved/untreated roads and on disturbed soil areas with active operations. All clearing, grading, earth moving, and excavation activities shall cease during periods of winds greater than 20 miles per hour (averaged over one hour), if disturbed material is easily windblown, or when dust plumes of 20% or greater opacity impact public roads, occupied structures, or neighboring property.
- Sufficiently water or securely cover all fine material transported off site to prevent excessive dust.

[7] Year 2015 emissions are primarily from CalTrans Highway 155 and 178 realignment and bridge work. These emissions could be reduced further by agreement with CalTrans to utilize lower emitting equipment.

- Minimize areas disturbed by clearing, earth moving, or excavation activities.
- Stabilize by watering or other appropriate method stockpiles of soil or other fine loose material to prevent wind-blown fugitive dust.
- Control weeds, where acceptable to the fire department, by mowing instead of discing, thereby leaving the ground undisturbed and with a mulch covering.
- Treat all inactive soil areas within the construction site by: (1) seeding and watering until plant growth is evident; (2) treating with a dust palliative; and/or (3) watering twice daily until soil has sufficiently crusted to prevent fugitive dust emissions.
- Limit on-site vehicle speed to 15 miles per hour and speed limit.
- Post speed limits should throughout all construction areas with 15 miles per hour limit on all unpaved surfaces.
- Pave all areas with vehicle traffic, treat with dust palliatives, or water a minimum of twice daily.
- Keep streets adjacent to the project site clean, and remove project-related accumulated silt.
- Provide an apron into the project site at access points from adjoining surfaced roadways. The apron should be surfaced or treated with dust palliatives. If operating on soils that cling to the wheels of vehicles, a grizzly or other such device should be used on the road exiting the project site, immediately prior to the pavement, in order to remove most of the soil material from vehicle tires.
- Maintain all equipment as recommended by manufacture manuals.
- Shut down equipment when not in use for more than 5 minute periods of time.
- Use electric equipment whenever possible in lieu of diesel or gasoline-powered equipment.
- Equip all construction vehicles with proper emissions control equipment and keep in good and proper running order to substantially reduce NO_X emissions.
- Ensure that on-road and off-road equipment which is under the control of the Corps meets meet Tier 4 emissions standards.

Portable equipment such as generators, rock crushing and screening operations, concrete batch plants, etc. that are to be on-site for more than one year may be required to obtain a Permit to Operate from the EKAPCD. If such equipment is to be on-site less than one year and would not return the following year, it may be permitted under CARB's Portable Equipment Registration Program. The EKAPCD should be consulted to clarify if and when specific equipment is to be permitted.

5.2 OPERATIONS

Operation of the Isabella Lake Dam Facilities after the Preferred Alternative is completed would remain unaffected as a result of construction. Therefore, operational emissions would not exceed EKAPCD significance thresholds.

5.2.1 Operations Mitigation Measures

No mitigation measures would be required for operations.

5.3 HEALTH RISK

The maximum estimated chronic health index predicted by the HRA for the Preferred Alternative is considered 0.014, which is well below the EKAPCD significance standard of 0.2. Therefore, implementation of the Preferred Alternative is deemed to be less than significant for chronic health risk.

The maximum estimated cancer risk predicted by the HRA for the Preferred Alternative is considered 0.6 in one-million, which is below the EKAPCD significance standard of one in one-million. Therefore, implementation of the Preferred Alternative is deemed to be less than significant for cancer risk.

5.3.1 Health Risk Mitigation Measures

All mitigation measures listed under construction activities resulting in reduced diesel combustion exhaust emissions would mitigate diesel particulate matter emissions, which is the focus of the HRA (Corps 2012d).

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CHAPTER 6
REFERENCES

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ATTACHMENTS

Note: To obtain any of the Attachments listed below, please contact the Sacramento District Public Affairs Office, 1325 J Street, Sacramento, CA 95814; Phone (916) 557-5101; email: isabella@usace.army.mil.

ATTACHMENT A: Construction Emission Calculations - Fugitive Dust and Employee

ATTACHMENT B: Construction Equipment List and Hours of Use

ATTACHMENT C: CalEEMod Output Files

ATTACHMENT D: Sacramento Metropolitan Road Construction Emissions Model Output Files

ATTACHMENT E: Indirect GHG Emission Calculations

ATTACHMENT F: CalEEMod Inpust Files (CD/Electronic copies of all input files)

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