Office of
Energy
Projects

March 2008

FERC/FEIS—0216F

Final Environmental Impact Statement for Hydropower License

Upper American River Hydroelectric Project
FERC Project No. 2101-084, California
Chili Bar Hydroelectric Project
FERC Project No. 2155-024, California

Federal Energy
Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Forest Service
U.S. Department of
Agriculture
Eldorado National Forest
100 Forni Road
Placerville, CA 95667

FERC/FEIS—0216F Federal Energy Regulatory Commission
Forest Service, U.S. Department of Agriculture

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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

Upper American River Hydroelectric Project—FERC Project No. 2101-084—California
Chili Bar Hydroelectric Project—FERC Project No. 2155-024—California

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, N.E.
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FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Final Environmental Impact Statement

Attached is the final environmental impact statement (EIS) for the Upper American River Project (UARP or Project No. 2101-084) located in the California counties of El Dorado and Sacramento, within the Rubicon River, Silver Creek, and the South Fork of the American River (SFAR) drainages; and the Chili Bar Hydroelectric Project (Project No. 2155-024), located on the SFAR in El Dorado County, near the town of Placerville, California.

The final EIS documents the view of governmental agencies; non-governmental organizations; affected Indian tribes; the public; the license applicants; the U.S. Department of Agriculture, Forest Service (Forest Service); and the Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations of the applicants' proposals and the alternatives for relicensing the UARP and Chili Bar Project.

The Commission and the Forest Service have agreed to participate as cooperating agencies in the preparation of the EIS for the UARP and Chili Bar Project. The Commission will use the EIS to determine whether, and under what conditions, to issue new licenses for the Projects. The Forest Service will use the EIS to base its finding under section 4(e) of the Federal Power Act and to decide whether to issue any necessary special use authorizations.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The EIS will be part of the record from which the Commission will make its decision. The final EIS is being issued in March 2008.

Copies of the final EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, NE, Washington DC 20426. The final EIS also may be viewed on the Commission's web site at www.ferc.gov by using the "eLibrary" link. Please call (202) 502-8222 or TTY (202) 208-1659 for assistance.

Attachment: Final Environmental Impact Statement

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COVER SHEET

a. Title: Relicensing the Upper American River Project (UARP), Federal Energy Regulatory Commission (FERC or Commission) Project No. 2101 and the Chili Bar Project, FERC Project No. 2155.

b. Subject: Final environmental impact statement

c. Lead Agency: FERC with U.S. Department of Agriculture, Forest Service (Forest Service) as a cooperating agency.

d. Abstract: The UARP is on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California. The Project affects 6,375 acres of federal land administered by the Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Bureau of Land Management (BLM).

The Chili Bar Project is on the SFAR in El Dorado County, near Placerville, California. The Project affects 48 acres of federal land administered by the BLM.

e. Contact:

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f. Transmittal: This final environmental impact statement prepared by the Commission and Forest Service staffs on the hydroelectric license application filed by Sacramento Municipal Utility District and Pacific Gas and Electric Company for the existing UARP and Chili Bar Projects (FERC Project Nos. 2101 and 2155) is being made available to the public on or about March 14, 2008, as required by the National Environmental Policy Act of 1969[1]

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[1]National Environmental Policy Act of 1969, amended (Pub. L. 91-190. 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

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FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric development subject to its jurisdiction, on the necessary conditions:

> That the project…shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)…[4]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[5] Compliance with such conditions during the licensing period is required. The Commission's Rules of Practice and Procedure allow any person objecting to a licensee's compliance or noncompliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.[6]

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[2] 16 U.S.C. §791(a)-825r, as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-486 (1992).

[3] Public Law 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. §803(a).

[5] 16 U.S.C. §803(g).

[6] 18 C.F.R. §385.206 (1987).

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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
Agencies	CDFG, the Forest Service, FWS, and the Water Board
AN	above normal water year
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
BBS	breeding bird survey
applicants	Pacific Gas and Electric Company and or Sacramento Municipal Utility District
BLM	U.S. Department of Interior, Bureau of Land Management
BN	below normal water year
ºC	degrees Celsius
CAA	Clean Air Act
CARB	California Air Resources Board
CCC	criterion continuous concentrations
CD	critically dry water year
CDFG	California Department of Fish and Game
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMC	criterion maximum concentrations
Commission	Federal Energy Regulatory Commission
DO	dissolved oxygen
DWR	California Department of Water Resources
EID	El Dorado Irrigation District
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
g	gram
GDP-IDP	U.S. Gross Domestic Product—Implicit Price Deflator
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kg	kilogram
kV	kilovolt
L	liter
MCL	maximum contaminant level
mg	milligram

MIS	management indicator species
mL	milliliter
mm	millimeter
MPN	most probable number
MW	megawatt
MWh	megawatt-hours
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NGO	non-governmental organization
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
PA	programmatic agreement
PAOT	people-at-one-time
PDEA	preliminary draft environmental assessment
PG&E	Pacific Gas and Electric Company
Projects	UARP and Chili Bar Projects
SD	super dry water year
SHPO	State Historic Preservation Officer
SFAR	South Fork of the American River
SFRR	South Fork of the Rubicon River
SFSC	South Fork of Silver Creek
SIP	State Implementation Plan
SMUD	Sacramento Municipal Utility District
TCP	traditional cultural property
UARP	Upper American River Project
USGS	U.S. Geological Survey
μg/L	microgram per liter
VES	visual encounter survey
VQO	visual quality objective
Water Board	State Water Resources Control Board
YOY	young-of-the-year

EXECUTIVE SUMMARY

This final environmental impact statement (final EIS) evaluates the potential effects on the environment associated with the relicensing of the seven hydroelectric developments that make up the existing 688-megawatt (MW) Upper American River Project (UARP) (Project No. 2101); the proposed construction of an eighth, 400-MW development at Iowa Hill (Iowa Hill development) as part of the UARP; and the relicensing of the 7-MW Chili Bar Project (Project No. 2155). The UARP is located on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California. The Chili Bar Project is located on the SFAR in El Dorado County, near Placerville, California, immediately downstream of the UARP. The licenses for both Projects expired on July 31, 2007. On August 8, 2007, the Federal Energy Regulatory Commission (Commission) authorized continued operations of both Projects through July 31, 2008.

The Sacramento Municipal Utility District (SMUD) filed a license application with the Commission for the UARP on July 7, 2005. The Project occupies 6,375[7] acres of federal land administered by the U.S. Department of Agriculture, Forest Service (Forest Service), in Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Department of the Interior, Bureau of Land Management (BLM).

The Forest Service is reviewing an application for a special use permit for constructing SMUD's proposed Iowa Hill development on National Forest System lands. The Forest Service is also a cooperating agency in preparing this EIS for the UARP.

Pacific Gas and Electric Company (PG&E) filed a license application with the Commission for the Chili Bar Project on June 21, 2005. The Project, which consists of a single development, occupies 47.81 acres of federal land administered by the BLM.

The UARP and Chili Bar Project (Projects) have common stakeholders and issues, as well as operational and hydraulic interrelationships. PG&E and SMUD entered into two relicensing cooperation agreements that resolved many of the overlapping issues between the two Projects. These overlapping issues include coordinating operations and the flow releases into and out of Chili Bar reservoir. Operational coordination and flow-related resource measures are necessary because PG&E depends on the UARP and does not have control over the amount of water flowing into Chili Bar reservoir.

The key environmental issues tied to the existing operations of the UARP are providing suitable habitat in the downstream reaches to support native species and

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[7]This acreage includes 185 acres of Eldorado National Forest lands associated with the proposed Iowa Hill development.

coordinating operations between SMUD and PG&E. Changing existing operations to increase instream flow would increase the quantity and velocity of flows into the downstream reaches. Increased flows would lower water temperatures and reduce sedimentation in these reaches. Lowering water temperatures, increasing flow velocities, and reducing sedimentation should have a positive effect on the abundance of native fish and benthic macroinvertebrates and the ability of amphibians to breed in these reaches. Increased coordination between SMUD and PG&E would reduce the number of unanticipated spills at the Chili Bar Project.

SMUD's and PG&E's license applications outlined their proposals to continue operating the Projects in accordance with certain existing and proposed operational and environmental measures. SMUD and PG&E filed a comprehensive Offer of Settlement (Settlement Agreement) with the Commission on February 1, 2007, that replaces the Proposed Actions. The terms of the Settlement Agreement[8] include a wide range of measures described in Proposed Articles 1-1 through 1-37 for the UARP without the Iowa Hill development, Proposed Articles 1-38 through 1-50 for the UARP with the Iowa Hill development, and Proposed Articles 2-1 through 2-21 for the Chili Bar Project.

In written and oral comments on the draft EIS, local residents expressed concern about the proposed construction and operation of the Iowa Hill development and agencies that were signatories to the Settlement Agreement expressed concern about our suggested modifications to certain proposed measures. Local residents commented on traffic congestion and potential heavy equipment damage to county roads, the potential threat and damage from fire, loss of habitat, the visual effects of project facilities on nearby residences, and the effects of construction and construction traffic on tourism during apple picking season. They also commented that many attended meetings of the Iowa Hill Joint Advisory Committee (Advisory Committee) and questioned why some of the mitigation measures that SMUD is considering were not included in the draft EIS. In response to comments about the Iowa Hill development and to Commission staff requests, SMUD filed additional technical reports about traffic and aesthetics on January 31, 2008. We discuss the findings of those reports in this final EIS.

Agency representatives and stakeholders who signed the Settlement Agreement expressed concern about the recommended staff modifications to several of the proposed measures in the Settlement Agreement. Notably, they state that staff misunderstands the connection between the construction of the Iowa Hill development and the whitewater boating flows and request that the staff adopt the language of the Settlement Agreement in the final EIS. Although we no longer recommend that SMUD

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[8]The Settlement Agreement is available on the Commission's web site from the eLibrary feature at http://www.ferc.gov/docs-filing/elibrary.asp. Accession number 20070208-4003.

file a new whitewater release schedule after 10 years of monitoring, with or without the construction of the Iowa Hill development, we continue to recommend that whitewater releases be made only if the recreational use and environmental triggers are met after 15 years following the issuance of any license.

Under the Proposed Action, SMUD would implement the following measures at the UARP: (1) a set of measures focused on the ecological health and suitability of reaches downstream of the Project dams to support native fish, amphibian, and reptile populations implemented in coordination with PG&E's Chili Bar Project; (2) a set of measures to provide for specific water level elevations for the protection of fish populations, assuring the availability of boat launch facilities, or to enhance the visual experience at the Project reservoirs; (3) a plan to monitor streamflows and reservoir elevations; (4) a set of measures that provide for the protection of wildlife and plants, including the implementation of wildlife safety measures at Project facilities; (5) a comprehensive program of monitoring to determine the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoirs and stream reaches; (6) vegetation and invasive weed management plans, which would provide for the protection of sensitive species habitat and the control of noxious weeds; (7) a suite of measures that focus on upgrading, expanding, operating, and maintaining recreational facilities and services in response to user demands, monitoring future use, providing additional whitewater boating opportunities, providing public information, and fish stocking within the framework of a recreation implementation plan; (8) a plan for extending and formalizing trails that are needed for Project operations that are located on or affect National Forest System lands; (9) a plan to establish SMUD's level of responsibility for improving and maintaining Project access roads and to perform several specific improvements, including reconstructing and surfacing several Forest Service roads that provide access to the Project's recreational facilities; (10) a visual management plan; and (11) a Historic Properties Management Plan (HPMP) to protect cultural resources. These environmental measures are described in detail in this final EIS in section 2.4.3, *SMUD's Proposal.*

SMUD's Proposal includes construction and operation of the Iowa Hill development, a pumped-storage facility partially located on National Forest System lands. Under the Proposed Action, SMUD would implement a series of measures for resource protection during construction and operation of the proposed Iowa Hill development. These measures would address potential effects of the proposed development on water quality; groundwater; native fish and amphibians in Slab Creek reservoir; replacement of permanently disturbed wildlife habitat; control of traffic, air pollution, and noise during construction; recreational access to Slab Creek reservoir;

protection of cultural resources; and modification of facility designs so that they are compatible with the Eldorado National Forest visual quality objectives. These environmental measures also are described in detail in this final EIS in section 2.4.3, *SMUD's Proposal.*

Staff modified some of SMUD's proposed environmental measures to include the following measures:(1) file a report with the Commission by July 31 of each year about the provision of pulse flows; (2) prepare a Gerle Creek fish passage plan for brown trout; (3) expand the geographic scope of the invasive weed and vegetation management plans to include all land within the Project boundary affected by Project activities; (4) provide for an annual employee environmental awareness program in the vegetation management plan to educate employees and key personnel about the known locations of special status species and habitats; (5) prepare a transportation system management plan for roads on or affecting National Forest System lands and non-National Forest System roads that are primarily used for Project purposes and within the Project boundary; (6) prepare a plan for extending and formalizing trails primarily used for Project operations that are located on or affect National Forest System lands and are located or would be located within the Project boundary; (7) prepare a wildlife lands mitigation plan for the Iowa Hill development; and (8) provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 of any new license if environmental and use triggers are met. None of these measures conflict with measures included in the Settlement Agreement. Staff's modified and additional recommended measures are described in this final EIS in section 2.7.5, *Staff Modification of SMUD's Proposal.*

Under the Proposed Action, PG&E would implement the following measures at the Chili Bar Project: (1) a set of measures focused on the ecological health and suitability of the reaches downstream of the Project dam to support native fish, amphibian, and reptile populations implemented in coordination with SMUD's UARP; (2) a plan to monitor streamflows and reservoir elevations; (3) a set of measures that provide for the protection of wildlife and plants; (4) a comprehensive program of monitoring to determine the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoir and downstream reach; (5) vegetation and invasive weed management plans that provide for the protection of sensitive species habitat and the control of noxious weeds; (6) a suite of measures that focus on providing formal access to recreational boating, providing additional recreational boating flows, and providing public information services; (7) a visual management plan; and (8) an HPMP to protect cultural resources. These environmental measures are described in detail in final EIS section 2.5.3, *PG&E's Proposal.*

Staff modified PG&E's proposed vegetation and invasive weed management plans to: (1) expand the geographic scope of the invasive weed and vegetation management plans to include all land within the Project boundary affected by Project activities, and (2) include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats. Staff also recommends the development of a recreation plan for the Chili Bar Project. None of these modifications or the additional staff measures conflict with the measures included in the Settlement Agreement. Staff's modified and additional recommended measures are described in final EIS section 2.7.5, *Staff Modification of PG&E's Proposal.*

In this final EIS, we analyze and evaluate the environmental effects associated with issuance of new licenses for the existing hydropower projects and the proposed Iowa Hill development, and recommend conditions for inclusion in any licenses issued. For any licenses issued, the Commission must determine that the projects will be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to energy conservation and the protection and enhancement of fish and wildlife, aesthetics, cultural resources, and recreational opportunities. This final EIS for the UARP and Chili Bar Project reflects the Commission staff's consideration of these factors.

Overall, the measures proposed by SMUD and PG&E under the terms of the Settlement Agreement, along with additional staff-recommended and modified measures, would protect and enhance existing water use, water quality, fish and wildlife, land use, aesthetics, recreational resources, and cultural resources. In addition, the Projects would continue to provide a reliable source of renewable energy for SMUD's and PG&E's customers. The Proposed Action with Staff Modifications (Staff Alternative) for both Projects includes all of the mandatory conditions filed by the Forest Service and BLM that are enforceable by the Commission. For the two conditions that would require payments to the Forest Service and BLM, we recommend alternative measures that would achieve the same objectives.

The Proposed Action includes construction and operation of the Iowa Hill development. Building Iowa Hill would disturb the majority of 283 acres of land within the proposed Project boundary for the Iowa Hill development and introduce new visual elements to the landscape. SMUD proposes in-kind replacement of habitat and construction of an underground powerhouse to minimize the effects on wildlife and neighboring land owners. Although constructing and operating the proposed development would have environmental effects, the pumped-storage operations would provide SMUD flexibility to help meet peak power needs.

Under the Staff Alternative, the UARP (which includes the Iowa Hill development) would generate 2,673,000 MWh and have a net annual benefit of $110,791,000 ($41.45/MWh). For Chili Bar, the Staff Alternative would generate 31,291 MWh and have a net annual benefit of $481,200 ($15.38/MWh).

Based on our independent analysis of the UARP, including our consideration of all relevant economic and environmental concerns, we conclude that issuing a new license for the Project as proposed by SMUD with the Iowa Hill development, along with staff's modifications and additions to those proposals, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the UARP and the Upper American River.

Based on our independent analysis of the Chili Bar Project, including our consideration of all relevant economic and environmental concerns, we conclude that issuing a new license for the Project as proposed by PG&E, along with staff's modifications and additions to those proposals, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Chili Bar Project and the Upper American River.

1.0 PURPOSE AND NEED FOR ACTION

On July 7, 2005, the Sacramento Municipal Utility District (SMUD) filed an application for new license for the Upper American River Project (UARP) with the Federal Energy Regulatory Commission (FERC or Commission). This application was prepared under the Alternative Licensing Process approved by the Commission on August 29, 2001, and included a preliminary draft environmental assessment (PDEA). The Project is on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California (figure 1-1). The UARP's 11 reservoirs are capable of impounding more than 425,000 acre-feet of water. The eight powerhouses can generate up to 688 megawatts (MW) of power. The Project occupies 6,375[9] acres of federal land administered by the U.S. Department of Agriculture, Forest Service (Forest Service) Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Bureau of Land Management (BLM).

On June 21, 2005, Pacific Gas and Electric Company (PG&E) filed an application for a new license for the Chili Bar Project using a Traditional Licensing Process. The Chili Bar Project is on the SFAR in El Dorado County, near Placerville, California, and it is a 7-MW hydroelectric project that encompasses about 3 river miles. The Chili Bar Project occupies 47.81 acres of federal land administered by the BLM, and its facilities are located downstream of SMUD's UARP (figure 1-1).

The Forest Service will be reviewing a special use permit application for construction of the Iowa Hill development on National Forest System lands. The Commission and the Forest Service have agreed to participate as cooperating agencies in the preparation of this final environmental impact statement (EIS) for the UARP.

The existing licenses for both the UARP and the Chili Bar Project (Projects) expired on July 31, 2007. The Commission issued annual licenses for the Projects on August 8, 2007.

1.1 PURPOSE OF ACTION

The Commission must decide whether to relicense the Projects and what conditions should be placed on any licenses issued. In deciding whether to authorize the continued operation of hydroelectric projects and related facilities in compliance with the Federal Power Act (FPA)[10] and other applicable laws, the Commission must

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[9]This acreage includes 185 acres of El Dorado National Forest lands associated with the proposed Iowa Hill development.

[10]16 U.S.C. §§791(a)-825(r), as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-486.

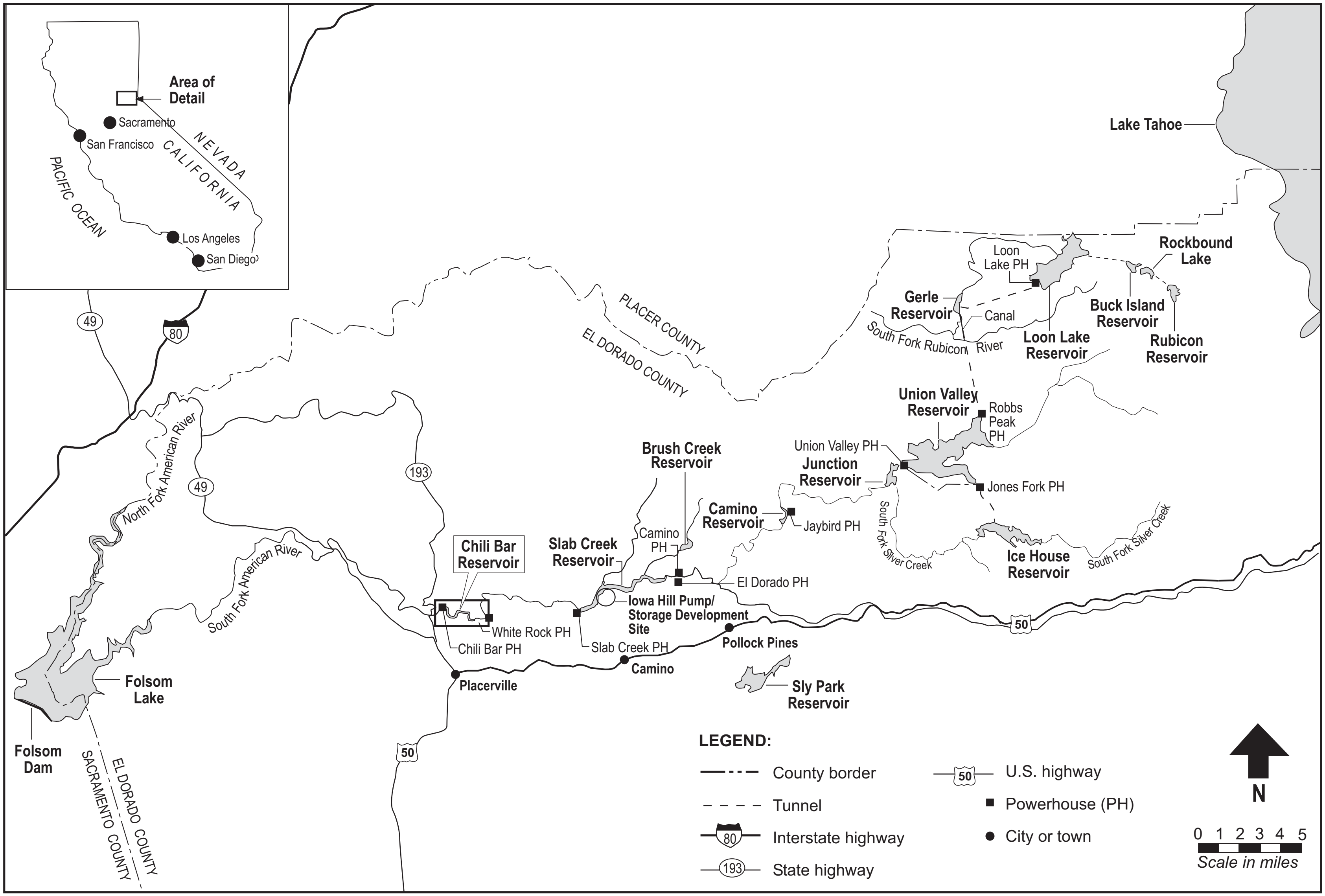

Figure 1-1. General vicinity of the UARP and Chili Bar Project. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

determine that the Projects will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality. The Forest Service must decide whether to issue a special use permit for construction of the Iowa Hill development.

The Forest Service, under the Federal Land Policy and Management Act, must decide whether to grant a special use permit and/or easement for construction and operation of the proposed Iowa Hill development, including access and associated facilities. In this final EIS, we assess the environmental and economic effects of (1) continuing to operate the UARP and Chili Bar Project as they are currently operated (No-action Alternative); (2) operating the UARP with the Iowa Hill development as proposed by SMUD and the Chili Bar Project as proposed by PG&E (SMUD's Proposal and PG&E's Proposal as described in the Settlement Agreement, or the Proposed Action); (3) operating the UARP without the Iowa Hill development (UARP-only Alternative) and the Chili Bar Project as proposed by PG&E; and (4) operating the UARP with the Iowa Hill development as proposed by SMUD and the Chili Bar Project as proposed by PG&E with additional or modified environmental measures (Staff Alternative).

Important issues that are addressed in this final EIS include the potential effects of the Proposed Actions and alternatives on streamflows and water quality in the 12 river reaches (11 reaches of the UARP and one reach of the Chili Bar Project); the existing fish and amphibian resources in the river reaches, terrestrial resources, and plans to manage and enhance these resources; federally listed threatened or endangered plant and wildlife species; existing recreational uses and facilities and plans to improve and expand these facilities; cultural resources; and measures to protect these resources.

1.2 NEED FOR POWER

1.2.1 Regional Power Considerations

The UARP, with an installed capacity of 688 MW and an average annual generation of 1,835,000 megawatt-hours (MWh)[11] per year of energy, plays an important part in meeting the capacity requirements of SMUD. It is a significant power resource to the state of California and within the Western Electricity Coordinating

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[11]This value is the average generation for SMUD’s No-action Alternative as provided in SMUD’s April 11, 2007, Settlement Cost Analysis filed by Van Ness Feldman.

Council, which includes the states west of the Rockies; portions of Texas, Nebraska, and Kansas; Alberta and British Columbia, Canada; and a portion of North Baja California. Similarly, PG&E's Chili Bar Project, with an installed capacity of 7 MW and an average annual generation of 32,291 MWh[12] per year of energy, is another power resource available to the region.

Because the Projects are located in the California-Mexico Power area of the Western Electricity Coordinating Council region, we looked at the regional need for power as reported by the Western Electricity Coordinating Council[13] (WECC, 2005) to anticipate how the demand for electricity is expected to change in the region.

The California-Mexico Power area, which encompasses most of California and a part of Baja California in Mexico, has a significant summer peak demand. For the period from 2005 through 2014, the Western Electricity Coordinating Council forecasts peak demand and annual energy requirements in the area to grow at annual compound rates of 2.4 and 2.6 percent, respectively. The Western Electricity Coordinating Council anticipates that 6,783 MW of new capacity would come on line within the next 10 years in the California-Mexico Power area. The Projects could continue to meet part of the existing load requirements within a system in need of generating resources.

1.2.2 Iowa Hill Implications

SMUD's proposed Iowa Hill development would add an additional 400 MW of capacity during peak demand periods. The development would provide 931,000 MWh of super on-peak energy and 43,000 MWh of off-peak energy; however, 1,230,000 MWh of off-peak energy would be required to pump the water from Slab Creek reservoir to Iowa Hill reservoir during off-peak hours. This would result in net energy of –256,000 MWh.

SMUD and possibly other utilities in California would likely use the electricity from the Project to displace the use of gas-fired energy during on-peak hours. If the Project is not licensed, utilities would still need to provide a comparable amount of capacity and energy from other resources, most likely through the operation of gas-fired generation facilities.

The California Energy Commission was created in 1974 and is responsible for forecasting future energy needs and keeping historical energy data, among other duties. The California Energy Commission noted in its 2004 Integrated Energy Policy Report Update that "while supplies are tight during peak periods, the state has more than adequate amounts of power in the low load periods, especially at night" (CEC, 2004).

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[12]This value is the average generation for PG&E's No-action Alternative as provided in its May 18, 2006, Additional Information Response.

[13]WECC has yet to issue its 2006 forecast.

California utilities and generators have some options for shifting power supplies from off-peak to on-peak periods through the use of pumped-storage facilities.

If the UARP's license is issued to include the Iowa Hill development, the pumped-storage facility would contribute to a diversified generation mix and help meet power needs within and beyond the region. Regional power benefits from the new development would include those often referred to as ancillary system benefits, including spinning reserves, non-spinning reserves, peaking capacity, and grid stability. Pumped storage generates and stores power during off-peak periods that can be provided rapidly during on-peak periods. Additionally, it could allow SMUD to meet 6 to 7 years of anticipated peak demand growth. It could produce significant local generation to alleviate anticipated voltage and transmission constraints during peak-demand periods in the region and aid management of greatly increased minute-by-minute load balancing and control area[14] challenges presented by wind and other intermittent generation technologies required by renewable portfolio standards. Licensing the Iowa Hill development would allow SMUD to compete in the power market for sale of the Project's power and ancillary benefits.

1.3 SCOPING PROCESS

1.3.1 Upper American River Project

SMUD and PG&E conducted the National Environmental Policy Act (NEPA) scoping process for the overlapping issues for the UARP as part of SMUD's Alternative Licensing Process.[15] SMUD issued Scoping Document 1 on August 14, 2003. Three public scoping meetings were held in Sacramento and Placerville, California, on September 9–11, 2003, and a site tour was conducted on September 12, 2003. The scoping meetings allowed individuals an opportunity to submit oral or written comments to the relicensing record.

1.3.2 Chili Bar Project

The Commission issued Scoping Document 1 for the Chili Bar Project on December 20, 2005, to address non-overlapping issues exclusive to that Project.[16] After reviewing the two written comments filed during the scoping comment period, we

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[14]SMUD is one of four entities that currently operate control areas entirely within the state of California. As its own control area, SMUD is responsible for balancing the demand of its customers with power supplies.

[15]Under the Alternative Licensing Process, the applicant conducts scoping prior to filing the draft and final license application.

[16]Under the Traditional Licensing Process, the Commission issues a scoping document after a final license application is filed.

prepared Scoping Document 2 that addressed the comments from the State Water Resources Control Board (Water Board) and PG&E and presented the issues and alternatives for the Chili Bar Project in this final EIS.

1.4 AGENCY CONSULTATIONS

1.4.1 Alternative Licensing Process for UARP

After consulting with agencies, non-governmental organizations (NGOs), and members of the public, SMUD filed a formal request with the Commission to follow the Alternative Licensing Process. The Commission approved the request on August 29, 2001. From fall 2001 until 2005, the resource agencies and several NGOs participated in SMUD's Alternative Licensing Process with the intent (1) to produce a comprehensive set of protection, mitigation, and enhancement measures, acceptable to the settlement negotiations group, for submittal in the July 2005 final license applications for the UARP and Chili Bar Project; (2) to produce a quality settlement agreement to be submitted to the Commission for consideration in its environmental analysis; and (3) to preserve coordination between the UARP and Chili Bar Project on overlapping issues.

In April 2004, with the timeline for development of proposed measures and a settlement agreement behind schedule, the resource agencies proposed that SMUD be excused from completing a draft license application and instead have adequate time to complete studies, review study reports, develop and agree upon recommended measures, and write a comprehensive settlement agreement that would be acceptable to the settlement parties. The Commission excused SMUD from filing a draft license application. These goals were not achieved, however, and SMUD's final license application, including its PDEA, was filed without agreement on proposed measures among the parties in the Alternative License Process and without the parties knowing which environmental measures were proposed in the final license application.

PG&E filed a final license application for the Chili Bar Project in June 2005 under the Traditional Licensing Process.

1.4.2 Interventions and Comments

On July 28, 2006, the Commission issued a notice for the UARP soliciting interventions and requesting final terms, conditions, prescriptions, and recommendations and setting a comment deadline of 90 days from the date of the notice. On August 22, 2006, the Commission issued a notice for the Chili Bar Project that the Project was ready for environmental review and preliminary terms, conditions, and recommendations could be filed for the Chili Bar Project within 60 days of the date of the notice.

The following entities filed motions to intervene:

Intervenors in the UARP	**Date of Filing**
Eldorado Hills Community Service District	November 4, 2005
California Water Resources Control Board	September 6, 2006
Eldorado Parties[17]	September 13, 2006
U.S. Department of the Interior	September 22, 2006
Pacific Gas &Electric Company	September 25, 2006
Placer County Water Agency	October 4, 2006, and January 23, 2007
California Department of Fish and Game	October 17, 2006
Friends of the River	October 17, 2006
National Marine Fisheries Service	October 18, 2006

The following entities filed motions to intervene in the Chili Bar Project:

Intervenors in the Chili Bar Project	**Date of Filing**
U.S. Department of the Interior	September 22, 2006
California Water Resources Control Board	October 13, 2006
California Department of Fish and Game	October 17, 2006
National Marine Fisheries Service	October 18, 2006
Friends of the River	October 23, 2006
Sacramento Municipal Utility District	October 23, 2006

[17] Joint motion to intervene of the County of El Dorado, El Dorado County Water Agency, El Dorado Irrigation District, Georgetown Divide Public Utility District, and the El Dorado Water & Power Authority.

On November 16, 2006, the Commission extended the filing deadline for the final terms and conditions for the UARP and the preliminary terms, conditions, prescriptions, and recommendations for the Chili Bar Project to February 1, 2007, to give parties to the Settlement Agreement time to revise and file their terms, conditions, prescriptions, and recommendations.

The following entities filed comments, terms, conditions, prescriptions, or recommendations in response to the Commission's notice for the UARP and Chili Bar Project that are consistent with the Settlement Agreement:

Commenting Entities—UARP Project No. 2101	**Date of Filing**
California Water Resources Control Board	October 17, 2006
California Department of Fish and Game	October 18 2006 and January 31, 2007
U.S. Department of the Interior	October 17, 2006 and January 31, 2007
California Sportsfishing Alliance	October 18, 2006
National Marine Fisheries Service	October 18, 2006
U.S. Department of Agriculture, Forest Service	October 18, 2006 and January 30, 2007
California Department of Parks and Recreation	October 19, 2006
Environmental Council of Sacramento	October 19, 2006
Sacramento County Farm Bureau	October 23, 2006
Commenting Entities—Chili Bar Project No. 2155	**Date of Filing**
California Water Resources Control Board	October 16, 2006
California Department of Fish and Game	October 17 2006 and January 31, 2007
U.S. Department of the Interior	October 18, 2006 and January 31, 2007
California Department of Parks and Recreation	October 18, 2006

1.4.3 Settlement Agreement

After the final license applications were filed, seven resource agencies and several NGOs continued to work and developed a comprehensive alternative that addressed the interests of these parties and the interests of the licensees, as they were understood by these participants, as well as a rationale report that explained the rationale for the comprehensive alternative. On November 1, 2005, the seven agencies, two NGOs, and several individuals filed a Comprehensive Resource Agency/NGO Alternative and requested that the alternative be fully analyzed in the EIS. On August 18, 2006, SMUD filed a supplemental preliminary environmental assessment in response to the agency alternative.

From November 2005 until May 2006, the agencies and NGOs continued to negotiate with SMUD in an attempt to reach a comprehensive settlement agreement. That goal was not achieved, and in October 2006, the resource agencies filed preliminary terms, conditions, and recommendations in response to the Commission's July 28, 2006, notice. In November 2006, the agencies, NGOs, SMUD, and PG&E participated in negotiations that led to an Agreement in Principle, which was filed with the Commission on November 16, 2006. Because of the substantial progress that had been demonstrated in the Agreement in Principle, the Commission extended the deadline for filing preliminary terms, conditions, and recommendations to February 1, 2007.

SMUD and PG&E filed the Settlement Agreement on February 1, 2007. The Settlement Agreement was signed by representatives of federal and state agencies, NGOs, and individuals listed below. We consider the Settlement Agreement to represent the Proposed Actions for these Projects.

Signatories to the Settlement Agreement
U.S. Department of Agriculture, Forest Service
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, Bureau of Land Management
U.S. Department of the Interior, National Park Service
California Department of Fish and Game
California Department of Parks and Recreation
American Whitewater
Friends of the River
California Sportsfishing Protection Alliance
American River Recreation Association and Camp Lotus
Foothill Conservancy

Signatories to the Settlement Agreement
California Outdoors
Hilde Schweitzer
Rich Platt
Theresa Simsiman

The Commission issued a notice of the Settlement Agreement and set a comment deadline of March 10, 2007, and a reply comment deadline of March 25, 2007. The following entities filed comments on the Settlement Agreement.

Commenting Entities on Settlement Agreement	Date of Filing
Placer County Water Agency	March 9, 2007
California Sportfishing Protection Alliance	March 9, 2007

SMUD filed reply comments on March 16, 2007.

During the relicensing proceeding, SMUD and El Dorado County entered into the El Dorado-SMUD Cooperative Agreement on November 22, 2005. This agreement resolved all relicensing issues among SMUD, El Dorado County Water Agency, El Dorado Irrigation District (EID), Georgetown Divide Public Utility District, and the El Dorado Water & Power Authority. SMUD filed this agreement with the Commission on December 2, 2005, for information purposes only. Section 3.4.2 of the El Dorado-SMUD Cooperative Agreement requires SMUD and El Dorado County to create an Advisory Committee to the SMUD Board. The role of the Advisory Committee would be to receive public input and to develop reasonable and feasible measures to substantially mitigate the effects of activities related to construction of the Iowa Hill development on the surrounding communities and existing infrastructure. The agreement calls for the Advisory Committee to be convened no later than 30 days after SMUD issues its Notice of Intention to Proceed with construction of the Iowa Hill development following issuance of a license. However, SMUD and El Dorado County agreed that it would be beneficial to initiate the Advisory Committee early in order to engage the local community and address concerns.

The seven-member Advisory Committee, created in the spring of 2006, met 13 times between June 2006 and August 2007 and focused on five major areas of concern: visual, noise, transportation, fire protection, and socioeconomics. The results of the Advisory Committee’s efforts were summarized in a series of matrices that are available on the SMUD relicensing web site. These matrices call for SMUD to adopt numerous measures beyond those included in the license application and with greater specificity than the Proposed Articles included in the Settlement Agreement. SMUD indicates in its filing dated December 7, 2007, that it is conducting preliminary analyses of these mitigation measures but has not adopted any of the recommendations contained in the Advisory Committee's matrices. SMUD also indicates that it will address the mitigation measures proposed by the Advisory Committee in a supplemental document to be prepared under the California Environmental Quality Act. Commission staff requested that SMUD file any new or revised studies performed as a result of the recommendations of the Advisory Committee.

On January 31, 2008, SMUD filed a Technical Report of the Iowa Hill Pumped-Storage Development Turbidity Analysis (Stillwater, 2008), a Visual Resources Technical Report, Addendum No. 1 (CH2M HILL, 2008a), and a Transportation Route Technical Report (CH2M HILL, 2000b). We reviewed these technical reports and discuss the findings in this final EIS.

1.4.4 Comments on the Draft Environmental Impact Statement

The Commission issued its draft EIS for relicensing the UARP and the Chili Bar Project on September 21, 2007. The Commission also held a public meeting on November 5, 2007, in Placerville, California, to receive public comment on the draft EIS. In appendix A, we summarize the written and oral comments received, provide responses to those comments; and indicate, where appropriate, how we have modified the text of the final EIS.

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2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the No-action Alternative, the UARP and Chili Bar Project would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.2 UPPER AMERICAN RIVER PROJECT

The UARP was constructed from 1959 to 1985 and placed in service between 1961 and 1985. SMUD owns and operates the Project, consisting of 7 developments located in the California counties of El Dorado and Sacramento, within the Rubicon River, Silver Creek, and the SFAR drainages. The Project's 11 reservoirs are capable of impounding more than 425,000 acre-feet of water. The eight powerhouses can generate up to 688 MW of power. The Project also includes 11 transmission lines that have a combined length of about 180 miles, about 28 miles of power tunnels/penstocks, one canal that is 1.9 miles long, and about 700 developed public-use campsites.

2.2.1 Existing Facilities

The UARP includes seven developments and the components necessary to use the available water resources for hydroelectric generation: Loon Lake, Robbs Peak, Jones Fork, Union Valley, Jaybird, Camino, and Slab Creek/White Rock. Reservoir and powerhouse characteristics are shown in tables 2-1 and 2-2 (presented at the end of this subsection).

Loon Lake

The Loon Lake development is the most upstream project facility and consists of: (1) Rubicon dam—a concrete gravity diversion dam, 36 feet high and 644 feet long, with an auxiliary dam that is 29 feet high and 553 feet long, which together impound the Rubicon reservoir; (2) Rubicon-Rockbound tunnel—a horseshoe tunnel that is 13 feet in diameter and 0.2 mile long that diverts water from the Rubicon reservoir to the Buck Island reservoir via Rockland Lake (a non-project facility) on Highland Creek; (3) Buck Island dam—a concrete gravity diversion dam that is 23 feet high and 293 feet long and a concrete auxiliary dam that is 15 feet high and 244 feet long located on the Little Rubicon River that impounds the Buck Island reservoir; (4) Buck Island-Loon Lake tunnel—an unlined modified horseshoe tunnel that is 1.6 miles long and 13 feet in diameter that diverts water from Buck Island reservoir to Loon Lake reservoir; (5) Loon Lake dam—a rockfill dam that is 108 feet high and 0.4 mile long with a 250-foot-long side channel spillway on the right bank, a rockfill auxiliary dam that is 95 feet high and 910 feet long, and an earth dike that together form Loon Lake reservoir; (6) Loon Lake powerhouse penstock that includes a concrete-lined horseshoe tunnel that is 0.3 mile long and 14 feet in diameter, a concrete lined vertical shaft that is 10 feet in diameter, and a steel lined tunnel that is 8.5 feet in diameter and extends from Loon Lake reservoir to Loon Lake powerhouse; (7) Loon Lake powerhouse—an underground powerhouse located more than 1,100 feet below the surface of Loon Lake reservoir; (8) Loon Lake powerhouse tailrace tunnel—a unlined horseshoe tunnel that is 18 feet in diameter and extends 3.8 miles from the Loon Lake powerhouse to the Gerle Creek reservoir; and (9) transmission lines—two 69 kilovolt (kV) overhead transmission lines, the Loon Lake-Robbs Peak transmission line extending 7.9 miles to the Robbs Peak and the Loon Lake-Union Valley transmission line extending 12.4 miles to the Union Valley switchyard. Rubicon dam is located inside a designated wilderness area (Desolation Wilderness), within the boundary of the Eldorado National Forest. All other facilities in this development are located outside the wilderness boundary but within the Eldorado National Forest.

Robbs Peak

The Robbs Peak development consists of: (1) Gerle Creek dam—a concrete gravity overflow structure that is 58 feet high and 444 feet long on Gerle Creek, upstream of its confluence with the South Fork of the Rubicon River (SFRR); and that has two low level outlet gates, incorporating the intake of Gerle Creek canal in its left abutment, creating Gerle Creek reservoir; (2) Gerle Creek canal—an above-ground canal, partially lined with gunite, that is 22 feet wide and 19 feet deep, extending 1.9 miles from Gerle Creek reservoir to Robbs Peak reservoir; (3) Robbs Peak dam—a concrete gravity overflow structure that is 44 feet high and 320 feet long, with 12 steel bulkhead gates, all 6.2 feet high, on the spillway crest, located on the SFRR upstream of its confluence with Gerle Creek, that forms Robbs Peak reservoir; (4) Robbs Peak tunnel—an unlined horseshoe that is 3.2 miles long and 13 feet in diameter and a diversion tunnel that is 10 feet in diameter from Robbs Peak reservoir to Robbs Peak penstock; (5) Robbs Peak penstock—a steel penstock that is from 9.75 to 8.5 feet in diameter extending 0.4 mile from Robbs Peak tunnel to Robbs Peak powerhouse; (6) Robbs Peak powerhouse—located on the northeast shore of Union Valley reservoir; and (7) Robbs Peak-Union Valley transmission line—an overhead 69-kV line that extends 6.8 miles to connect the Robbs Peak switchyard to the Union Valley switchyard. This development is located on both private and public land within the boundary of the Eldorado National Forest.

Jones Fork

The Jones Fork development consists of: (1) Ice House dam—a rockfill dam located on the South Fork of Silver Creek (SFSC) that is 150 feet high and 0.3 mile long incorporating a concrete ogee spillway with radial gates, and two auxiliary earthfill dikes impounding the Ice House reservoir; (2) Jones Fork tunnel—a horseshoe concrete and steel-lined tunnel that is 8 feet in diameter and extends 0.3 mile from Ice House reservoir to the Jones Fork penstock; (3) Jones Fork penstock—a steel and concrete penstock that is 6 feet in diameter and extends 1.6 miles from Jones Fork tunnel to the Jones Fork powerhouse; (4) Jones Fork powerhouse on the southeast shore of Union Valley reservoir; and (5) Jones Fork-Union Valley transmission line—a 69-kV overhead transmission line that extends 4.0 miles from the Jones Fork switchyard to the Union Valley switchyard. The Jones Fork powerhouse is located on public land within the boundary of the Eldorado National Forest. The Jones Fork tunnel and the Jones Fork penstock are on both private and public land within the Eldorado National Forest.

Union Valley

The Union Valley development consists of: (1) Union Valley dam—an earthfill dam located on Silver Creek that is 453 high and 0.3 mile long, incorporating a concrete ogee spillway with radial gates, creating Union Valley reservoir; (2) Union Valley tunnel—a concrete-lined tunnel that is 11 feet in diameter with a steel penstock approximately 10 feet in diameter in part of the tunnel and extending 268 feet to connect the Union Valley reservoir with Union Valley powerhouse; (3) Union Valley penstock—a steel penstock that is 10 feet in diameter and extends 0.3 mile to convey water from the outlet of the Union Valley tunnel to the Union Valley powerhouse; (4) Union Valley powerhouse, located at the base of Union Valley dam; and (5) transmission lines—two 230-kV overhead transmission lines, one extending 11.8 miles to the Camino switchyard via the Union Valley-Camino transmission line and the other extending 5.9 miles to the Jaybird switchyard via the Union Valley-Jaybird transmission line. This development is located on both public and private land within the boundary of the Eldorado National Forest.

Jaybird

The Jaybird development consists of: (1) Junction dam—a double curvature, concrete overflow arch dam located on Silver Creek that is 525 feet long and 168 feet high, creating Junction reservoir; (2) Jaybird tunnel—a modified horseshoe tunnel that is 11 to 14 feet in diameter and extends 4.4 miles connecting Junction reservoir and the Jaybird penstock; (3) Jaybird penstock—a steel penstock 6 to 10 feet in diameter that is 0.5 mile long with a surge tank, connecting Jaybird tunnel and Jaybird powerhouse; (4) Jaybird powerhouse; and (5) Jaybird-White Rock transmission line—a 230-kV overhead transmission line that extends 15.9 miles to connect the Jaybird and White Rock switchyards. This development is located on both private and public land within the boundary of the Eldorado National Forest.

Camino

The Camino development consists of: (1) Camino dam—a concrete double curvature arch dam on Silver Creek that is 133 feet high and 470 feet long that has three integral bulkhead gates, creating the Camino reservoir; (2) Camino tunnel—a power tunnel with a diameter ranging from 13 feet to 14 feet, including a surge tank, that extends 5 miles to connect the Camino reservoir with the Camino penstock; (3) Brush

Creek dam—a double curvature arch dam located on Brush Creek that is 213 feet high and 780 feet long, creating Brush Creek reservoir; (4) Brush Creek tunnel—a modified horseshoe tunnel, about 14 feet in diameter extending 0.8 mile from Brush Creek reservoir to the lower end of Camino tunnel; (5) Camino penstock—an above-ground steel penstock that is 5 to 12 feet in diameter extending 0.3 mile to connect the Camino tunnel and Camino powerhouse; (7) Camino powerhouse, located on the SFAR; and (8) transmission lines—two 230-kV overhead transmission lines originating at the Camino switchyard, the Camino-Lake transmission line extends 31.7 miles and connects to SMUD's Lake substation and the Camino-White Rock transmission line extends 10.0 miles and connects to the White Rock switchyard. All the facilities in this development are located on public land within the Eldorado National Forest.

Slab Creek/White Rock

The Slab Creek/White Rock development consists of: (1) Slab Creek dam—a double curvature variable radius concrete arch dam that stretches across the SFAR that is 250 feet high and 817 feet long, with a central uncontrolled overflow spillway, creating the Slab Creek reservoir; (2) Slab Creek penstock—a steel penstock that is 24 inches in diameter that extend 40 feet and passes through the dam to connect Slab Creek reservoir with Slab Creek powerhouse; (3) Slab Creek powerhouse—located at the base of Slab Creek dam that uses minimum stream flow releases; (4) White Rock tunnel—a modified horseshoe tunnel that is 20 to 24 feet in diameter, with a surge shaft, that extends 4.9 miles to connect Slab Creek reservoir with White Rock penstock; (5) White Rock penstock—an above-ground steel penstock that is 9 to 15 feet in diameter and extends 0.3 mile to connect White Rock tunnel to White Rock powerhouse; (6) White Rock powerhouse; and (7) transmission lines—two 230-kV overhead transmission lines and one 12-kV distribution line both 21.8 miles long. The two transmission lines connect the White Rock switchyard to SMUD's Folsom Junction. The 600-foot-long 12-kV Slab Creek tap line is 600 feet long and connects the Slab Creek powerhouse to the junction with PG&E's 12-kV distribution line. The Slab Creek/White Rock development is the most downstream Project facility (excluding transmission lines) and discharges into the Chili Bar reservoir, which is part of PG&E's Chili Bar Project. Slab Creek reservoir is located on public and private (including SMUD) land within the Eldorado National Forest. The remainder of the development is located on private land adjacent to and beyond the western boundary of the Eldorado National Forest.

Table 2-1 summarizes key characteristics of each reservoir associated with the Project, and table 2-2 shows the characteristics of each powerhouse. For ease of reference and consistency, we use the terminology presented in these two tables throughout the EIS to discuss various locations relative to the Projects.

Table 2-1. Characteristics of Project reservoirs. (Source: SMUD, 2005)

Reservoir Name (Development Name if Different)	Maximum Pool Elevation (feet msl)	Normal Maximum Reservoir Capacity (acre-feet)	Surface Area at Maximum Pool (acres)
Rubicon (Loon Lake)	6,545	1,450	108
Buck Island (Loon Lake)	6,436	1,070	78
Loon Lake	6,410	76,200	1,450
Gerle Creek (Robbs Peak)	5,231	1,260	60
Robbs Peak	5,231	30	2
Ice House (Jones Fork)	5,450	45,960	678
Union Valley	4,870	277,290	2,860
Junction (Jaybird)	4,450	3,250	64
Camino	2,915	825	20
Brush Creek (Camino)	2,915	1,530	20
Slab Creek	1,850	16,600	280

Note: msl – mean sea level

Table 2-2. Characteristics of Project powerhouses. (Source: SMUD, 2005)

Reservoir Name	Powerhouse Capacity (MW)	Number of Units	Type of Units
Loon Lake	82	1	Vertical Pelton
Robbs Peak	29	1	Vertical Francis
Jones Fork	11.5	1	Vertical Francis
Union Valley	46.7	1	Vertical Francis
Jaybird	144	2	Vertical Pelton
Camino	150	2	Vertical Francis
Slab Creek	0.4	1	Vertical Francis
White Rock	224	2	Vertical Francis
Total	687.6	11	

2.2.2 Current Operations

One of the primary aspects of operational flexibility of the UARP lies in the ability of the Project to store water seasonally. The combined 400,000 acre-feet gross capacity of the three storage reservoirs (Loon Lake, Ice House, and Union Valley) allows SMUD to manage the water, within physical, safety, and regulatory constraints, to generate electricity when power is most valued throughout the year. The Project is operated generally to provide electricity during peak load situations. It is also operated to ensure reliability of the electric transmission system within SMUD's control area.

From a water management perspective, operation of the Project follows an annual cycle of reservoir filling and release that coincides with the natural patterns of rain and snowmelt runoff characteristic of the Sierra Nevada. While the Project includes 11 reservoirs, each is used in a different way to manage the water for power production. Loon Lake, Ice House, and Union Valley reservoirs, accounting for 94 percent of total UARP gross storage capacity, operate primarily as long-term storage reservoirs, capturing as much of the winter/spring rain and snowmelt runoff as practicable, consistent with various regulatory constraints.

The two uppermost reservoirs (Rubicon and Buck Island) provide limited storage and are operated primarily run-of-river to capture and divert water from the Rubicon River and the Highland Creek drainages. No power is generated at the uppermost reservoir.

Typically, from about mid-summer to winter, the elevations of the three primary storage reservoirs are gradually lowered to generate electricity and provide adequate storage space to capture winter/spring runoff and minimize the frequency and amount of spillage. During this period, the Project is operated in a peaking mode, essentially following the daily demand cycle. Water is released from one or more of the storage reservoirs and is passed through the reservoirs as it makes its way through the series of downstream powerhouses (see figures 2-1 and 2-2). In winter, as rainstorms and snowmelt begin to increase streamflow in the basin, the process is reversed, with more water stored than released through the powerhouses. Thus, from winter to early summer, the water elevations of the storage reservoirs gradually increase.

Five Project reservoirs (Gerle Creek, Robbs Peak, Junction, Camino, and Slab Creek) operate primarily as re-regulating forebays and/or afterbays to the various powerhouses. The remaining reservoir (Brush Creek) is operated typically to provide either spinning reserves or maximum peaking power for system reliability purposes. SMUD's water rights do not allow the storage of water in these six reservoirs. Thus, retention time in these reservoirs is short, and water levels are likely to fluctuate daily as they provide the re-regulating functions for which they were designed.

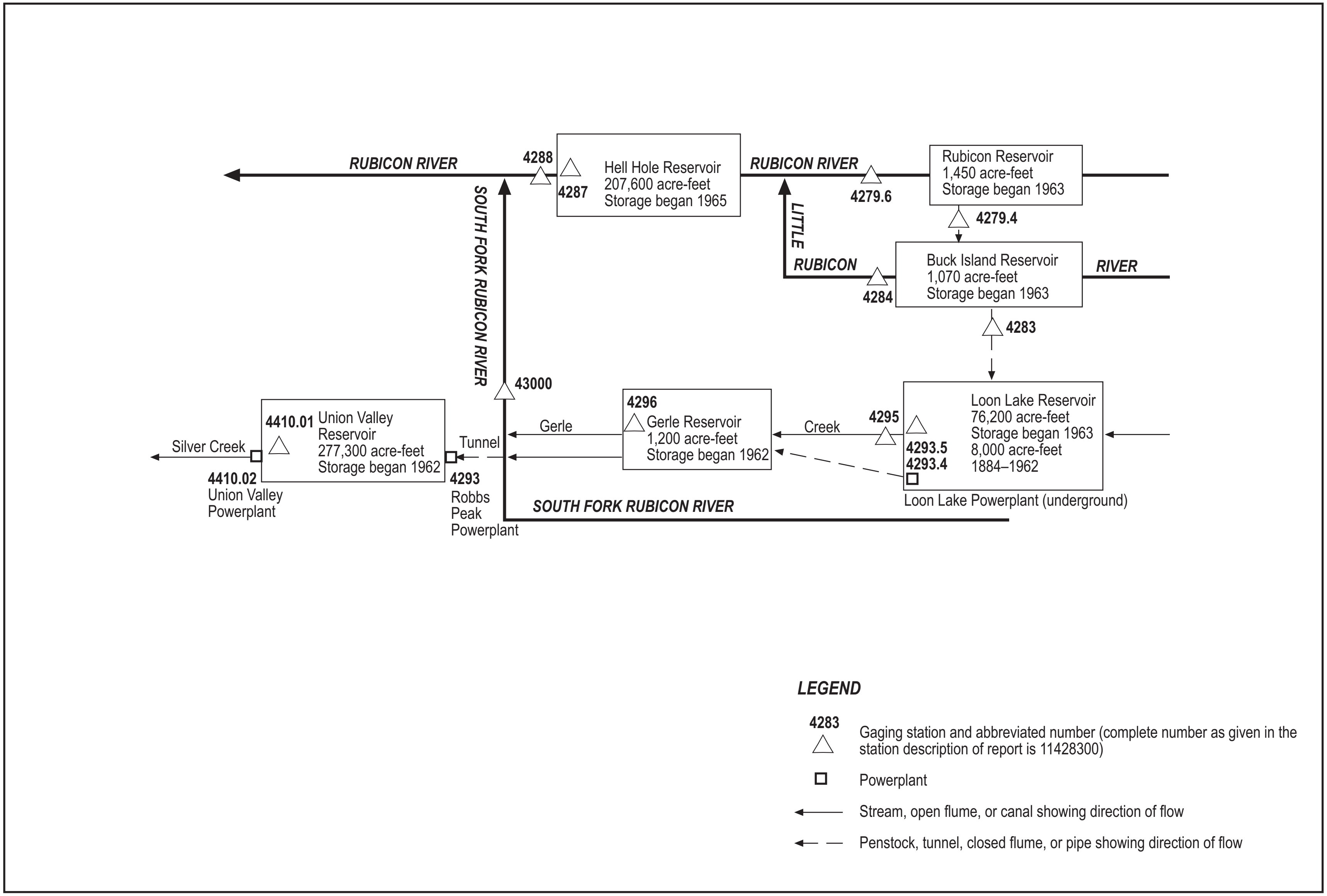

Figure 2-1. Diversions and storage in Rubicon River Basin. (Source: USGS, 2005; as modified by staff)

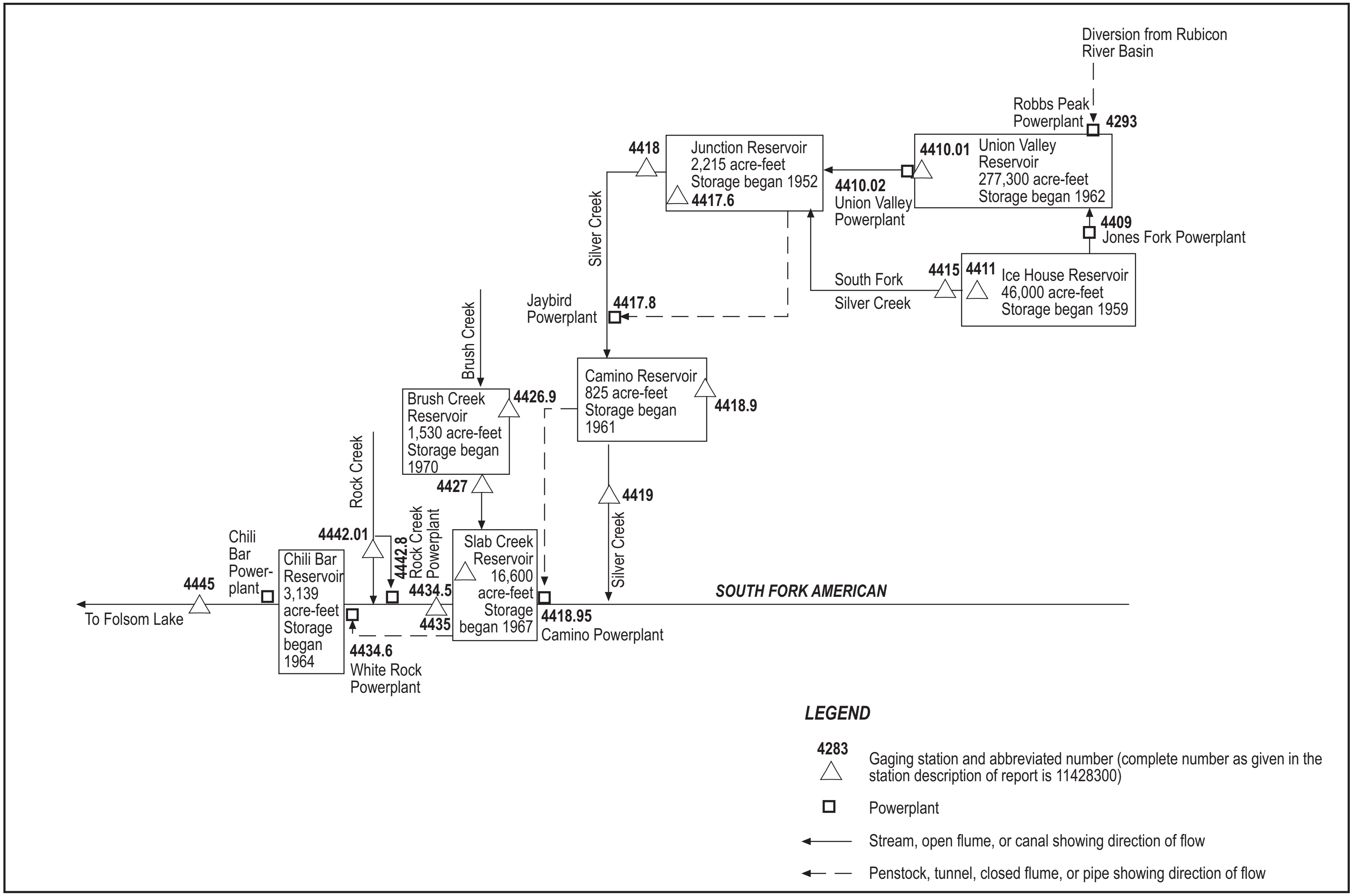

Figure 2-2. Diversions and storage in the South Fork of the American River Basin. (Source: USGS, 2005; as modified by staff)

Six powerhouses (Loon Lake, Jones Fork, Union Valley, Jaybird, Camino, and White Rock) account for 95 percent of the total UARP 688-MW maximum capability. These powerhouses can generally be operated flexibly, with limited constraints on flows and sufficient storage to meet daily peaking cycles. Of the two remaining powerhouses, Robbs Peak powerhouse is operated run-of-river due to the lack of storage capacity in the Robbs Peak development. Robbs Peak powerhouse does, however, contribute to peaking power capability because Robbs Peak's primary inflow during most of the year is the Loon Lake powerhouse discharge. The Slab Creek powerhouse is typically operated to meet baseloads and uses the continuous minimum flow from the Camino tunnel and the SFAR for power generation and releases into the SFAR.

2.2.3 Existing Project Boundary

The current Project boundary encompasses all Project facilities including linear corridors ranging from 50 to 100 feet for transmission lines and tunnels at each development and generally does not include the stream reaches downstream of the dams. The current Project boundary follows a contour line generally 3 feet above the maximum normal water surface elevation at each developed reservoir except at the location of Project facilities and at most, but not all, Project recreational facilities on National Forest System lands. The recreational facilities located within the Project boundary at the Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs are shown on figures 3-33, 3-34, and 3-35 in section 3.3.6, *Recreational Resources*.

Five campgrounds, including Gerle Creek, Pleasant, Loon Lake Equestrian, Jones Fork, and Big Silver, are only partially within the existing Project boundary. Several Project access roads also are not entirely within the existing boundary, including access roads at Wolf Creek, Northern Ice House, and Jones Fork.

2.2.4 Project Safety

The UARP has been operating for 28 years under the existing license, during which time Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the Project has been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been filed for Commission review. As part of the relicensing process, the Commission staff evaluate the adequacy of the proposed Project facilities under a new license. Since SMUD proposes to build the Iowa Hill development, Commission staff would inspect the development, if licensed, both during and after construction. Special articles relating to safety issues would be included in any license issued, as appropriate. Commission staff would continue to inspect the Project during the new license term to ensure continued adherence to Commission-approved plans and specifications; special license articles relating to construction, operation, and maintenance; and accepted engineering practices and procedures.

2.3 CHILI BAR PROJECT

2.3.1 Existing Project Facilities

The Chili Bar Project is located immediately downstream of SMUD's UARP. The Chili Bar Project facilities consist of a concrete gravity dam that is 126 feet high and 380 feet long with a dam spillway that is 170 feet long with a crest elevation of 997.5 feet (National Geodetic Vertical Datum [NGVD]) located 31 feet below the crest of the dam; (2) a reservoir with a surface area of 110 acres and a useable storage capacity of 1,339 acre-feet at elevation 997.5 feet NGVD; and (3) a powerhouse that is 80 feet square containing a single turbine unit with a normal maximum gross head of 60 feet, a maximum hydraulic capacity of 1,979 cubic feet per second (cfs), and an installed capacity of 7 MW. There is no project transmission line because the 21-kV switchyard connects directly to the local distribution grid.

2.3.2 Current Operations

Because the Chili Bar Project has limited reservoir storage, PG&E can only manage the flow releases from SMUD's upstream White Rock powerhouse on a daily basis. Typically, Chili Bar stores the releases from White Rock during off-peak hours and generates electricity during peak load hours. Therefore, flows downstream of the Chili Bar Project often fluctuate daily. Given that White Rock powerhouse has a flow capacity almost twice as high as Chili Bar, the Chili Bar Project often spills flow in excess of its generating capacity at Chili Bar dam. The Chili Bar powerhouse has semi-automatic operation and is operated from PG&E's Wise Switching Center about 35 miles away in Auburn, California.

2.3.3 Existing Project Boundary

The existing Project boundary includes all the land PG&E owns ranging from about 50 to 250 feet from either side of the river and starting about 320 feet downstream of the Project dam to about 3.2 miles upstream of the Project dam. There are no formal recreational facilities within the Chili Bar Project boundary; however, at Chili Bar dam, PG&E manages an informal boat launch that PG&E uses infrequently and exclusively for inspection and maintenance purposes. The boat launch is inaccessible to the public. The Project boundary does not include the reach downstream of Chili Bar dam.

2.3.4 Project Safety

The Chili Bar Project was placed in operation in 1965 and has been operating for 42 years under the existing license. Inspection activity is the same as described for the UARP in section 2.2.4.

2.4 SMUD'S PROPOSAL

2.4.1 Proposed Project Facilities—Iowa Hill Development

As part of the relicensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill development, which would operate as a pumped-storage facility (figures 2-3 and 2-4).

The Iowa Hill development, as proposed, would be an off-stream pumped-storage project that makes use of the existing UARP Slab Creek reservoir as a lower reservoir and a new upper reservoir atop Iowa Hill (figure 1-1). The difference in elevation between the two reservoirs would be about 1,200 feet, providing the capability of the development to generate a nominal 400 MW of electricity. Under the proposed layout, the reservoirs would connect through an underground powerhouse and tunnel system.

While SMUD considered alternative reservoir sizes and locations, the upper reservoir as proposed would cover a surface area of about 100 acres atop Iowa Hill and would hold about 6,400 acre-feet. The upper reservoir would be created by the construction of a berm atop Iowa Hill. SMUD proposes to construct the berm for the upper reservoir from crushed rock from the tunneling operation, earth from the upper reservoir basin, a high-density polyethylene liner to prevent leakage, and appropriate revetment/rock where needed to minimize bank erosion. During construction of the upper reservoir, SMUD proposes to balance the excavation and fill requirements of the total development, eliminating any need for permanent spoil disposal areas at the upper reservoir. Before construction is completed, all temporary spoil would be eliminated by incorporation into the upper reservoir dikes, and the area would be landscaped.

The proposed underground powerhouse would house three equally sized, variable-speed pump/turbine units with a rated capacity of 400 MW. Variable speed units possess a number of advantages over conventional synchronous speed units, including: (1) lower system disturbance from pumping starts, (2) the ability to operate at part load during pumping mode, (3) use for regulation while in pumping mode, and (4) flexibility to lower overall system costs.

SMUD proposes to construct a multi-port (i.e., octagonal) intake at approximately 1,770 feet, 80 feet below the Slab Creek reservoir maximum water level elevation of 1,850 feet. The intake would be 15 feet high. To construct the octagonal intake, a steel cofferdam would be floated in and sunk in place.

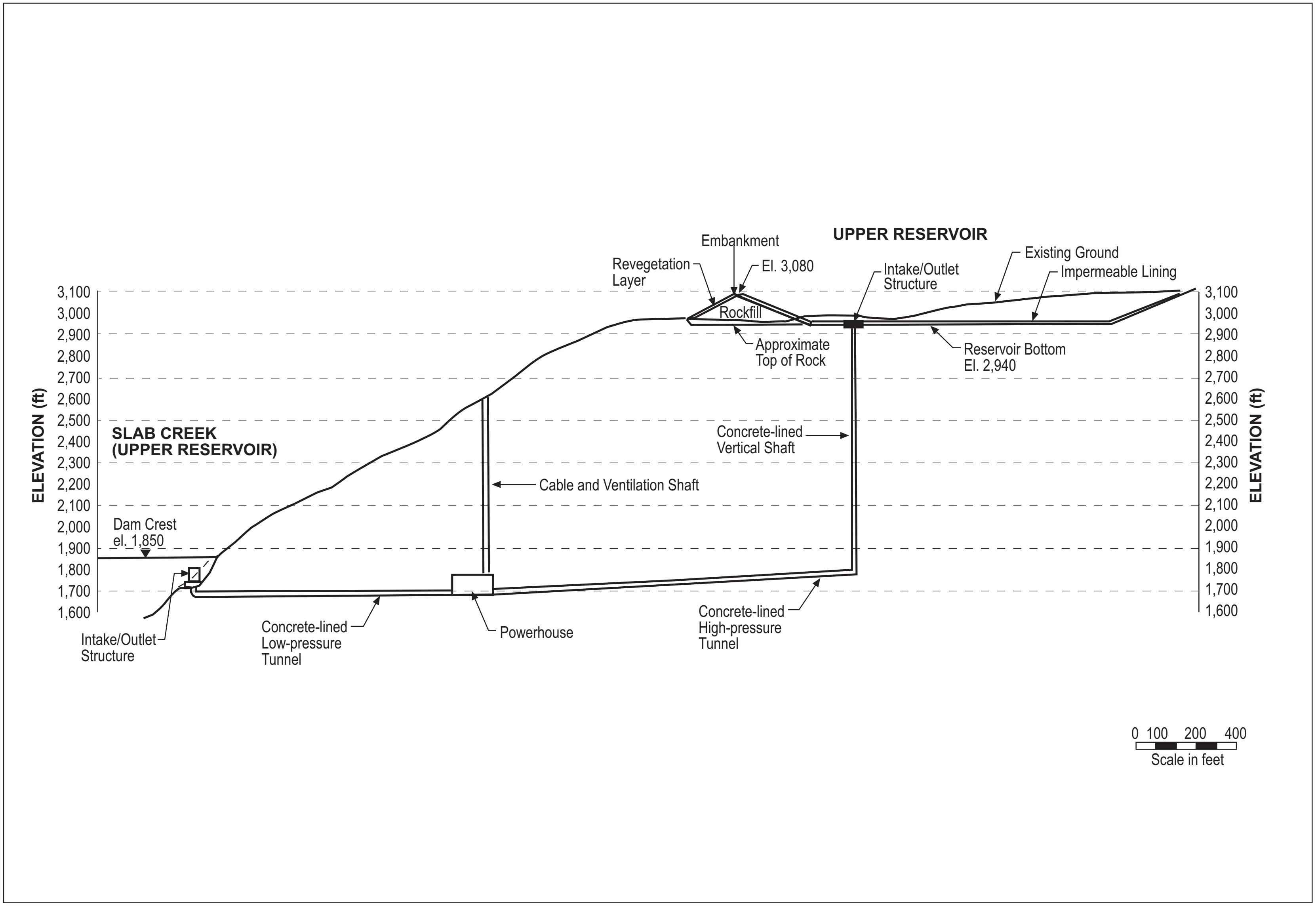

Figure 2-3. Schematic of the proposed Iowa Hill pumped-storage operation. (Source: SMUD, 2005, as modified by staff)

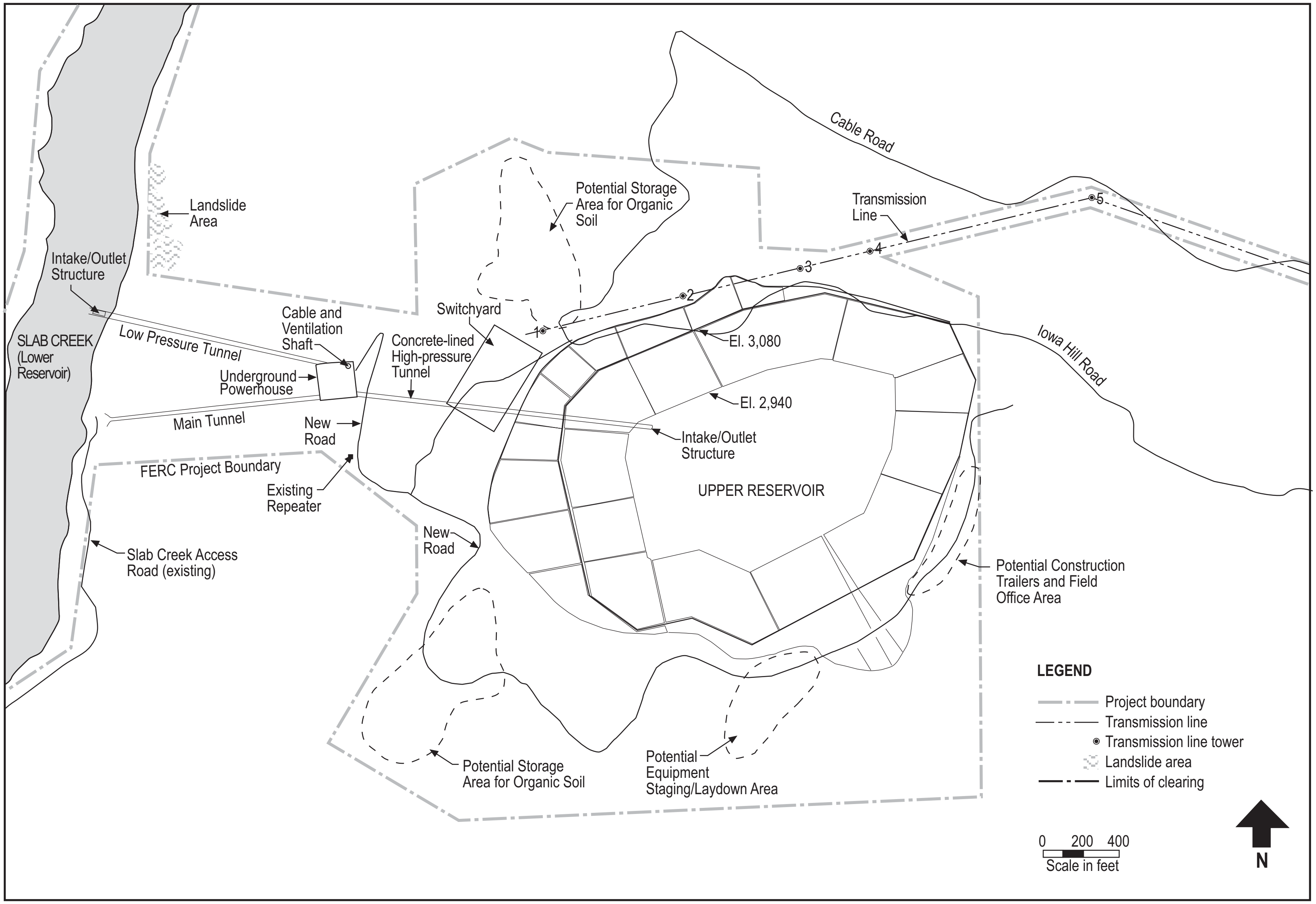

Figure 2-4. Plan view of the Iowa Hill development. (Source: SMUD, 2005, as modified by staff)

In its license application, SMUD proposes that the primary access to the upper reservoir site off of U.S. Highway 50 would be provided by Carson Road to Cable Road to Iowa Hill Road. SMUD would improve the serviceability of 4 miles of the existing Cable Road from the end of the paved portion of Cable Road to the upper reservoir site by either providing an unimproved gravel road or paving the 4 miles of existing roadway. The existing road would not be widened. About 1,200 feet of Carson Road would be included in the proposed Project boundary for the Iowa Hill development. Wide places in the existing road would be improved along with the rest of the road and would function as passing turnouts. Once constructed, the upper reservoir would be fenced, locked, and unavailable for public recreation.

In its license application, SMUD proposes that the primary access to the lower reservoir site off U.S. Highway 50 would be provided by Carson Road to Larsen Drive to the Slab Creek reservoir access road. The location of the Project facilities to be constructed at the lower reservoir is at the end of the existing 2-mile-long Slab Creek reservoir access road. SMUD constructed the first 1.1 miles of the existing road, starting from North Canyon Road going to a point near the dam, as a gravel road to provide access for dam construction and for operation and maintenance access to the existing Slab Creek reservoir. The remaining 0.9 mile of the existing access road, starting from near the dam and heading east, was originally constructed as a 10-foot-wide road and currently provides access to the existing, semi-developed boat launch site. This segment of road, which would be included in the Project boundary, would be widened by 2 feet and paved. During construction, the excavated rock and soil from the powerhouse, tunnel, and shaft would be transported to the upper reservoir site to be used for berm construction of the upper reservoir. SMUD proposes to use a vertical material handling system consisting of either a conveyor or bucket-and-cable system located in the cable shaft to transport the excavated material from the main access tunnel for the powerhouse to the upper reservoir site.

In response to comments on the draft EIS, SMUD studied several alternative routes to both the upper and lower reservoir sites. These routes, as well as the proposed routes, are evaluated in this final EIS in sections 3.3.7, *Land Use,* and 3.3.10, *Socioeconomic Resources*.

The electrical power output would be carried by the existing three 230-kV transmission lines that move power from the UARP to SMUD's load center. The only new transmission line would be a generation tie-line about 2 miles long that would tie the Iowa Hill development into the UARP system by looping the Camino/White Rock circuit through the development switchyard to an interconnection point on the Camino-White Rock transmission line. This same tie-line would also be used for the development when it is operated in the pumping mode. The tie-line would start at the proposed switchyard, to be located adjacent to the upper reservoir berm (northwest of the reservoir). From there, the tie-line would lie in a generally easterly direction just north of the reservoir toward the existing UARP transmission corridor, which passes by the development to the south and southeast. The connection point along the transmission corridor is just southwest of the Cable Road crossing.

2.4.2 Proposed Operations

Slab Creek reservoir, the lower reservoir of the Iowa Hill development, is currently operated as a re-regulating afterbay/forebay. The reservoir serves as an afterbay to the Camino powerhouse and a forebay for the White Rock powerhouse. The reservoir currently receives water from Camino powerhouse and inflow from the SFAR. Because of this re-regulating mode of operation, water levels in the reservoir may fluctuate daily with changing volumes of inflow and powerhouse flow. Typical weekly fluctuation is no more than 30 feet, ranging between the operation pool levels of 1,820 feet and 1,850 feet.

In the pumping mode for a 400-MW powerhouse, the estimated discharge capacity of the tunnels (i.e., the rate of withdrawal from Slab Creek reservoir) would range between 3,600 and 4,200 cfs and in the generating mode the discharge capacity of the tunnel (i.e., the rate of release to Slab Creek reservoir) would range between 4,800 and 5,200 cfs. The "rated" condition is based on the need to be capable of delivering 400 MW in the generating mode under adverse conditions (i.e., when the upper reservoir is nearly empty and the lower reservoir is near its normal maximum elevation of 1,850 feet).

Early evaluations of the Iowa Hill development indicated small changes to the current levels of fluctuation of Slab Creek reservoir. For example, if the Slab Creek reservoir is at elevation 1,830 feet, a release of 5,200 cfs would increase the reservoir elevation by about 2 feet per hour. Thus, with minimal change in the pattern of reservoir elevation, there should be no increased incidence of spill at the dam, no effect on the ability to release minimum flows into the Slab Creek dam bypassed reach, and no change in the volume of water released through the White Rock powerhouse.

2.4.3 Proposed Environmental Measures under the Settlement Agreement

SMUD proposes a comprehensive set of measures covering the full range of resources in the Upper American River Basin. Table 2-3 summarizes those proposed measures under the Settlement Agreement.[18]

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[18]The precise wording of the measure summaries in this table differs from the specific language of the Settlement Agreement. Individual measures (Proposed Articles in the Settlement Agreement) include programmatic elements for scheduling and developing plans, monitoring, evaluation, and reporting that are not listed in this table. Characterizations of these measures are primarily the result of our attempt to provide a concise summary of the measures for this draft EIS and are not intended to modify any of the terms of the Settlement Agreement.

Table 2-3. Proposed environmental measures for the UARP under the Settlement Agreement. (Source: SMUD and PG&E, 2007)

Article	Measure	Elements
Measures Specific to the Upper American River Project		
1-1	**Minimum Streamflows**	Maintain minimum streamflows in Rubicon River below Rubicon dam, Little Rubicon River below the Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, SFAR below Slab Creek dam, and SFAR within 3 days of determining base water year types and operations consistent with California Department of Water Resources (DWR) Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. Specific minimum flow schedules for each river reach, the specific factors to be applied to each river reach, and the compliance points for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*.[19]
1-2	**Pulse Flows**	Provide annual pulse flow events beginning as early as reasonably practicable within 3 months after license issuance, but not prior to the implementation of the new minimum streamflows, in Rubicon River below Rubicon River dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam. Specified pulse flows do not need to be implemented in water years where natural spill provides flows of equivalent magnitude and duration during spring snowmelt runoff or a natural storm event that occurs in the months of January through May in each of the specified watersheds. **Rubicon River Below Rubicon Dam** Provide a pulse flow of 600 cfs for 3 days that coincides with winter storm events or spring snowmelt runoff in the Rubicon River watershed during below normal (BN), above normal (AN), and Wet water years if a natural spill of 3,600 acre-feet or more within 3 consecutive days does not occur. Implement the specified pulse flow using the existing flashboards at the Rubicon tunnel headworks and either meet annually or develop a tunnel gate operation plan for future pulse flows.

[19]Definitions of critical dry (CD), dry, below normal (BN), above normal (AN), and wet water year types are also provided in section 3.3.3.2, *Aquatic Resources*.

Article	Measure	Elements

Gerle Creek Below Loon Lake Dam

Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type as follows:

	BN	**AN**	**Wet**
Day 1	125	200	600
Day 2	125	200	600
Day 3	180	250	740*
Day 4	125	200	600
Day 5	125	200	600

*or maximum capacity of outlet works, whichever is less.

Complete a sensitive site investigation that includes additional permanent cross-sections that characterize the upper and middle Rosgen[20] Level 3 analysis reaches and mapping of unstable banks and downed logs that are obstructing streamflow, and test pulse flows at levels up to 740 cfs or the maximum capacity of the outlet works, to determine the appropriate pulse flows to meet desired channel conditions.

[20]This is a classification system developed by Dave Rosgen and described in *Applied River Morphology* (Rosgen, 1996).

Article	Measure	Elements
		SFSC Below Ice House Dam
		Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type, below.

	BN	AN	Wet
Day 1	450	550	600
Day 2	450	550	600
Day 3	550	650	780*
Day 4	450	550	600
Day 5	450	550	600

*or maximum capacity of outlet works, whichever is less.

Article	Measure	Elements
		Pulse flows may be timed to coincide with winter storm events between December 15 and April 10. Base pulse flows implemented during this period on the prior water year type, and regardless of water year type revisions after the event.
1-3	**Ramping Rates**	Use a ramping rate of 1 foot per hour for pulse flow releases in Gerle Creek below Loon Lake dam and SFSC below Ice House dam; minimum streamflow releases in Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam; and recreational streamflow releases in SFSC below Ice House dam and SFAR below Slab Creek dam.
1-4	**Coordinated Operations**	Develop and implement a plan to coordinate operations with the licensee of the Chili Bar Project to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects.
		Consult and coordinate with the licensee of the Chili Bar Project in the implementation of Proposed Articles 2-1 (minimum streamflows), 2-2 (ramping rates), 2-4 (monitoring program), 2-5 (adaptive management program), 2-6 (sediment management plan), 2-14 (public information services), and 2-15 (recreational streamflows).
1-5	**Monitoring Program**	**General Monitoring Program Requirements**
		Monitoring plans for items (11) recreation survey, (14) heritage resources, (15) review of recreational developments, and (16) reservoir level evaluation are described in Proposed Articles 1-16, *Recreation Survey*, 1-29, *Heritage Resource Discover*, 1-18, *Review of Recreation Developments*, and 1-26, *Fish Stocking*).

Article	Measure	Elements
	1. Fish Population	Develop a plan to (a) monitor rainbow trout fish populations by electrofishing and/or snorkeling during late summer/fall in 10 river reaches; (b) monitor hardhead by snorkel surveys in SFAR below Slab Creek dam reach, only, from immediately downstream of Mosquito Road Bridge to, and including site SCD-F2; and (c) monitor brown trout in the Gerle Creek below Loon Lake dam reach.
	2. Aquatic Benthic Macroinvertebrate Monitoring	Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at: Rubicon river below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFFR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam.
	3. Amphibian and Reptile Monitoring	Develop a plan to (a) monitor the foothill yellow-legged frog in Silver Creek below Junction dam, Silver Creek below Camino dam, SFAR below Slab Creek dam, and Rock Creek (tributary upstream of White Rock powerhouse), and (b) monitor the mountain yellow-legged frog in Rubicon reservoir, Rockland lake, and Buck Island reservoir.
	4. Foothill Yellow-legged Frog Flow Fluctuation Monitoring	Develop a plan to conduct visual surveys for the foothill yellow-legged frog in Silver Creek below Camino dam in June through September when streamflows are 100 cfs or less and flows fluctuate more than 40 cfs or more over 1 week's time.
	5. Riparian Vegetation Monitoring	Develop a plan to conduct aerial photo flights and Greenline method at the 15 intensive field study sites, and collect data to document species composition, percent cover, and length and width of riparian community.
	6. Algal Species Identification and Monitoring	Develop a plan to collect, identify, and archive samples of the species of algae in Silver Creek below Junction dam and additional baseline samples in SFRR below Robbs Peak dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam, and add additional sites or reaches if it is determined that the algal species have negative effects on the aquatic ecosystem.
	7. Geomorphology, Sensitive Site Investigation and Mitigation	Complete a detailed field investigation of Gerle Creek fluvial, geomorphic properties below Loon Lake dam at LL-DG1 and LL-G2 in years 1 and 2 and develop a Gerle Creek Geomorphology Mitigation Plan that includes channel stabilization recommendations.

Article	Measure	Elements
	8. Geomorphology, Continuing Evaluation	Develop a geomorphology continuing evaluation of representative channel areas monitoring plan providing for establishing permanent transects and monitoring channel cross-sections, longitudinal profiles, substrate composition, and other geomorphic properties (Rosgen Level 3) in representative areas, including in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam.
	9. Water Temperature	Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 17 locations immediately above and below Project dams and at the confluence with tributaries and monitor stream temperatures from March 15 to September 30 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies.[21]
	10. Water Quality	Develop a water quality monitoring plan addressing the water quality monitoring elements listed below, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program.

[21] The Agencies include CDFG, the Forest Service, FWS, and the Water Board.

Article	Measure	Elements
		Water Chemistry Monitoring—Conduct a water chemistry sampling program using U.S. Environmental Protection Agency (EPA) standard methods for parameters designed to demonstrate seasonal conditions at all reservoir and stream locations described in the UARP relicensing *Water Quality Study Plan* (Plenary approval, January 8, 2003). Sample in situ physical parameters (pH, water temperature, dissolved oxygen [DO], specific conductance, and turbidity) at representative locations on diverted stream reaches downstream of all Project reservoirs and at 1-meter intervals in Loon Lake, Gerle reservoir, Ice House reservoir, Union Valley reservoir, Junction reservoir, Camino reservoir, and Slab Creek reservoir. Collect general chemistry samples of minerals, nutrients, metals (total and dissolved fractions), measured hardness, and petroleum products from all Project reservoirs and in stream locations, dam release points from reservoirs, and representative sites along all diverted stream reaches greater than 1 mile in length. Collect samples of minerals, nutrients, and metals at the surface and near the bottom at multiple, representative locations within each reservoir. Collect secchi disc measurements of water clarity from Loon Lake, Ice House reservoir, Union Valley reservoir, and Slab Creek reservoir seasonally in summer and fall once every 5 years after license issuance. The locations and frequency of monitoring are provided in table 3-28.
		Bacterial Monitoring—Conduct bacterial monitoring consistent with Central Valley Regional Water Quality Control Board's (Central Valley Water Board) water quality control plan (Basin Plan) objectives for protection of the REC-1 beneficial uses annually, at a minimum of 15 shoreline recreational locations within the Project boundary that have swimming and other water contact recreational activities in the area and sources for potential introduction of pathogens to the water column in the immediate vicinity for the first 5 years after license issuance (Central Valley Water Board, 2004).
		Metals Bioaccumulation Monitoring—Collect resident fish tissue samples from Loon Lake, Gerle, Ice House, Union Valley, Camino, and Slab Creek reservoirs to analyze for rates of bioaccumulation and tissue residue levels of mercury, copper, lead, and silver using target fish species, numbers of individuals, sampling strategy, and analytical methods that are consistent with current *Surface Water Ambient Monitoring.*
	12. Robbs Peak Powerhouse Entrainment	Develop a monitoring plan to determine when and at what flows flow fish migration is occurring, and if fish are being entrained.

Article	Measure	Elements
	13. Terrestrial Wildlife Monitoring	Develop a bear management monitoring plan and a bald eagle monitoring plan.
1-6	**Adaptive Management Program**	**General Adaptive Management Program Requirements—** Implement an *Ecological Resources Adaptive Management Program* as early as reasonably practicable within 3 months after license issuance generally consisting of implementing a monitoring program (Proposed Article 1-5, *Monitoring Program*), and specific adaptive management measures. Conduct monitoring to determine if the applicable ecological resource objectives are achievable and being met. Implement adaptive management if the monitoring program and other scientific information indicate that it is likely the applicable ecological resource objectives identified in the Rationale Report (CDFG, 2007) will not be met without adaptive management changes. Adaptive measures include (1) cancellation of pulse and recreational streamflows in SFSC if water temperatures at SFSC rise above 12 degrees Celsius (ºC) mean daily temperature for a 7-day running average, (2) cancellation of recreational streamflows in SFAR due to water temperatures, (3) control of untimely spill events below Slab Creek and Camino dams, (4) cancellation of October recreational streamflows below Slab Creek dam if amphibian monitoring show unacceptable impacts; (5) measures to address fish entrainment in the SFRR if monitoring indicates fish are being entrained during fish migration, (6) placement of sediment downstream or dredging based on geomorphology monitoring, (7) management of algae growth in Silver Creek below Junction dam if the new streamflow regime does not reduce algae growth, (8) performance of additional studies if results of monitoring metals bioaccumulation suggest that metals are adversely affecting aquatic species; (9) adjustment of water temperature indicator for the foothill yellow-legged frog, (10) additional measures to reduce bear/human interactions if monitoring indicates that such interactions have not declined, and (11) investigation of other measures if annual review of coordinated operations shows they are not effective.
1-7	**Gerle Creek Channel Stabilization**	Develop and implement a stabilization plan for the Gerle Creek channel below Loon Lake dam.
1-8	**Gerle Creek Fish Passage**	Maintain the reservoir level at Gerle Creek that provides fish passage into Gerle Creek from August through October 31.
1-9	**Large Woody Debris**	Ensure that mobile, instream large woody debris greater than 20 centimeters wide and 12 meters long continues to move downstream beyond Robbs, Junction, Camino, and Slab Creek dams.

Article	Measure	Elements
1-10	**Streamflow and Reservoir Elevation Gaging**	Develop and file a Streamflow and Reservoir Elevation Gaging Plan that meets U.S. Geological Survey (USGS) standards and includes a minimum of 10 streamflow gage locations, 9 reservoir elevation compliance gaging locations, and provides for simple staff gages at the Slab Creek and Ice House recreational boating put-ins and the installation of telemetry equipment if such equipment is economically and technologically feasible, and can be installed in a manner consistent with the laws, regulations, and policies applicable to the Congressionally designated Desolation Wilderness.
1-11	**Canal and Penstock Emergency and Maintenance Release Points**	Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality impacts when the release points are used.
1-12	**Wildlife and Plant Protection Measures**	(1) **Project Canals and Wildlife**—Maintain and operate in working condition all devices and measures for wildlife protection along Project canals; provide an annual report of deer or other wildlife found in Project canals; and, should wildlife mortality exceed three individuals, develop and implement a wildlife exclusion plan. (2) **Future Need for Biological Evaluation/Assessment**—Before commencing any new construction or maintenance (including but not limited to proposed recreational developments) on National Forest System lands that may affect state or federally listed sensitive plant or wildlife species or its habitat, ensure that a biological evaluation (including necessary surveys) is prepared for Forest Service approval, and for any activity that might affect a species proposed or listed under the Endangered Species Act (ESA), or its critical habitat, ensure that a biological evaluation is prepared for the relevant federal agency (U.S. Fish and Wildlife Service [FWS] or National Marine Fisheries Service [NMFS]). (3) **Sensitive Plants**—Immediately notify agencies if occurrences of sensitive plants or wildlife species are detected prior to or during ongoing construction, operation, or maintenance of the Project. If Forest Service, California Department of Fish and Game (CDFG), or FWS determines that the Project-related activities are adversely affecting the sensitive species, then develop and implement appropriate protection measures.

Article	Measure	Elements
		(4) **TES and Special Status Species Review**—Annually review the current list of special status plant and wildlife species (federal ESA or Eldorado National Forest Watch List) and if species are added, determine if the species or unsurveyed habitat for the species might occur on National Forest Systems lands and if so, develop and implement a study plan to assess the effects of the Project on the species.
		(5) **Pine Hill Rare Plant Preserve**—Consult with BLM, FWS, and CDFG prior to undertaking maintenance under transmission lines within the Pine Hill Rare Plant Preserve.
		(6) **Avian Protection**—Develop and implement an avian protection plan that addresses retrofitting transmission lines as described in the Bird-Powerline Associations Technical Report to meet the Avian Power Line Interaction Committee (APLIC) design and siting standards
1-13	**Vegetation and Invasive Weed Management**	**Invasive Weed Management**—Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations.
		Vegetation Management—Develop and implement a vegetation management plan that addresses hazard tree removal and trimming; transmission line clearing; habitat improvement; revegetation of disturbed sites; soil protection and erosion control; revegetation with culturally important plant populations; and use of clean, weed free, and preferably locally collected seed.
1-14	**Annual Review of Ecological Conditions**	Annually schedule and facilitate a meeting with the Agencies to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year.
1-15	**Recreation Implementation Plan**	Develop and implement a recreation implementation plan including a construction schedule for the recreational facilities specified in Proposed Article 1-19, *Specific Recreation Measures*, and other issues including but not limited to signing and sign placement, dissemination of public information, and a schedule for the design of facilities to be reconstructed.

Article	Measure	Elements
1-16	**Recreation Survey**	Conduct a recreational survey and prepare a report on recreational resources every 6 years from the date of license issuance, including, but not limited to, changes in use and use patterns, levels of use, user preferences, kinds and sizes of recreational vehicles, carrying capacity information sufficient to indicate change in capacity, and recreational user trends in the Project area.
1-17	**Forest Service Liaison**	Provide an individual for liaison with the Forest Service whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place within the Eldorado National Forest.
1-18	**Review of Recreation Developments and Facilities within the Project Boundary**	Schedule a meeting with the Forest Service every 6 years to review all Project recreational facilities described in Proposed Articles 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures*, and to agree upon the need and timing for maintenance, rehabilitation, construction, and reconstruction work. Keep or include Project recreational facilities within the Project boundary as shown in Attachment 1, and include the listed 34 recreational facilities constructed or reconstructed by SMUD in the future within the Project boundary.
1-19	**Specific Recreation Measures**	Complete the construction, reconstruction, and restoration to meet current Forest Service design standards and the requirements of the Americans with Disabilities Act (ADA) including all the pre-construction survey, design, permitting, analysis, and specifications for the initial recreational projects identified at the time of license issuance, including Buck Island development; High Country are trails; formal recreational facilities in Crystal Basin at Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs; recreational facilities in the Canyonlands at Junction, Brush Creek, and Slab Creek reservoirs; and developing and implementing a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities identified as lacking such facilities The specific sites and elements at each site are described in detail in table 3-65 in section 3.3.6, *Recreational Resources*.
1-20	**Heavy Maintenance**	Maintain, rehabilitate, and reconstruct, including paying the costs of design and administration, Project recreational facilities as determined through the Review of Recreation Developments.

Article	Measure	Elements
1-21	**Recreation, Operation, Maintenance, and Administration**	Beginning in the first full year after license issuance, pay the Forest Service $1,000,000 (year 2007 cost basis and escalated based on the GDP-IDP[22]) annually for the Forest Service to provide for operation, maintenance, and administration of those developed recreational sites adjacent to or in the vicinity of Project reservoirs and facilities listed in Proposed Article 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures* (either developed as part of the original/amended license or affected by operations).
1-22	**Carrying Capacity on Lands Affected by the Project**	Provide data to support the Forest Service determination of carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of "desired conditions," user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience.
1-23	**Reservoir Levels**	Beginning as early as reasonably practicable within 6 months after license issuance: (1) meet or exceed the end-of-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs; (2) maintain water surface at as high elevations as possible in Gerle Creek reservoir from May 1 to September 10 and in Slab Creek reservoir from July 1 through September 30, and limit daytime fluctuations to less than 6 feet (3) maintain seasonal reservoir levels at Junction and Brush Creek reservoirs within the range of levels measured between 1975 and 2000; (4) make every reasonable effort to maintain the water surface in Rubicon and Buck Island reservoir at as high as possible with minimum fluctuation between May 1 and September 10; (5) maintain an overwintering minimum pool elevation of 6,527 feet msl in Rubicon reservoir; (6) follow procedures and protocols for super dry (SD) water years, interim modification, conferences on abnormal water years, and reservoir level monitoring and adjustments; and (7) measure compliance at the reservoir elevation gages as published by the USGS. The specific elevations are detailed in section 3.3.2.1, *Water Quantity, Reservoir Levels*

[22]GDP-IDP is the U.S. Gross Domestic Product—Implicit Price Deflator.

Article	Measure	Elements
1-24	**Recreation Streamflows**	Based on the determination of water year type, provide recreational streamflows (1) in the SFAR below Slab Creek in BN, AN, and wet water years by spilling water between 850 and 1,500 cfs between 10:00 a.m. and 4:00 p.m. for 6 days in not less than 3 events from March 1 through May 31 and, if conditions permit, one of the events will be replaced with a 3-day event on the Memorial Day weekend in which case the total number of days would be increased to 7, until the Iowa Hill development is constructed or 15 years and longer if specific triggers are met, and prepare and implement a recreation management plan to address the whitewater recreational needs in reach from the Slab Creek dam to White Rock powerhouse; and (2) in Silver Creek below Ice House dam from 10:00 a.m. and 1:00 p.m. from 300 cfs to 500 cfs for 1 to 4 weekend days as determined by water year type, and if construction of the Iowa Hill development has not commenced within 5 years of license issuance, prepare and implement a whitewater recreation plan to determine triggers for establishing when the number of days of recreational streamflows could be increased. The specific recreation streamflow schedules are described in detail in section 3.3.6.2, *Recreational Resources, Whitewater Boating.*
1-25	**Public Information Services**	Provide (1) real-time streamflow information for 10 reaches via a toll-free telephone number and website and real-time reservoir level information for 10 reservoirs including two simple staff gages for use by the public on two stream reaches proposed for whitewater boating—SFAR downstream of Ice House reservoir dam and SFAR downstream of Slab Creek reservoir dam; (2) a Project recreation brochure/map that describes the recreational opportunities, facilities, rules, and responsibilities for the Project area; and (3) an interpretive, education, and public information plan within 2 years.
1-26	**Fish Stocking**	Provide up to a total of 50,000 pounds of fish per year but not less than 25,000 pounds of fish per year to be distributed among Loon Lake, Union Valley, and Ice House reservoirs as determined by CDFG.
1-27	**Visual Resource Protection**	Meet every 5 years with the Forest Service to review opportunities to improve how well Project facilities blend in with the surrounding landscape, during planning and prior to any new construction or maintenance of facilities that have the potential to affect visual resources of National Forest System lands (including but not limited to the recreation-related construction), prepare and implement a plan for the protection and rehabilitation of National Forest System visual resources affected by the Project, and perform 10 specific mitigation measures to existing facilities to improve visual quality within 2 to 8 years of license issuance.

Article	Measure	Elements
1-28	**Heritage Resources**	Develop and implement a Historic Properties Management Plan (HPMP) that would be incorporated into the programmatic agreement (PA) by reference.
1-29	**Heritage Resource Discovery**	Immediately cease work and notify the Forest Service and do not resume work until the Forest Service provides written approval if, prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on National Forest System lands and adjoining property, and perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service.
1-30	**Transportation System Management**	Develop and implement a transportation system management plan for roads on or affecting National Forest System lands addressing SMUD's primary responsibility for non-system roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads.
1-31	**Trails System Management**	Develop and implement a trails system management plan for the trails that are needed for Project operations and are located on or affect National Forest System lands, including a map developed based on GIS locations, showing the location of all trails associated with the Project; the seasons and amount of use of the trails by SMUD, the conditions of the trails indicating construction or maintenance needs, and a provision for identifying maintenance and reconstruction needs for trails required for Project operations every 5 years.
1-32	**Facility Management**	Develop and implement a facility management plan including (1) a map showing all Project facilities, including structures on or affecting National Forest System or BLM lands (and associated water and septic systems, and other utilities); above- and below-ground storage tanks; etc.; (2) the type and season of use of each structure; (3) the condition of each structure and planned maintenance or removal; and (4) provision for a plan every 5 years identifying the maintenance, reconstruction, and removal needs of Project facilities.
1-33	**Vegetation Management Plan**	Prior to any ground-disturbing activities, provide to Forest Service, a vegetative management plan that (1) identifies and prioritizes all inadequately vegetated areas to be revegetated or rehabilitated along with an implementation schedule, (2) lists the plants to be used along with planting locations, methods, and densities, giving an emphasis to native plant species, especially those of cultural importance and to using seed from certified weed-free sources and local sources.

Article	Measure	Elements
1-34	**Fire Management and Response Plan**	Develop and implement a fire prevention and response plan that is developed in consultation with appropriate state and local fire agencies and that sets forth in detail SMUD's responsibility for the prevention, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations.
1-35	**Reservation of Authority under Section 18**	SMUD recognizes the NMFS and U.S. Department of the Interior (Interior) right to reserve authority to prescribe the construction, operation, and maintenance of fishways at the Project, including measures to determine, ensure, or improve the effectiveness of such fishways.
1-36	**BLM Reservation of Authority under Section 4(e)**	Under the separate off-license Recreation Payment Agreement filed as appendix 6 to the Settlement Agreement for information purposes only, make a one-time payment to BLM of $270,000 and annual payments of $270,000, as annually adjusted based on the GDP-IDP with 2007 as the base year, on or before October 1 of each year during the term of the license and all annual renewals thereof.
1-37	**Implementation Schedule**	Develop and implement an implementation plan that includes (1) a schedule for implementing the articles in any license issued for the Project; (2) a schedule for filing the plans and related documents in Proposed Articles 1-1 through 1-50; and (3) documentation of consultation with the Consultation Group.
Measures Specific to the Iowa Hill Development		
1-38	**Special Use Authorization**	Obtain a special-use authorization from the Forest Service for the occupancy and use of National Forest System lands.
1-40	**Aquatic Resources (hardhead)**	To protect hardhead in the Slab Creek reservoir (1) monitor hardhead during all four seasons of the year to establish the locations of all life stages in Slab Creek reservoir (including edgewater locations) and in the water fluctuation zone upstream on SFAR above and below the Iowa Hill development for 2 years prior to and 2 years after commencement of operations; (2) monitor edgewater temperatures of Slab Creek reservoir between May and September to demonstrate that temperatures in shallow water areas of the Slab Creek reservoir are not affecting hardhead distribution by pump discharge; (3) maintain at least 12°C during the months of June (after the descending limb of the hydrograph), July, and August in the SFAR Slab Creek dam reach below Mosquito Bridge; (4) ensure that flow fluctuations in the SFAR below Slab Creek dam do not occur as a result of the Iowa Hill development; and (5) monitor hardhead to determine whether entrainment is occurring as a result of the Iowa Hill development.

Article	Measure	Elements
1-41	**Terrestrial Resources**	Prior to initiating construction of the development, purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license to mitigate the loss of wildlife habitat associated with the Iowa Hill development. The Forest Service and CDFG would determine the in-kind value of lands proposed for this purpose.
1-42	**Water Quality and Water Pollution**	No later than 90 days before initiating ground-disturbing activities for construction of the Iowa Hill development, file with the Commission a storm water pollution prevention plan to describe the measures SMUD would implement to protect water quality and manage hazardous substances during construction of the Iowa Hill development, and obtain all necessary permits.
1-43	**Groundwater**	Develop and implement a plan for managing groundwater inflows during construction and for groundwater monitoring and management once construction is completed including provisions for (1) a completed survey of the Project area that would be affected by the proposed tunnel; (2) monitoring springs and creeks for 5 years after the tunneling operation is completed; (3) a method for quantifying groundwater encountered during tunneling boring operations; (4) a method for verifying is not occurring or has been minimized after tunnel construction; (5) identification of corrective measures if tunnel boring operations encounter more groundwater than predicted; and (6) mitigation of any and all identified impacts.
1-44	**Visual Resources**	Develop a design for the Iowa Hill development that meets the visual quality objectives (VQOs) of the Eldorado National Forest Land and Resource Management Plan.
1-45	**Heritage Resource Protection**	Comply with section 106 requirements of the National Historic Preservation Act (NHPA) and its implementing regulations, found at 36 Code of Federal Regulations (CFR) 800, prior to the licensee undertaking activities on National Forest System lands.
1-46	**Road Use**	File a road use permit for all National Forest System roads that would be used for construction activities for the Iowa Hill development.
1-47	**Spoils Disposal**	Obtain permitting approvals, as necessary, for discharge of spoils to land and avoid depositing spoils on National Forest System lands without prior review and approval by the Forest Service.

Article	Measure	Elements
1-48	**Construction Noise**	Prior to undertaking construction activities affecting National Forest System lands, develop and implement a plan to address construction noise, including measures to address (1) vehicle idling, (2) advance notification of any material transport and construction activities with 0.5 mile of the tract; (3) notices for residents indicating the nature, timing, and duration of all materials transport and construction occurring with 0.5 mile for their residences; (4) a noise hot line telephone system for reporting construction noise disturbances; (5) monitoring to address compliance with items (1) through (4), and (6) actions to mitigate violations of the above measures.
1-49	**Recreation Access Plan for Slab Creek Reservoir**	Develop and implement a recreation access plan that addresses recreational access to the reservoir (1) during the time of construction of Iowa Hill reservoir and the tunnel connecting to Slab Creek reservoir, and (2) when Iowa Hill reservoir and associated powerhouse are operational.
1-50	**Future Revisions to the Iowa Hill Development**	The Agencies and BLM reserve the right to seek modification of Proposed Articles 1-38 through 1-49 (related to the Iowa Hill development) if SMUD seeks a revision or amendment to the description and/or proposed operation of the Iowa Hill development as approved in any license for the Project and such revision would affect resources under their jurisdiction.

In addition to the proposed measures in the Settlement Agreement, SMUD would file a final transportation management plan for the Iowa Hill development.

2.4.4 Project Boundary

As part of the Proposed Action, SMUD proposes to exclude from the Project description and Commission Project boundary certain transmission line sections included in the current license and Commission Project boundary. The excluded sections are (1) a 9.3-mile-long section of 230-kV line from Folsom Junction to Orangevale Substation; (2) a 17.8-mile-long section of 230-kV line from Folsom Junction to Hedge Substation; and (3) a 1.9-mile-long section of 230-kV line from Folsom Junction to Lake Substation.

SMUD states that these three line sections (lines) would still exist even if the UARP were retired, since they are needed for system reliability. If the Project were retired, the lines would require minor reconfiguration to provide power flow between the three substations as part of SMUD's interconnected system. Therefore, we recommend that these three line sections be excluded in any license issued for the UARP.

The Settlement Agreement includes a provision to include all of the 34 recreational facilities that would be upgraded or otherwise improved within the Project boundary, if they are not already included.

2.4.5 Alternative Sites Analysis

Before selecting the Iowa Hill site for development of a pumped-storage facility, SMUD conducted an alternative sites analysis that included 158 different sites and configurations in 12 California watersheds, including 59 locations within the vicinity of the UARP. SMUD applied four screening factors to every site: (1) minimum capacity requirements for 12 hours of storage and 400 MW of capacity with SMUD being able to control water in both the upper and lower reservoir; (2) a location that was within 10 miles of SMUD's 230-kV transmission lines; (3) no new dam or impoundment on any unimpaired stream or reach; and (4) a tunnel-to-height ratio that favors a shorter tunnel.

The analysis yielded four potential sites near the Ice House development (Granite and Peavine configurations), Union Valley development (Big Hill), and Iowa Hill. The Granite and Peavine configurations would require off-stream impoundments upstream of Ice House reservoir, would not be able to provide year-round capacity, and would affect recreational use of the popular Ice House reservoir. The configuration that would place an upper reservoir on Big Hill would require the relocation of a Forest Service heliport, would not be able to provide year-round capacity, and would disturb recreation and bald eagle nesting. We assume that any site considered at Deer Knob, on the opposite side of the Union Valley reservoir, also would not meet the year-round capacity criterion. The Iowa Hill site was selected because it would require the least amount of underground construction, it would have the shortest transmission line tie-in, it would have the lowest tunnel length to height ratio, it would create least disturbance to recreational use, and because Slab Creek is not drawn down in the winter months, the site can provide year-round capacity.

After reviewing the criteria and alternative sites considered by SMUD in its analysis, we find the analysis to be reasonable from both business and operations perspectives. To economically and efficiently provide SMUD with the flexibility necessary to meet peak demand periods, the pumped-storage facility needs to be near its reservoir and distribution system. The Iowa Hill location meets those criteria.

2.5 PG&E'S PROPOSAL

2.5.1 Proposed Project Facilities

PG&E does not plan any changes to the Chili Bar Project facilities. The Project would continue to be operated as it has been in the past with modifications only as needed to complete maintenance activities.

2.5.2 Proposed Operations

PG&E does not plan any changes to the operation of the Chili Bar Project. The Project would continue to be operated as it has been in the past, with modifications only as needed to implement any resource management measures that are adopted as conditions of the new license.

2.5.3 Proposed Environmental Measures

PG&E proposes a comprehensive set of measures covering the full range of resources in the SFAR Basin. Table 2-4 summarizes those proposed measures under the Settlement Agreement.[23]

Table 2-4. Proposed environmental measures for the Chili Bar Project under the Settlement Agreement. (Source: SMUD and PG&E, 2007)

Article	Measure	Elements
2-1	**Minimum Streamflows**	Maintain minimum streamflows in the SFAR below Chili Bar dam provided inflow to the Project is sufficient within 3 days of determining base water year types and operations consistent with the DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. The minimum streamflow schedule, the specific factors to be applied, and the compliance point for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*.
2-2	**Ramping Rates**	Implement upramping rates for licensee-controlled streamflow releases of 500 cfs per hour for flows between 150 and 1,000 cfs and 1 foot per hour for flows between 1,000 cfs and 1,950 cfs. Implement downramping rates of 1 foot per hour for flows between 1,950 and 1,000 cfs, 500 cfs per hour for flows between 1,000 cfs and 600 cfs and 250 cfs for flows between 600 cfs and 150 cfs provided that inflow to the Project is sufficient.
2-3	**Coordination with UARP License**	Develop and implement a plan to coordinate operations with the licensee of the UARP to enable PG&E to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects.

[23]The precise wording of the measure summaries in this table differs from the specific language of the Settlement Agreement. Individual measures (Proposed Articles in the Settlement Agreement) include programmatic elements for scheduling and developing plans, monitoring, evaluation, and reporting that are not listed in this table. Characterizations of these measures are primarily the result of our attempt to provide a concise summary of the measures for this draft EIS and are not intended to modify any of the terms of the Settlement Agreement.

Article	Measure	Elements
2-4	**Monitoring Program**	**General Monitoring Program Requirements**
		Implement the monitoring program in coordination with SMUD after license issuance and through the term of the new license and any annual licenses, in coordination with the Agencies. Monitoring may be reduced or terminated at any time if the relevant ecological resource objective(s) have been met or no changes in resource response(s) are expected. Monitoring plans for heritage resources would be described in the HPMP.
		File with the Commission by June 30 of each year an annual monitoring report fully describing the monitoring efforts and results of the previous calendar year. The Agencies have at least 30 days to review and comment on the draft monitoring report prior to filing with the Commission.
	1. Fish Population	Develop a plan to (a) monitor rainbow and brown trout fish populations by electrofishing and/or snorkeling at SFAR below Chili Bar dam and note any hardhead detected.
	2. Aquatic Benthic Macroinvertebrate Monitoring	Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at SFAR below Chili Bar dam
	3. Amphibian and Reptile Monitoring	Develop a plan to monitor the foothill yellow-legged frog, western pond turtle, and California red-legged frog in the SFAR below Chili Bar dam (entire reach from CB-AI5 to Ponderosa Campground on right and left banks).
	4. Riparian Vegetation Monitoring	Develop a plan to conduct aerial photo flights and Greenline method at the 5 intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community.
	5. Water Temperature	Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 4 locations in the SFAR immediately below Chili Bar dam, upstream of Dutch Creek confluence, upstream of Camp Lotus, and upstream of Greenwood Creek and monitor stream temperatures from March 15 to October 15 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies.

Article	Measure	Elements
	6. Water Quality	Develop a water quality monitoring plan addressing the water quality monitoring elements listed below, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. **Water Chemistry Monitoring**—Conduct a water chemistry sampling program using EPA standard methods designed to demonstrate seasonal conditions at all reservoir and stream locations described in the Project No. 2101/2155 relicensing *Water Quality Study Plan* (Plenary approval, January 8, 2003). Conduct laboratory analyses using EPA standard methods adequately sensitive to detect constituent levels for determination of compliance with recognized state and federal criteria. Sample in situ physical parameters (pH, water temperature, DO, specific conductance, and turbidity) at representative locations in the SFAR downstream of the Chili Bar reservoir and as vertical profiles collected at 1-meter intervals from surface to bottom in the reservoir. Collect general chemistry samples of minerals, nutrients, metals (total and dissolved fractions), measured hardness, and petroleum products from Chili Bar reservoir and at a minimum of three representative sites along the SFAR between Chili Bar dam and the confluence of Greenwood Creek. Collect samples at the surface and near the bottom at multiple, representative locations in the reservoir. The details for the locations and frequency of monitoring are provided in table 3-28. **Bacterial Monitoring**—Conduct bacterial monitoring consistent with *Basin Plan* objectives for protection of the REC-1 beneficial uses annually, at a minimum of 8 shoreline recreational locations within the Project boundary that have swimming and other water contact recreational activities in the area and sources for potential introduction of pathogens to the water column in the immediate vicinity for the first 5 years after license issuance. Continue annual monitoring if data demonstrates bacterial concentrations present risks to human health at specific reservoir(s) or riverine sites, through the life of the license. **Metals Bioaccumulation Monitoring**—Collect resident fish tissue samples from Chili Bar reservoirs to analyze for rates of bioaccumulation and tissue residue levels of mercury, copper, lead, and silver using target fish species, numbers of individuals, sampling strategy, and analytical methods that are consistent with current *Surface Water Ambient Monitoring Program*.

Article	Measure	Elements
		Algae Monitoring—Monitor for didymosphenia genimata in conjunction with the annual water quality monitoring in the SFAR downstream of Chili Bar dam.
2-5	**Adaptive Management Program**	Implement in coordination with SMUD an adaptive management program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Proposed Article 2-5, *Adaptive Management Program*), and specific adaptive management measures. Conduct monitoring to determine if the applicable ecological resource objectives are achievable and being met. Implement adaptive management if the monitoring program and other scientific information indicate that it is likely the applicable ecological resource objectives identified in the Rationale Report (CDFG, 2007), will not be met without adaptive management changes. Annually review the coordinated operations and determine the need for placement of sediment downstream or dredging based on geomorphology monitoring (Proposed Article 2-6, *Sediment Management Plan*)
2-6	**Sediment Management Plan**	Develop a geomorphology monitoring plan in coordination with SMUD include be profile measurements at three cross-sectional transects, longitudinal profiles, substrate composition, and other geomorphic properties three sampling sites (CB-G1, CB-G2 and CB-G3) to be performed every 5 years.
2-7	**Large Woody Debris**	Ensure, provided conditions permit safe and reasonable access and working conditions, that mobile instream large woody debris in Chili Bar reservoir, including at a minimum, all sizes greater than 20 centimeters wide and 12 meters in length, continues downstream beyond Chili Bar dam using reasonable means that include short-term spill flows at the dam and shall be allowed to continue downstream beyond the dam.
2-8	**Streamflow and Reservoir Elevation Gaging**	Develop and implement a streamflow and reservoir elevation gaging plan that meets USGS standards and approved by the Water Board at a minimum addressing compliance gaging at SFAR below Chili Bar dam (existing USGS gage no. 11444500 or its successor) and in the Chili Bar reservoir
2-9	**Wildlife and Plant Protection Measures**	**TES and Special Status Species Review**—Annually review the current list of special status plant and wildlife species (federal ESA or BLM sensitive) and if species are added, determine if the species or un-surveyed habitat for the species might occur on BLM lands and if so, develop and implement a study plan to assess the effects of the Project on the species.

Article	Measure	Elements
2-10	**Invasive Week and Vegetation Management Plan**	**Invasive Weed Management**—Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations.
		Vegetation Management—Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed.
2-11	**Annual Review of Ecological Conditions**	Annually schedule and facilitate a meeting with the Agencies and BLM to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year.
2-12	**BLM Liaison**	Provide an individual for liaison with the BLM whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place on BLM lands with the Chili Bar Project boundary.
2-13	**BLM Recreation Improvements**	Construct (1) a gravel parking area for three to four vehicles off Rock Creek Road, (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir, (3) a kiosk sign along the trail near the beginning, explaining the rules of the area, and (4) one picnic table of coated wire mesh material will be provided in a leveled out area that is outside of the floodplain.
2-14	**Public Information Services**	Provide in coordination with the UARP licensee (1) real-time lake stage height and storage information for Chili Bar reservoir, installation of up to two simple staff gages for use by public, real-time streamflow and reservoir level information via a toll-free telephone number and web site, and collection of streamflow information consistent with the standard USGS gaging practices for the existing stream gage facilities downstream of Chili Bar reservoir dam ; and (2) in coordination with the UARP licensee pay BLM $15,000 annually for BLM to provide a Project recreation brochure/map that describes the recreational opportunities, facilities, rule, and responsibilities for the Project area; and an interpretive, education, and public information plan.

Article	Measure	Elements
2-15	**Recreational Streamflows**	Based on the determination of water year type, provide recreational streamflows (1) in the SFAR below Chili Bar dam provided that inflows to the Project are sufficient. The specific recreation streamflow schedule is described in detail in section 3.3.6.2, *Recreational Resources, Whitewater Boating.*
2-16	**Visual Resource Protection**	Meet every 5 years with BLM to review opportunities to improve how well Project facilities blend in with the surrounding landscape, during planning and prior to any new construction or maintenance of facilities that have the potential to affect visual resources on BLM lands (including but not limited to the recreation-related construction), the licensee prepare and implement an plan for the protection and rehabilitation of BLM visual resources affected by the Project.
2-17	**Heritage Resources**	Develop and implement an HPMP that would be incorporated into the PA by reference.
2-18	**Heritage Resource Discovery**	Immediately cease work and notify BLM and not resume work until BLM provides written approval if, prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on BLM lands and licensee adjoining property, and perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by BLM.
2-19	**Reservation of Authority under Section 18**	PG&E recognizes the NMFS and Interior right to reserve authority to prescribe the construction, operation, and maintenance of fishways at the Project, including measures to determine, ensure, or improve the effectiveness of such fishways.
2-20	**BLM Reservation of Authority under Section 4(e)**	Under the separate off-license Recreation Payment Agreement filed as appendix 6 to the Settlement Agreement for information purposes only, make a one-time payment to BLM of $30,000 and annual payments of $30,000, as annually adjusted based on the GDP-IDP with 2007 as the base year, on or before October 1 of each year during the term of the license and all annual renewals thereof.
2-21	**Implementation Schedule**	Develop and implement an implementation plan that includes (1) a schedule for implementing the articles in any license issued for the Project; (2) a schedule for filing the plans and related documents in Proposed Articles 2-1 through 2-21; and (3) documentation of consultation with the Consultation Group.

2.5.4 Project Boundary

PG&E proposes to revise the Project boundary. The existing Project boundary includes all the land PG&E owns ranging from about 50 to 250 feet from either side of the river and starting about 320 feet downstream of the Project dam to about 3.2 miles upstream of the Project dam. The proposed Project boundary would be at the normal maximum water surface elevation at 997.5 feet mean sea level. The proposed Project boundary would enclose all Project works including the Chili Bar dam and downstream tailrace, intake structure, powerhouse, switchyard, access roads, stream gage, and reservoir. In addition, the proposed Project boundary would include a 12-foot-wide corridor for a new proposed hiking trail (Sand Bar Trail) to provide public access to the reservoir shoreline. PG&E also proposes to revise the Project boundary to avoid conflicts with the UARP licensee's future Slab Creek reach boating take-out in the vicinity of White Rock powerhouse.

2.6 UPPER AMERICAN RIVER PROJECT-ONLY ALTERNATIVE

Under the UARP-only Alternative, all components of SMUD's Proposed Action would be in place except those dealing with the addition of the 400-MW Iowa Hill development. SMUD would operate the existing UARP facilities in a manner identical to SMUD's Proposed Action, except that the increased frequency of water level fluctuation at Slab Creek reservoir described under the Proposed Action would not occur. The weekly range of Slab Creek reservoir water level fluctuations under this alternative would be the same as the Proposed Action. The release schedule for the Project dams would be the same as SMUD's Proposed Action. Thus, the quantity of water stored in Project reservoirs (with seasonal and daily changes) and the volume of water passing through Project reaches would be the same as the Proposed Action. All environmental measures contained in the Proposed Action would occur except for those pertaining to the Iowa Hill development, and the potential impacts associated with construction and operation of the Iowa Hill development would not occur. If the Iowa Hill development were not constructed and the recreational triggers are met in year 15, SMUD proposes to make physical modifications to the White Rock tunnel to provide enhanced recreational boating flows downstream of Slab Creek reservoir.

2.7 MODIFICATIONS TO APPLICANTS' PROPOSALS

2.7.1 Water Quality Certification

SMUD and PG&E (applicants) applied for section 401 Water Quality Certification for their Projects on September 22 and 18, 2006, respectively, following the Commission's notice for final terms and conditions (UARP) and Ready for Environmental Analysis notice (Chili Bar) on July 28, 2006. In its letters filed with the Commission on March 30 and April 10, 2007, the Water Board requested that SMUD and PG&E, respectively, amend their applications for Water Quality Certification to bring the requests into consistency with the provisions of the Settlement Agreement. In response to the Water Board's request, PG&E simultaneously withdrew its application for Water Quality Certification and submitted a new application for Water Quality Certification in a letter dated May 1, 2007, that was acknowledged as received by the Water Board on May 22, 2007. SMUD withdrew its application for Water Quality Certification on September 6, 2007, and resubmitted its application on October 23, 2007. Therefore, state action on the Water Quality Certifications will be required before October 22, 2008, for the UARP and before May 1, 2008, for the Chili Bar Project. If the state does not act on the two applications by these dates, respectively, certification of the two Projects will be deemed waived.

2.7.2 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as the Secretaries of the U.S. Departments of Commerce (NMFS) and Interior (through FWS) may prescribe. NMFS, by letter filed on October 18, 2006, and Interior, by letters filed on October 17, 2006, and January 31, 2007, reserved this authority.

2.7.3 Section 4(e) Federal Land Management Conditions

Section 4(e) of the FPA states that the Commission may issue a license for a Project on a federal reservation only if it finds that the license will not interfere or be inconsistent with the purpose for which the reservation was created or acquired. Such a reservation includes, without limitation, Forest Service- and BLM-administered land. Section 4(e) of the FPA requires that a Commission license for a Project located on a reservation include the conditions that the Secretary of the department under whose supervision the reservation falls deems necessary for the adequate protection and utilization of such reservation.

The Forest Service filed preliminary 4(e) conditions on October 18, 2006, and revised preliminary conditions on January 30, 2007, for the UARP. Interior, on behalf of FWS and BLM, filed preliminary 4(e) conditions on October 17, 2006, and revised preliminary 4(e) conditions on January 31, 2007, for both the UARP and the Chili Bar Project. Both agencies state that their revised preliminary 4(e) conditions are intended to be consistent with the Settlement Agreement. Interior, on behalf of BLM, filed only standard general conditions and its filing did not include any Project-specific conditions for either Project.

In its revised preliminary conditions for the UARP, the Forest Service put into italics the portions of its conditions that the Forest Service determined to be outside its jurisdiction, but indicated that the Forest Service fully supports the italicized wording and recommends it be included in any licenses issued for the Projects. The italicized wording is found in the Project-specific conditions and pertains generally to all references to consultation with other agencies and specifically to: (1) locations that are not within or adjacent to the Eldorado National Forest, including monitoring the foothill yellow-legged frog in Rock Creek (condition no. 31, item 3), and maintenance under transmission lines in the Pine Hill Rare Plant Preserve (condition no. 38); or (2) issues that are under the purview of other agencies, including water temperature monitoring (condition no. 31, item 9), water quality (condition no. 31, item 10), adjustments to the Project boundary to include all Project recreational facilities (condition no. 44), fish stocking in Loon Lake, Union Valley, and Ice House reservoirs (condition no. 52), reservation of authority under section 18 of the FPA (condition no. 61), and BLM reservation of section 4(e) authority (condition no. 62).

Because the revised preliminary conditions filed by the Forest Service and Interior are consistent with the provisions of the Settlement Agreement, we discuss these terms and conditions in the context of our discussions of the Settlement Agreement measures throughout this EIS

2.7.4 Section 10(j) Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the Project.

Section 10(j) also states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purpose and the requirements of the FPA or other applicable laws, the Commission and agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibility of the agency.

In response to the Commission's Ready for Environmental Analysis notice issued on July 28, 2006, Interior (on behalf of FWS), CDFG, and NMFS filed comment letters that included section 10(j) recommendations.[24] Interior and CDFG, parties to the Settlement Agreement, filed revised 10(j) recommendations on January 31, 2007, that are consistent with the Settlement Agreement. NMFS did not file revised 10(j) recommendations. We discuss the 10(j) recommendations in the context of our discussion of the Settlement Agreement measures throughout the EIS.

2.7.5 Proposed Action with Staff Modifications (Staff Alternative)

After evaluating the Proposed Actions, including the terms and conditions filed pursuant to section 4(e) of the FPA, and other recommendations from resource agencies and interested entities under section 10(a) and 10(j) of the FPA, we considered what, if any, additional measures may be necessary or appropriate for the continued operation of the UARP and Chili Bar Project.

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[24]NMFS letter filed October 18, 2006, Interior (FWS) letter dated October 17, 2006, and CDFG letters dated October 16, 2006.

UARP

In addition to the applicant's proposed Project-related environmental measures for UARP, the Staff Alternative includes provisions to:

- file a report with the Commission by July 31 of each year stating the dates when the pulse flows were provided or an explanation of why they were not provided;
- prepare a Gerle Creek fish passage plan for brown trout with measures to maintain the Gerle Creek reservoir at an elevation sufficient to provide fish passage into Gerle Creek from August 1 through October 31;
- expand the geographic scope of the invasive weed and vegetation management plans to cover all land within the Project boundary affected by Project activities;
- include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats;
- prepare a transportation system management plan for roads on or affecting National Forest System lands and non-National Forest System roads that are primarily used for Project purposes and within the Project boundary;
- prepare a plan for extending and formalizing trails primarily used for Project operations that are located on or affect National Forest System lands and are located or would be located within the Project boundary;
- prepare a wildlife lands mitigation plan for construction of the Iowa Hill development; and
- provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 if environmental and use triggers are met.

Chili Bar Project

In addition to the applicant's proposed Project-related environmental measures for the Chili Bar Project, the Staff Alternative includes provisions to:

- expand the geographic scope of the invasive weed and vegetation management plans to cover all land within the Project boundary affected by Project activities.
- include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats.
- develop and implement a recreation plan.

2.8 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

We propose eliminating the following alternatives from detailed study in the EIS.

2.8.1 Federal Government Takeover

We do not consider federal takeover to be a reasonable alternative. Federal takeover of the Projects would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed an interest in operating the UARP or Chili Bar Project.

2.8.2 Nonpower License

A nonpower license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. At this time, no governmental agency has suggested a willingness or ability to takeover the Projects. No party has sought a nonpower license, and we have no basis for concluding that the UARP and Chili Bar Project should no longer be used to produce power. Thus, we do not consider a nonpower license a reasonable alternative.

2.8.3 Project Retirement

Retiring the Projects would require denying SMUD and PG&E's license applications and require the surrender and termination of the existing licenses with any necessary conditions. The Projects would no longer be authorized to generate power. Retiring the Projects would involve significant cost and would foreclose any opportunity to add environmental enhancements to the existing UARP or Chili Bar Project. For these reasons, we do not consider Project retirement to be a reasonable alternative.

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3.0 ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the Project vicinity and any environmental resources that could be cumulatively affected by relicensing the UARP and Chili Bar Project. Then, we address each affected environmental resource. For each resource, we first describe the affected environment—the existing condition and the baseline against which to measure the effects of the proposed Project and any alternative actions—and then the environmental effects of the proposed Project, including proposed articles included in appendix 1 and 2 of the Settlement Agreement for the UARP and Chili Bar Project, respectively. Unless otherwise stated, the sources of our information are the license applications for the Projects (SMUD, 2005; PG&E, 2005).

3.1 GENERAL DESCRIPTION OF THE RIVER BASINS

3.1.1 Rubicon River

The Rubicon River originates near Clyde Lake in the Desolation Wilderness. Upstream of UARP's Rubicon reservoir, the major tributary on the Rubicon River is Phipps Creek. From its headwaters, the Rubicon River flows generally north to Rubicon reservoir, then northwest to the mouth of the Little Rubicon River, and to Placer County Water Agency's 209,000 acre-foot Hell Hole reservoir. The Rubicon River flows westerly from the Hell Hole reservoir until it joins the Middle Fork American River, then to the North Fork American River near Auburn, California. This confluence forms the main stem of the American River. Besides the main stem of Rubicon River on which Rubicon dam is located, UARP facilities are located on three tributaries to the Rubicon River: Little Rubicon River (Buck Island dam), Gerle Creek (Loon Lake and Gerle Creek dams), and the SFRR (Robbs Peak dam).

The Little Rubicon River headwaters originate near Highland Lake in the Desolation Wilderness. Highland Creek is the major tributary to the Little Rubicon and generally flows north to Rockbound Lake and then to Buck Island reservoir. Upstream of Buck Island reservoir lay the natural Rockbound and Highland lakes. From Buck Island reservoir, the Little Rubicon flows generally northwesterly to its mouth at the Rubicon River.

3.1.2 Silver Creek

The Silver Creek headwaters originate in the Desolation Wilderness at the confluence of Tells, Big Silver, and Jones Fork Silver creeks at Union Valley reservoir. From the reservoir, Silver Creek flows generally southwesterly to its terminus at the SFAR. Major tributaries of the Silver Creek downstream of Union Valley reservoir include SFSC, Little Silver, Onion, Jaybird Canyon, and Round Tent Canyon creeks. Three UARP facilities occur along the main stem of Silver Creek: Union Valley, Junction, and Camino dams. One UARP facility, Ice House dam, is located on the SFSC, a tributary to Silver Creek. The SFSC headwaters also originate in the Desolation Wilderness and flow generally westerly and northerly to Silver Creek Junction reservoir. Major tributaries of the SFSC include Lyons and Peavine creeks and Big Hill Canyon. No reservoirs occur on the SFSC upstream of Ice House dam.

3.1.3 South Fork of the American River

SFAR headwaters originate in the Crystal Range and flow generally westerly to its terminus at the American River at Folsom Lake. Major tributaries of the SFAR above Slab Creek dam include Pyramid, Strawberry, Alder, Silver, Brush, and Slab creeks and the Silver Fork American River. Downstream of Slab Creek dam, Rock and Iowa Canyon creeks are the primary tributaries. UARP facilities are located on the Brush Creek and in the Silver Creek watershed. The headwaters of Brush Creek originate near Little Sugar Pine Mountain and then flow generally southwesterly to the SFAR at Slab Creek reservoir. No reservoirs occur on Brush Creek upstream of Brush Creek reservoir.

3.2 CUMULATIVELY AFFECTED RESOURCES

According to the Council on Environment Quality's regulations for implementing NEPA (§1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, to include hydropower and other land and water development activities. Resources that could be affected cumulatively by continued operation of the UARP and Chili Bar Project, and construction of the Iowa Hill development, in combination with other activities in the SFAR Basin, include sediment supply; water quality; water temperature; aquatic resources including fisheries, benthic macroinvertebrates, and amphibian populations; botanical resources; and recreation.

3.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the Projects' effects on resources. The geographic scope is defined by the physical limits or boundaries of (1) the UARP's and Chili Bar Project's effects on the resources, and (2) the contributing effect from other hydropower and non-hydropower activities. In this case, the overall scope of analysis for the potentially cumulatively affected resources encompasses the SFRR from the upstream influence of the Rubicon reservoir downstream to the confluence with the SFAR and then downstream to Folsom Lake. Additionally, the geographic scope of the recreation analysis for the UARP encompasses the Eldorado National Forest.

UARP operations, in conjunction with Chili Bar Project operations, interact in a cumulative sense. The operation of the UARP 7.5 miles upstream controls the waters that flow into the Chili Bar Project. Therefore, the waters in the 19.1-mile reach downstream of the Chili Bar dam are controlled mainly by the UARP but also by Chili Bar Project operations

3.2.2 Temporal Scope

The temporal scope of the cumulative effects analysis in the EIS includes past, present, and reasonably foreseeable future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion is, by necessity, limited to available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Geological resources in the vicinity of the Projects that could be affected by the Proposed Actions include the reservoir shorelines, channel attributes of the 12 river reaches (totaling 81 river miles, excluding reservoirs), the extent and quality of large woody debris within those channels, and selected upland watershed areas, mostly related to recreation and roads.

Geology

The rocks of the UARP area are part of the Sierra Nevada metamorphic belt, a 200-mile-long, northwest-trending belt that makes up the western foothills of the Sierra Nevada Mountains. The geology within and surrounding the UARP can be divided into two general categories in relation to the location of Union Valley reservoir, which is about mid-elevation within the Project area. Reservoirs upstream of Union Valley reservoir are underlain primarily by the Sierra Nevada batholith,[25] which is of Mesozoic age – about 80 to 130 million years old. Downstream of Union Valley reservoir, reservoirs are chiefly underlain by older sedimentary rocks deposited 350 to 400 million years ago. The dominant rocks in this category are quartzite, schists, crystalline limestone, and dolomite. These rocks underlie most of the lower watershed area and are capped by volcanic rocks formed about 2 to 24 million years ago. Except for the main

[25] A batholith is an exposed area of mostly continuous plutonic (granite) rock that covers an area larger than 100 square kilometers. The Sierra Nevada batholith is a continuous granitic formation that forms much of the Sierra Nevada in California.

stem SFAR, which cuts a gorge across the rock formations, all high-order streams in the Project area have developed deep canyons only in the sedimentary rock reaches.

The geology in the area of the proposed Iowa Hill development includes the northwest flank of Iowa Hill (situated above the east shore of Slab Creek reservoir) and the surrounding area. The Iowa Hill area is underlain by bedrock shown on state geologic maps as consisting of undifferentiated Paleozoic rocks. More specifically, the proposed site of the Iowa Hill development is located within the eastern metamorphic terrane of the Sierra Nevada Mountains. This terrane, known as the Shoo Fly Complex, is bound on the east by rock of the Sierra Nevada batholith, and on the west by the Melones fault (northern branch) and the Calaveras-Shoo Fly thrust fault. Rocks in this terrane originally consisted of sand and clay probably deposited on the slopes of the continental margin during early Paleozoic time.

Regional Faulting and Seismicity

The proposed Iowa Hill development lies in central California, an area that has historically experienced relatively low seismic activity. Most seismic activity in the region is concentrated in the region from the northwest to the east and southeast of Lake Tahoe, as well as the area immediately south of Lake Oroville. According to the California Geological Survey, no active or potentially active faults pass through or near the site of the proposed Iowa Hill development.

Five faults or fault systems within a 62-mile radius of the proposed Iowa Hill site are active. The North Tahoe fault and the Genoa fault are located 38 miles northeast and 47 miles east of the proposed site, respectively. Neither of these has produced an earthquake of magnitude 5.0 or greater in known history, but the Genoa fault is believed to be capable of producing an earthquake with a moment magnitude[26] of 6.9. The remaining three faults or fault systems are described in the following section.

The Truckee fault is about 10 miles long and is located about 50 miles northeast of the Iowa Hill site. A 1966 earthquake associated with the fault registered a magnitude of 6.0. Most of the Foothills fault system, approximately 7 miles southwest of the Iowa Hill site, is inactive; however, there are potentially active portions of this fault system across the Bear Mountain and Melones fault segments that are capable of producing an

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[26]The moment magnitude scale is a successor to the Richter scale and is used by seismologists to compare the energy released by earthquakes. The constants used in the equation to determine moment magnitude are chosen so that estimates of moment magnitude roughly agree with estimates using other scales such as the Richter magnitude scale. One advantage of the moment magnitude scale is that, unlike other magnitude scales, it does not saturate at the upper end—e.g., there is no particular value beyond which all large earthquakes have about the same magnitude. For this reason, moment magnitude is now frequently used to estimate large earthquake magnitudes.

earthquake with a maximum moment magnitude of 6.5. The Cleveland Hill fault segment, a portion of the Foothills fault system (located about 60 miles northwest of the proposed site), ruptured in 1975, triggering the Oroville earthquake that registered 5.7 on the Richter scale.

The Dunnigan Hills fault is located about 62 miles west of the proposed site, and is about 12 miles long. Historically, no earthquakes of magnitude 5.0 or greater have occurred on the Dunnigan Hills fault; however, it is believed that this fault is capable of generating a maximum credible earthquake with a moment magnitude of 6.5.

Other faults and fault systems within a 62-mile radius of the proposed site are considered to be potentially active. The Maidu fault and an unnamed east-dipping fault that is located near the community of Rescue are both about 14 miles west of the proposed site. They both show evidence of prehistoric displacements, though not historic displacements. As described above, they are both part of the Bear Mountains Fault Zone within the Foothills fault system. SMUD reported that "an assumed maximum credible earthquake of 6.5 magnitude occurring on the most easterly, possibly active strand of the Bear Mountains fault zone (also referred to as the Rescue fault)…represents the potential earthquake that would give rise to the most severe ground motion at…Slab Creek Dam." According to SMUD, the maximum peak ground acceleration expected at Slab Creek dam resulting from the maximum credible earthquake on this fault is 0.30 g (horizontal ground acceleration).

Unnamed faults near the community of Volcanoville and Jenkinson Lake also show evidence of prehistoric displacements, though not historic displacements. The unnamed normal fault near Volcanoville is located about 12 miles north-northwest of the proposed Iowa Hill development. Two additional unnamed faults, one on the east side and one on the west side of Jenkinson Lake, are located about 7 miles east-southeast of proposed site.

The geology within and downstream of the Chili Bar Project area is similar to that described above for the areas downstream of Union Valley reservoir. The geology of the SFAR from the confluence with Rock Creek (just upstream of Chili Bar reservoir) to Folsom Lake includes granite rocks and sedimentary rocks that have recrystallized over time. As the SFAR flows through the town of Coloma, it also passes through a granite inclusion from the Sierra Nevada batholith before changing back to the Calaveras Complex geology. Serpentine rock masses also occur where the SFAR enters into Folsom Lake.

Reservoir Shorelines

The shorelines of the UARP reservoirs exhibit a wide range of characteristics, owing in part to their differing elevations, geologic settings, and reservoir water elevation changes (annually and daily). Studies examining reservoir shorelines focused on warmwater or reservoir-spawning fish species. Buck Island, Rubicon, and Brush Creek reservoirs are generally composed of erosion-resistant rock and do not support warmwater fish species, so were not studied. Camino reservoir, a reregulating reservoir with daily water level fluctuations of up to 15 feet, was also removed from the study because of safety and access constraints; no shoreline erosion data are available for that reservoir.

Gerle Creek and Robbs Peak reservoirs are smaller reservoirs that are largely ringed by either stable vegetation or bedrock/boulders. Gerle Creek reservoir impounds only 1,260 acre-feet and has an average annual water level fluctuation of 9 feet, with an average daily water level fluctuation of 1.5 feet. Robbs Peak reservoir is much smaller, impounding only 30 acre-feet in an on-channel reservoir with bedrock and boulder banks. The average annual water level fluctuation is 5 feet, while the average daily fluctuation is less than 0.5 foot. Shoreline erosion on these two reservoirs is minimal.

Table 3-1 shows information on the shorelines of the remaining five reservoirs in the UARP. Changes in operations are not proposed or recommended that would affect average water surface level fluctuations and reservoir shoreline erosion except for development of Iowa Hill, which would affect the frequency of water level fluctuations in Slab Creek reservoir but not the weekly range of fluctuations.

Chili Bar reservoir shoreline has very little erosion. Emergent vegetation is present on 94 percent of the shoreline although more than 80 percent of the shoreline is steeply (30 to 45 percent) sloped. The shoreline is mostly composed of sand-silt substrate. Data on daily fluctuations (based on 2002 hourly data) shows an average of 4.2 feet of fluctuation, and a maximum of 7 feet.

Reservoir Sedimentation

No issues regarding reservoir sedimentation were identified during scoping, so no studies were conducted during relicensing to consider loss of reservoir storage or other sedimentation effects on UARP operations. However, sources of sediment and potential future erosion were identified.

Upland Erosion and Sediment Sources

SMUD investigated erosion caused by the use of the approximately 104 Project roads (see section 3.3.7, *Land Use*) including: (1) main access roads that are paved and have structured drainage systems, (2) transmission line maintenance roads, and (3) unpaved surface roads that are near water bodies. The study concluded that main roads, which are paved, and transmission line maintenance roads, which are rarely used and tend to be located farther away from shorelines, contribute insignificant amounts of sediment supply or erosion to the Project waters. Unpaved roads contribute some sediment, but the amount is insignificant relative to the capacity of the Project water bodies, and these roads have both higher usage and better maintenance. Project owners and local agencies maintain the roads and drainage features to prevent sediment runoff from entering streams and reservoirs.

Table 3-1. Reservoir shoreline data within the UARP. (Source: SMUD, 2005)

Reservoir	Shoreline Slopes (%)	Shoreline Substrate (%)	Emergent Vegetation (% of shoreline)	Shoreline Erosion (%)	Average Annual Water Level Fluctuation		Notes
					Annual	Daily	
Loon Lake	Flat to moderate (0–5 to 10–30)	Bedrock and boulder (approx. 70)	(65) covered	Mild erosion (2)	43.6 feet	NA	Loon Lake is part of a storage reservoir that experiences gradual changes in water surface elevation
Union Valley	Gradual to steep (5–10 to 30–44)	Sand and silt dominant; some boulder and bedrock	NA	Mild erosion (80); significant erosion (> 14)	60 feet	< 0.5 foot	Mild erosion is largely a slow, progressive shoreline retreat. Slumping also occurs along a peninsula.
Ice House	Moderate to steep (10–29 to 30–44)	Sand and silt dominant; some cobble and boulders	(5) covered	Mild erosion (74); remainder stable	37 feet	NA	NA
Junction Reservoir	Steep (30–45) to over 45	Bedrock and cobble (85)	(6) covered	Mild erosion (1)	NA	20 feet	Junction reservoir is a re-regulating reservoir with frequent daily water level elevation changes.
Slab Creek	Steep (30–45) to over 45	Bedrock (> 70)	(> 50) covered	Mild erosion (18); significant erosion (< 1); remainder stable	30 feet	6 feet	Slab Creek reservoir is in a steep canyon, contributing to its frequent water surface elevation changes

Spoil Piles

SMUD investigated the stability of the three piles in the Project boundary that could erode and add sedimentation in the channels and reservoirs: the Jaybird Tunnel Adit spoil pile, the Camino Tunnel Adit spoil pile, and the White Rock Tunnel Adit No. 2 spoil pile. They are upslope of the waterways within the Junction dam reach, the Camino dam reach, and the Slab Creek dam reach, respectively. The material has historically been used for roadway maintenance.

All three piles show no signs of erosion and exist in stable angles of repose. The first two piles are mostly covered with rock and therefore are not susceptible to erosion from normal rainfall. They are also surrounded with diversion ditches to prevent runoff from causing erosion by mobilizing the piled material. Also, the UARP relicensing water quality study (see section 3.3.2, *Water Resources*) did not detect any elevated levels of chemical or foreign substances that might have leached from the piles.

Bathymetry studies indicate that total storage in Chili Bar reservoir has been reduced by 1,011 acre-feet, and useable storage (storage between the spillway crest and the preferred operating minimum) has been reduced by 252 acre-feet. About 13 percent of the annual or long-term incoming sediment load is trapped in the Chili Bar reservoir, and the remaining 87 percent is passed downstream. Based on observations made at the upstream end of the reservoir and the upstream face of the dam during valve maintenance activities, it appears that most particles greater than 2 millimeters (mm) settle out, while particles being transported downstream are virtually all fine material (less than 2 mm).

Stream Channel Morphology

In general, the channel beds within the reaches comprise a veneer of cobble, with numerous boulders and small amounts of gravel and sand overlying bedrock. The channels are typically narrow and located within bedrock-controlled canyons of moderate to steep slopes. Sections of channel with changing silt and sand deposits are the exception and occur in isolated reaches defined by topography.

Generally, very little fine sediment occurs in the stream channel or in the pools, although small pockets of fine sediment are deposited behind large flow obstructions and in low-velocity zones along the channel margins. Sections of stream channels that are relatively resilient and insensitive to changes in flow and/or sediment supply are termed “transport reaches” or “transport segments.” Channel character in these transport sections is primarily controlled by bedrock geology and coarse boulder substrate emplaced largely by processes such as glaciers. In these channels, the available capacity of the stream to transport sediment is greater than the local sediment supply, and most sediment supplied to the channel is transported downstream while coarser material (e.g., cobbles and boulders) remains either as a result of size (boulders) or local hydraulic conditions (gravels upstream of local in-channel or channel margin obstructions).

Because the channel morphology is essentially unrelated to the supply of sediment, any net loss in sediment supply from Project operations is less likely to have any morphologic significance.

Transport channel types dominate much of the stream reaches. Eight of the eleven UARP reaches (Rockbound dam, Buck Island dam, Gerle Creek dam, Junction dam, Camino dam, SFAR dam, Slab Creek dam, and Brush Creek dam)[27] are considered transport sections of stream throughout the entire length of each reach.

Response sections of streams, in contrast to transport sections, contain stream channels that are likely to be affected by changes in hydrology or sediment supply. Response sections of stream are generally defined as having channels with low slope (<4 percent); mostly silt, sand, or clay bed and banks (cobble-gravel or finer); and plane bed or pool-riffle characteristics. There are seven sections of channel with response characteristics that occur in four of the stream reaches: three in the Loon Lake dam reach; two in the Ice House dam reach; and one section each in the Rubicon dam reach and Robbs Peak dam reach. These response sections are generally short, between 400 and 1,300 feet long.

Because these seven response sections may be responsive to changes in hydrology and sediment supply, survey sites were established at each section during the relicensing studies to investigate their geomorphic condition. Two response sections exhibited very little effect from the existing hydrology: the Middle Loon Lake dam reach section and the Upper Ice House dam reach section. In these sections, the channel bed, bars, and banks are generally stable; vegetation on the banks is well-established; and fine sediment was not being deposited in areas of slower flow. The other five sections in the Rubicon, Loon Lake, and Ice House dam reaches showed that changes in hydrology could affect the characteristics of their geomorphology.

Rubicon Dam Reach

The 4.2-mile-long Rubicon dam reach on the Rubicon River extends from the base of Rubicon dam downstream to the confluence with Miller Creek, and has a low mean gradient. The entire reach is over 6,000 feet in elevation and drains a glaciated watershed, much of which is designated as federal wilderness, and flows through many sections of exposed granite and steep, confined bedrock chutes. No major tributaries enter this reach. On-the-ground stream mapping shows that bedrock and boulder comprise up to 70 percent of the dominant substrate over the length of the Project reach, indicating that a majority of the stream channel within the reach is transport dominated. The response channel portions of the reach are mostly in a low gradient, 1.9-mile-long segment near Rubicon Springs, a private land parcel owned by parties involved in off-highway vehicle recreation. This section is in a mature conifer forest and contains

[27] These reaches are generally not included in the Project boundaries.

deposits of gravel, sand, and silt with a number of beaver dams present. Studies show movement of the substrate depending on the level of flow, but the section is mostly stable bed, bars, and vegetated banks, and the sediment supply is virtually balanced with the flows.

Loon Lake Dam Reach

The 8.5-mile Loon Lake dam reach on Gerle Creek extends downstream from the base of Loon Lake dam to the normal high water line of Gerle reservoir, and has a mean gradient of about 2.3 percent. Tributaries in this reach include Jerrett, Barts, Dellar, and Rocky Basin creeks. From the Loon Lake reservoir outlet, Gerle Creek flows initially to the west through a wide and swampy valley that is surrounded by moderately sloping and glaciated hillsides. This upstream portion meanders for about 5 miles across the alluvial valley before the bedrock slopes constrict the channel near Wentworth Springs. Below the bedrock constriction, the valley widens and the stream channel is free to meander again through the middle portion of the reach (Neck and Gerle meadows). Before reaching Gerle reservoir, the creek flows through a steeper, lower portion (about 3 miles long) along a contact between granitic rocks and glacial till deposits.

Broad-scale geomorphic characterization (Rosgen Level I [Rosgen, 1996]) suggests 20 percent of the Loon Lake dam reach on Gerle Creek is composed of transport-dominated channel types; the other 80 percent is characterized by response channels. Results from field surveys corroborate this, indicating that sediment, cobble, and fine particles represent more than 50 percent of the substrate of the channel throughout the length of the reach.

The upper response section of Gerle Creek is located 0.5 mile downstream of Loon Lake dam, and it meanders through most of the Project response sections because it lies in a large, unconfined valley with relatively flat topography. There is a constriction at the lower end of this section, where steep bedrock walls confine the channel near Wentworth Springs. Historically, the meadow was probably formed by sediment deposition as a result of the bedrock constriction, causing water storage upstream. This area is still wet during some seasons, but it is likely that the water table is not as high as it was in the past.

The middle response section of Gerle Creek is 2.7 miles downstream of Loon Lake dam, immediately downstream of the confluence with Jerrett Creek, at the head of densely vegetated Gerle Meadow. This section is steeper than the upper response section, median grain sizes are much higher, and the number of bends is significantly lower. Many lateral bars that have bright sediment grains indicate that sediment mobilization likely occurs regularly at moderate flows. Debris jams and numerous pieces of large woody debris create areas of scour and deposition in the channel. In this section, analysis indicates that the sediment would likely mobilize at flows between 149 and 326 cfs. These flows correspond to the 1.5- to 4-year recurrence floods under the existing flow regime, which suggests that sediment and bed transport probably occurs with this frequency. Young vegetation on some of the bars and banks provides evidence of this.

The lower response section of Gerle Creek is 7.5 miles downstream of Loon Lake dam and has discrete pool-riffle sequences. Approximately 30 to 50 percent of the channel area has erosion and deposition at obstructions, bends, and constrictions. Many high-flow side channels and woody debris jams are present well above the streamflow surface elevation along the right bank. Sand deposits are present in low velocity zones behind larger obstructions and along the channel banks. Based on analysis, sediment would likely mobilize in this section at flows between 940 and 1,241 cfs. These flows reflect floods with 4- to 5-year recurrence intervals under the existing flow regime, so bed mobilization would not occur as often as in the middle section. This section is a multi-channel reach so the recurrence intervals for bed mobilization in the main channel would be less frequent because flows are distributed among various channels. The main channel bed is likely to have become more armored than the side channels by the higher flows it carries

Robbs Peak Dam Reach

The 5.9-mile-long Robbs Peak dam reach on the SFRR extends from the base of the Robbs Peak forebay downstream to the confluence with the Rubicon River. It has a mean gradient of about 5.5 percent, although some segments of this reach exceed 8 percent slope. Major tributaries to this reach include Gerle and South creeks. Upstream of the Gerle Creek confluence, the river flows through a glaciated, low-relief landscape, and this area contains the main response segment investigated in this reach. Downstream of the Gerle Creek confluence, the river becomes progressively more entrenched within the surrounding canyon. For the first 2 miles, the river is confined by moderate canyon slopes; then a contact between granitic and more erodible rocks marks a transition from the moderate canyon to a deeper gorge with 1,500-foot walls.

Broad-scale reach characterization of the reach shows that about 85 percent of the length of the reach is composed of transport-dominated channel types, while the other 15 percent is response-type channels. The response section investigated during relicensing is about 0.5 mile downstream of Robbs Peak forebay, within private property just upstream of the confluence of the SFRR and Gerle Creek. Here, the stream enters a broader, low-gradient segment of the reach where willows grow on many bars within the channel area and small conifers grow on recently scoured surfaces and other channel bars. Field observations and pebble counts reflect that finer sediments in the channel are likely stored in this section because of a constriction downstream. Valley topography creates a backwater effect during periods of high flow, which likely causes sediment to be deposited within the section. Local timber harvesting also likely adds to the sediment supply.

Ice House Dam Reach

The 11.5-mile-long Ice House dam reach on SFSC extends from the base of Ice House dam to the normal high water line of Junction reservoir and has a mean gradient of about 1.4 percent. The 1992 forest fire known as the Cleveland Fire created a fire-burned area that covers about two-thirds of the total reach length. The reach is characterized by moderate valley walls that confine the channel to a narrow floodplain. Peavine Creek, Winmiller ravine, and Big Hill canyon are the three major tributaries in this reach. In the first 2 miles below Ice House dam, the creek transitions from a steep canyon into a deeper gorge (near the Silver Creek campground) as the geology changes from granite terrain to deposited finer sediments. For the remainder of its 9.5 miles, the reach is confined to a bedrock valley and maintains an average gradient of 2 percent.

Despite the fact that on-the-ground stream mapping indicates that bedrock and boulder make up over 60 percent of the substrate of this reach, there are also substantial portions of the reach that are response-channel types. In the upper response section that was studied, located 1.5 miles downstream of Ice House dam, the channel is generally plane-bed morphology with some bends and bar formation. Mobilization of the sediment occurs at flows ranging from 185 to 393 cfs, which corresponds to floods with 1.5- to 3-year recurrence intervals under the current regulated flow regime. This indicates that bed material is regularly mobilized, and fresh, newly scoured surfaces are visible along the stream banks. Moderately high levels of sand and fine gravel observed in the section suggest that sediment supply from bank runoff and upstream sources may be greater than transport capacity.

The lower response section studied is located 8.6 miles downstream of Ice House dam in an area that was burned during the Cleveland Fire. A narrow band of riparian vegetation has recovered along the banks. Sediment mobilization in this section occurs at flows ranging from 497 to 775 cfs, which corresponds to floods with 1.5- to 2-year recurrence intervals under the existing flow regime. Bed mobilization therefore occurs frequently; however, because of the fire, fine sediment deposits are visible throughout and channel sediments are highly embedded, with many dull surfaces in the section. Sand covers the channel bed with larger deposits in lower flow areas, behind obstructions, and on the floodplain. Higher depositions of fine sediment and woody debris exist in this channel section compared to other Project reaches.

Camino Dam Reach to the South Fork of the American River Reach

Like the Camino dam and Junction dam reaches, the SFAR reach is characterized by steep valley bedrock walls in a highly confined gorge. The reach is 2.8 miles long and extends from the confluence with Silver Creek to the Camino and El Dorado powerhouses. Relatively little vegetation is present along the channel slopes.

Broad-scale geomorphic characterization of the reach concludes that about 10 percent of the reach is made up of channels with transport-dominated characteristics, while the other 90 percent of the reach is characterized as response channel. However, on-the-ground surveys along a 520-foot segment show that the channel is actually a transport-dominated channel. Like the Camino dam and Junction dam reaches, many boulders and bedrock outcroppings are present that do not mobilize even during high-flow events. Cobble substrate does exist as a veneer, but finer sediments are deposited only in low-flow areas near obstructions and along channel margins. Sediment supply is not greater than transport capacity, so the sediments that do exist do not affect channel morphology. The 1992 Cleveland Fire also affected this area of the watershed, so fine sediments probably increased in supply because of increased erosion in the contributing drainage area. However, no evidence of increased sediment was seen in the channel during on-the-ground surveys of the segment.

Slab Creek Dam Reach

The Slab Creek dam reach is an 8-mile reach extending from the base of the Slab Creek dam and powerhouse to the high-water level of Chili Bar reservoir. In this reach, the SFAR again flows through an area dominated by high-gradient channel segments, bedrock and boulder outcroppings, and steep valley slopes in a highly confined gorge. The valley slopes are also sparsely vegetated.

Broad-scale geomorphic characterization of the reach indicated that 40 percent of the reach is made up of transport-dominated channel segments, while the other 60 percent of the reach is characterized as response segments. An on-the-ground survey investigated a 650 foot portion of the Project reach above the Rock Creek confluence, about 4.6 miles below Slab Creek dam. This portion was originally characterized as a response channel, but the survey indicates that the channel is actually a transport-dominated channel. Like other reaches in the UARP watershed, many boulders and bedrock outcroppings are present that do not mobilize even during high-flow events. Cobble substrate does exist as a veneer, but finer sediments are deposited only in low-flow areas near obstructions and along channel margins. Sediment supply is not greater than transport capacity, so the sediments that do exist do not affect channel morphology. There is no evidence of lateral bar movement.

Chili Bar Dam Reach

The SFAR downstream of Chili Bar dam extends to the normal high water line of Folsom reservoir, falling about 500 feet more than 19.1 miles with an average gradient of about 0.5 percent. From upstream to downstream, tributaries to the SFAR include Dutch Creek, Granite Creek, Jacobs Creek, Greenwood Creek, Hastings Creek, Norton Ravine, and Weber Creek. The reach is differentiated into three subreaches of different character, the upper subreach (Upper Canyon site), the middle subreach (Upper and Lower Coloma sites), and the lower subreach (Gorge site). The upper and lower subreaches are characterized by higher channel gradients that create flowing rapids, steeper canyon walls, and fewer deposits of finer material. They are generally bounded by bedrock and boulders, with alluvial deposits only in areas of lower flow. In contrast, the middle subreach channel is wider, more sinuous, and more gently sloping floodplains and channel gradients. Some areas of it were not studied because dredging, associated with gold mining activities, has artificially deepened the channel and altered substrate characteristics.

Broad-scale geomorphic characterization indicates that the reach is dominated by transport sections, where sediment transport capacity does not exceed fine sediment supply. On-the-ground survey confirms this, as fine sediment deposits are not visible in main channel flow areas; only cobble substrate exists that is covering bedrock. The channel slopes are very steep, have little vegetation other than a thin forest, and there is little evidence of bank erosion. The reach also has an average slope of about 1.0 percent, creating higher velocity areas and rapids.

Broad-scale characterization indicates that the Upper subreach is dominated by response sections. The Upper Canyon site is a transitional area exiting the upper subreach, and is characterized by moderately steep slopes with varying levels of vegetation. South-facing slopes that receive more sunlight are generally too dry to support a wide variety of plant life, while north-facing slopes are more densely vegetated. South-facing slopes could contribute to sediment supply, and the gradient at this site is lower than the other sites studied in the reach. The analysis indicates that this subreach is probably a response channel, since a mid-channel bar is present and fines were observed within the coarse substrate. Calculations show that the flow threshold of incipient motion at one cross-section is as low as 1,703 cfs. It is therefore possible that the morphology of the site changes even during flood events that are well below the 1.5-year regulated flood of 5,667 cfs, since Chili Bar reservoir has limited storage.

In contrast, the section at the Lower Coloma site was surveyed to determine if it is characterized as a response section, and it is likely not. Gold mining sites that may have mobilized fines are located between this location and the Upper Canyon, but this subreach has a steeper gradient, and no fines were observed in the main channel areas. Also, much of the channel and banks are stabilized by bedrock outcroppings. Any depositions that exist appear to only occur in low-flow areas behind these types of obstructions. The valley slopes are not as steep and do not appear to be contributing sediment supply, and residential development along the channel banks helps to retain sediment runoff. Based on the analysis of this section, transport capacity exceeds sediment supply.

Like upstream areas of the reach, the slopes are more sparsely vegetated, which appears to contribute to sediment supply. However, the local gradient is steeper, bars that do exist are dominated by cobble, and the lack of algal growth and fines in the main channel areas suggest higher transport capacity. Although this section of the canyon is an alluvial section with some sandy beaches, most of the lower subreach at the Gorge Site is characterized by rapids and bedrock/boulder outcroppings in the channels. All evidence suggests that it is a transport-dominated channel, where sediment transport capacity exceeds supply.

3.3.1.2 Environmental Effects

Upland Erosion and Sediment Sources

Changes in the operation of the UARP could contribute to sediment supply and degradation of water quality.

No changes in Project operations are proposed that would affect upland sediment supply, but SMUD proposes to address the erosion that does occur under existing conditions. Under Proposed Article 1-30, *Transportation System Management*, SMUD would develop a transportation system management plan for roads on or affecting National Forest System lands. As part of this plan, SMUD would address measures to control Project-related erosion including dust and soil movement induced by Project roads and maintenance activities. This proposed plan would address the sediment that currently runs off the unpaved roads near Project shorelines. Although SMUD and other agencies maintain these roads periodically, long-term sediment erosion could affect channel morphology or reservoir storage, and in turn affect biological resources or Project operations.

Our Analysis

Development of a transportation system management plan would allow SMUD to coordinate road maintenance and use of Project roads with the other land-managing agencies to ensure that protocols for erosion control are followed that would minimize sediment disturbance and transport into streams and reservoirs.

Pulse Flows

SMUD's studies showed that sediment deposition occurs in the Rubicon, Robbs Peak, Loon Lake, Ice House, and Slab Creek reaches. Under Proposed Article 1-2, *Pulse Flows*, SMUD would provide pulse flows in three of these reaches: in the Rubicon River below Rubicon dam, in Gerle Creek below Loon Lake dam, and in the SFSC below Ice House dam.

Under Proposed Articles 1-5, *Monitoring Program*, and 2-6, *Sediment Management Plan*, SMUD would monitor reaches with significant response channel segments for changes in geomorphology during the license term: the reaches below Rubicon dam, Loon Lake dam, and Ice House dam, Silver Creek below Camino dam, and Slab Creek below Slab Creek dam. PG&E would monitor the reach below the Chili Bar Project. In addition, SMUD would monitor three of the above-listed reaches that are mostly transport channels for changes in characterization: the reaches below Robbs Peak dam, Camino dam, and Slab Creek dam.

Under Proposed Articles 1-5, *Monitoring Program*, and 2-6, *Sediment Management Plan*, SMUD and PG&E would use this geomorphology monitoring to determine if sediment should be placed in area(s) of the UARP reaches or if reservoirs should be dredged. If dredging of reservoirs is necessary, SMUD and PG&E would place the dredged sediment at locations determined in consultation with the Agencies and BLM.

Rubicon Dam Reach

Proposed Article 1-2, *Pulse Flows*, provides for pulse flows to coincide with high winter flows or spring snowmelt runoff. The goal of Article 1-2 for the Rubicon dam reach is to provide pulse flows of at least 600 cfs for 3 days or a total of 3,600 acre-feet of spill within those 3 consecutive days during BN, AN, and Wet water years. The pulse flows would be delivered to the Rubicon dam reach by inducing spill over Rubicon dam through operation of the flashboard gates at the Rubicon tunnel headworks. The purpose is to provide flows that would imitate natural flushing flow conditions during this time of year, to ensure that the morphology of the reach does not adversely affect biological resources. Proposed Article 1-5, *Monitoring Program*, provides for geomorphological evaluation to monitor changes in channel conditions and the effects from Project operations.

Loon Lake Dam Reach

The upper section's floodplain—a relatively flat meadow—is characterized as somewhat swampy and has unstable banks and fine sediment deposits, which could affect biological or recreational resources if the conditions continue to degrade. Under Proposed Article 1-7, *Gerle Creek Channel Stabilization*, SMUD would develop and implement a plan to stabilize Gerle Creek channel. The plan would require Forest Service approval and involvement in its implementation, and would address the areas of erosion, instability, and sediment deposits to prevent future degradation of the channel conditions and any affected resources.

The proposed pulse flows would provide for ongoing channel flushing, timed to coincide with spring snowmelt runoff. Included would be test pulse releases of up to 740 cfs or the maximum capacity of the outlet works, whichever is less. These test flows would be evaluated based on their impact on channel conditions, bridges, and recreational sites, and then the Forest Service might reduce (but may not increase) the prescribed flows. Currently, flows in wet years are prescribed over a 5-day period: 600 cfs on days 1, 2, 4, and 5 and up to 740 cfs on day 3. Ongoing monitoring of the channel morphology would ensure that channel conditions do not adversely affect area resources in the future. Monitoring would identify how these changes in operations affect the geomorphology of the reach, particularly in the upper response section. Currently, the single point outlet below the Loon Lake dam carves a distinct channel through the meadow. In part, the monitoring would determine if this channel and floodplain would be unchanged regardless of operations—possibly because of the bedrock constriction downstream of the meadow.

Ice House Dam Reach

The 11.5-mile-long Ice House dam reach on SFSC has been significantly affected by Project operations. Compared to the unregulated flow regime, reduced peak flows have allowed fine sediment to build up, especially since the 1992 Cleveland Fire. The reach and surrounding area are still clearly showing the effects of that event. The channel itself is primarily affected by the sediment deposition from that event, and that accumulation may be affecting biological resources in the reach.

Because of these effects, Proposed Article 1-2, *Pulse Flows*, provides for flushing flows timed to coincide with winter storm events and spring snowmelt runoff. These flows would serve as peak flows for channel flushing to imitate the unregulated condition. During wet years, for example, releases of 600 cfs would be provided for 5 days, with 780 cfs—or the maximum capacity of the outlet works—being released on the third day. The flushing flows would influence the geomorphology of the channel sections, scouring the finer sediments in areas where sediment supply has exceeded transport capacity, which in turn would restore the channel condition that existed before the fines from the Cleveland Fire affected the biological resources. The bed of the channel would also continue to be mobilized more frequently, so that future events that affect the channel substrate could be flushed in a more natural period of time and the aquatic resources of the reach could be restored. Proposed Article 1-5, *Monitoring Program*, provides for geomorphology monitoring to develop benchmarks and comparatively study the future effects of these flushing flows.

Chili Bar Dam Reach

Three subreaches were studied in the Chili Bar dam reach on the SFAR. Only one section was found to currently be characterized as a response section, but fines are being transported into the reservoir and downstream of the dam, and they could affect channel conditions throughout the reach. Under Proposed Article 2-6, *Sediment Management Plan*, PG&E would plan and implement a geomorphology monitoring program to evaluate long-term changes in cross-section, longitudinal profile, bed substrate, and channel and bank stability in the sections studied. The purpose would be to verify that Project operations would not be adversely affecting the resources of the reach.

Under Proposed Article 2-6, *Sediment Management Plan*, PG&E could elect to dredge the reservoir to increase reservoir storage, since the waterbody has captured a significant amount of sediment that has been transported from upland sources over the life of the dam. Prior to any dredging activity, PG&E would consult with the Agencies and BLM to develop a sediment management plan to protect the Project resources. The sediment management plan would not only address the potential adverse effects of dredging on the reservoir and related mitigating measures, but it also may include a provision to deposit the dredged material in the downstream reach.

Our Analysis

Under natural conditions, periodic high flows would move sediments through the river system. Based on geomorphology studies, SMUD and the Agencies have identified reaches that would benefit from periodic pulse flows to move sediments downstream. Coordinating the provision of pulse floods with natural high flow events is a reasonable means of achieving that goal.

Monitoring changes in sediment deposition in the reaches prone to sediment deposition would allow SMUD and PG&E, in consultation with the Agencies and BLM, to determine if and when to dredge the reservoirs and where to deposit the dredged materials. Based on our review of the studies, we conclude that pulse flows in the reaches where sediments are trapped or deposited would help to transport these sediments downstream. The downstream reaches are where sediments most likely would have traveled if the impoundment did not exist; however because any added material could threaten the resources of the reach, the development of a sediment management plan would minimize any potential adverse effects.

Reservoir Sedimentation

Construction and operation of the proposed Iowa Hill development could affect soil erosion and water turbidity in stream effluent from the development, as well as in Slab Creek reservoir. Construction of the development would include clearing and grading, cutting, and filling to create the upper reservoir, installation of an underground tunnel/penstock, construction of a multiport (octagonal) intake in Slab Creek reservoir, and construction of about 2 miles of transmission line. During construction, SMUD would prevent water pollution and erosion by implementing management practices described in the storm water pollution prevention plan proposed under Article 1-42, *Water Quality and Water Pollution*, including keeping all equipment staging for construction of the tunnel at least 100 feet from the SFAR and removing all material that is used within the riverbed, including siltation fabric, after completing construction. In addition, SMUD would implement best management practices to stabilize soil and retain sediment during construction as described in the erosion and sedimentation control plan included in appendix A of the license application. Under Proposed Article 1-47, *Spoils Disposal*, Forest Service approval would be required prior to discharging any spoils on National Forest System lands. During operation of the Iowa Hill development, increased reservoir surface fluctuation and turbulence from the proposed intake/outlet could increase turbidity in Slab Creek reservoir.

Our Analysis

Erodible soil is present that could be disturbed by construction activities. Construction of the proposed Iowa Hill development could potentially result in substantial soil effects. An octagonal intake would eliminate the need to alter the mountain slope (both under water and above the shoreline) during construction. The natural slope has existed under water for more than 30 years and has existed in-the-dry for thousands of years. Like the slopes in other UARP reservoirs, it is not anticipated that stability enhancements would be needed. Because of the octagonal configuration, the horizontal net velocity component on the reservoir would be minimal, greatly reducing any concern about stirring up sediment.

The risk of water quality disturbance and soil erosion could be minimized by implementing a storm water pollution preventive plan identifying the best management practices for erosion and sediment control, including the stabilization of spoil piles. This plan would also include the method of installation and removal of a temporary coffer dam in Slab Creek reservoir to prevent any construction disturbance to the water quality in the reservoir. SMUD indicates that construction of the Iowa Hill development would achieve a balance between excavated materials and fill such that there would be no permanent spoils discharge. We anticipate that the proposed storm water pollution prevention plan and use of best management practices would provide reasonable assurance that SMUD's construction activities would not directly or indirectly adversely affect water quality and aquatic habitat.

The increased reservoir surface fluctuation and turbulence from the proposed intake/outlet could cause increased turbidity in Slab Creek reservoir. During the licensing process, SMUD used existing bathymetry to investigate the effects of operating Iowa Hill on the turbidity and sedimentation in Slab Creek reservoir, and updated the bathymetry and analysis in response to comments from the Water Board. The *Technical Report on Iowa Hill Pumped-Storage Development Turbidity Analysis* (Stillwater Sciences, 2008) concludes that the turbidity and shoreline erosion would not increase substantially because (1) the proposed intake/outlet structure would be located 90 feet above the channel bed in Slab Creek reservoir, so it would be very unlikely to mobilize sediment on the reservoir's bottom; (2) the more frequent reservoir surface fluctuation would not affect shoreline erosion, since the shoreline is mostly cobble, boulder, and bedrock; and (3) based on bathymetry data, sediment transport modeling, and projected reservoir levels, the existing sediment delta that exists at the upper end of the reservoir would not advance within 100 years to a location where it could be affected by the intake/outlet. These conclusions are consistent with our analysis of the data provided in the technical reports that the operation of the proposed Iowa Hill development would not increase turbidity in Slab Creek over the term of any new license.

Seismicity and Groundwater Effects

If active or potentially active faults were passing through or near the site of the Iowa Hill development, seismic activity could potentially cause failure of the structures associated with the development. However, no faults or fault systems are considered active or near enough to create any greater risk than that associated with the structures that already impound Project waters. In fact, construction of a reservoir with earthen berms and an impermeable layer is likely to withstand an earthquake better than the closest existing dam—on Slab Creek reservoir, the lower reservoir in the pumped-storage development—since there would be no possibility of the earthen berms overturning.

However, the underground penstock/tunnel would be susceptible to seismic activity, so best management practices should account for this in design and construction.

The proposed development could also affect groundwater by creating seepage paths along the proposed tunnel that could lead to instability, or adversely affect natural resources by altering or polluting the water table and surrounding soil. Under Proposed Article 1-43, *Groundwater*, SMUD would develop and implement a plan for managing the flow of groundwater during construction and for post-construction monitoring of groundwater to evaluate Project impacts on groundwater. The proposed plan would establish baseline measurements of the Project area and affected groundwater levels. During construction, SMUD would document all groundwater encountered and propose corrective measures if the levels encountered are different than what were expected. Ongoing monitoring and reporting would last for 5 years, and it would evaluate springs and creeks that could be affected by Project seepage or piping. An approved plan would also include mitigating measures in the case of any adverse effects to ensure that the proposed development would not create any significant impact.

Our Analysis

Although the UARP area predominantly has bedrock, boulder, and cobble substrate in its waterways, geological investigations concluded that material in the area of the proposed Iowa Hill development is not watertight enough to prevent seepage from the proposed upper reservoir. Residual soil and fractured deposits could result in storage losses during operation. However, the use of an impermeable liner in the upper reservoir would limit seepage losses and would also minimize sediment mobilization and transport to Slab Creek reservoir.

Implementation of a plan for monitoring groundwater during and after construction of the Iowa Hill development would provide information on the effects of the development on groundwater and allow SMUD and the Agencies to recommend mitigation to remedy any identified effects on groundwater.

UARP-only Alternative

The Iowa Hill development would not be constructed or operated under the UARP-only Alternative. All other proposed environmental measures would be implemented. Operations would otherwise be similar to those in the Proposed Action, without the effects of the Iowa Hill development.

The effects of the Iowa Hill development that would not occur under this alternative include changes in water-level fluctuations in Slab Creek reservoir; effects on turbidity within the reservoir; and clearing, cutting and filling, and soil erosion as a result of constructing the development. Impacts on geology in that area would not occur at Iowa Hill.

3.3.1.3 Unavoidable Adverse Effects

None.

3.3.2 Water Resources

3.3.2.1 Affected Environment

Water Quantity

The UARP and the Chili Bar Project use water of the SFAR and Rubicon River watersheds to generate electricity (figure 3-1). The river basins drain a portion of the western slope of the Sierra Nevada Mountains between Placerville and the Sierra crest, which reach over 9,000 feet, just west of Lake Tahoe. The total drainage area for the SFAR is 598 square miles as measured near Placerville (USGS gage no. 11444500) (figure 3-2) about 700 feet downstream of Chili Bar dam. The total drainage of the reservoirs within the Rubicon River (a major tributary to the Middle Fork of the American River) watershed used for diverting some of inflow to the reservoirs to the SFAR watershed is about 76 square miles.

The American River Basin has warm dry summers and cool and wet winters. Temperatures and precipitation vary considerably depending on elevation. Summer high temperatures are normally above 90 degrees in the lower elevations and low temperatures are normally substantially below freezing during the winter in the higher elevations. Average precipitation ranges from 40 to 70 inches with more than 90 percent of the precipitation occurring from October through April, mainly in the form of snow in the higher elevations. A snowpack of 5 to 10 feet is common in the higher elevations, with little or no snow in the lower elevations below 2,000 feet. Much of the snowpack below 5,000 feet melts by the end of April, but snowmelt from higher elevations continues into at least June in most years. Streamflow normally peaks during the late spring and/or early summer from snowmelt runoff. Low flows within this watershed typically occur during the late summer or early fall, after the snowmelt and before the runoff from the fall storms moving in from the Pacific Ocean. In the higher elevations above 6,000 feet, most precipitation during fall, winter, and spring falls as snow which results in low flows other than from occasional rain-on-snow events, until snowmelt begins, normally in April.

Rubicon Reservoir

The primary purpose of the Rubicon reservoir is diversion of high spring-time flow from the main stem of the Rubicon River to Buck Island reservoir via the Rubicon-Rockbound tunnel, which diverts into Rockbound Lake. Rubicon reservoir is not used for long-term storage; however, SMUD has water rights for storage of up to 450 acre-feet

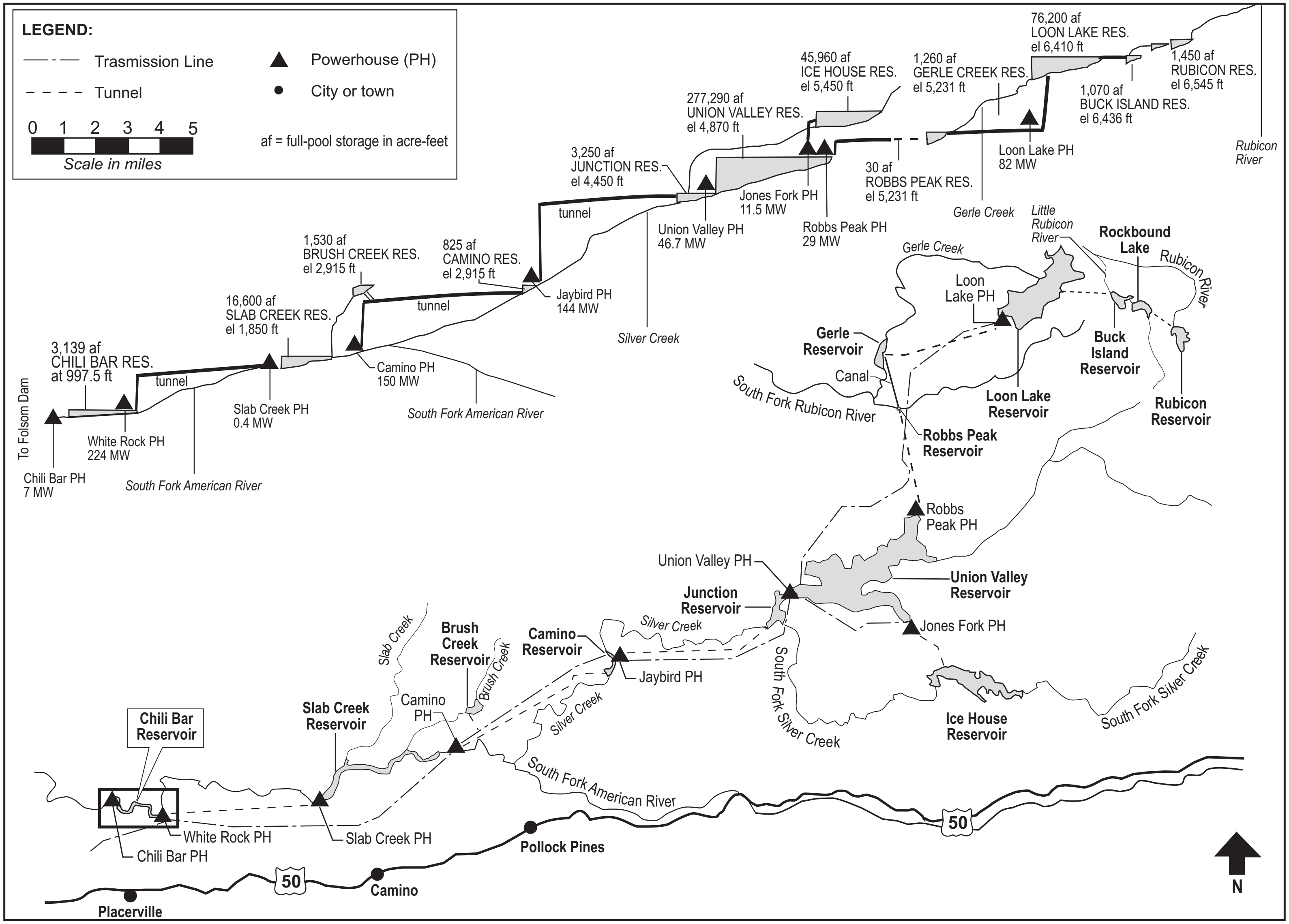

Figure 3-1. Profile of the Upper American River system, Rubicon Lake to the Chili Bar Project. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

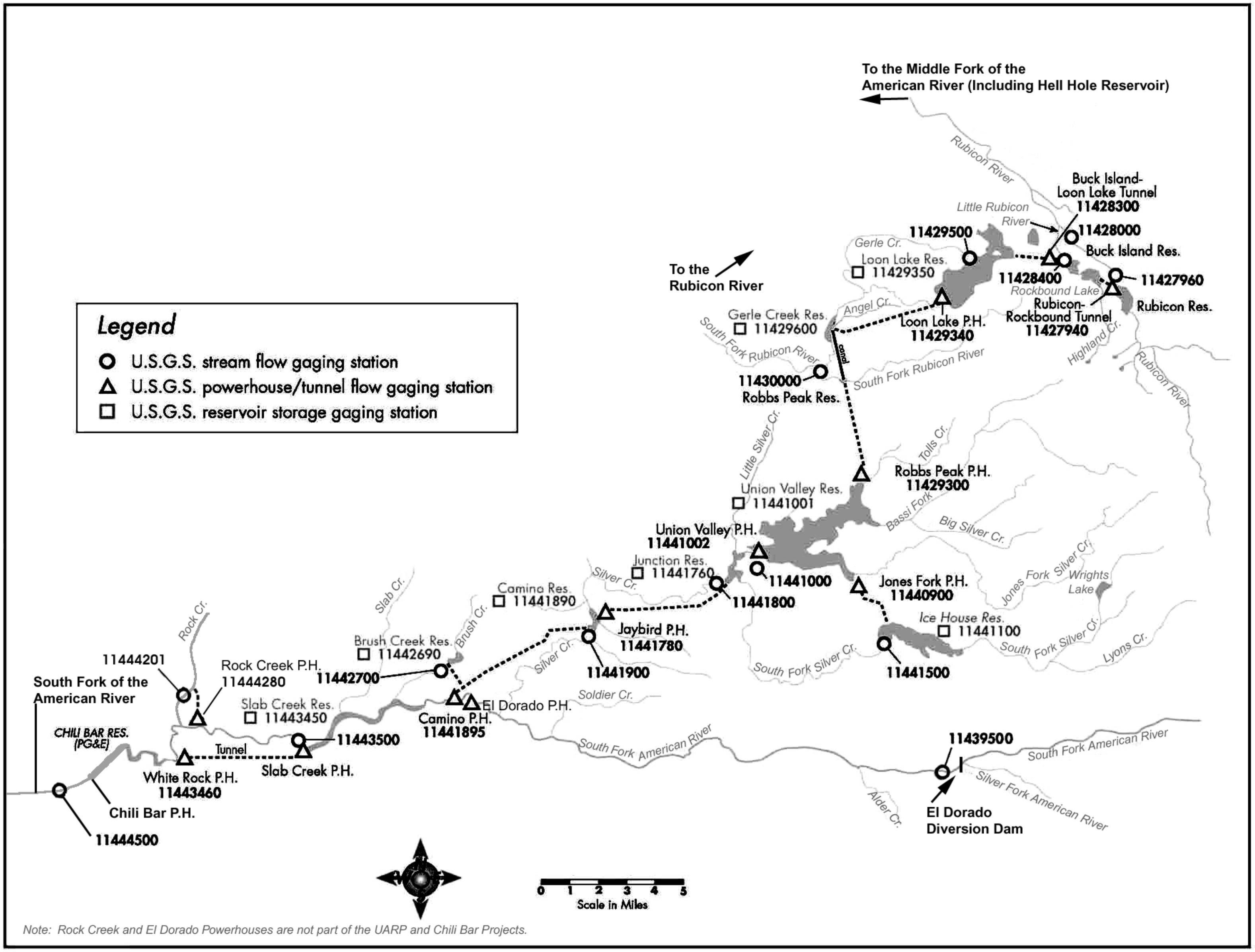

Figure 3-2. Existing USGS gages within the Upper American River system. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

in the reservoir, out of a total useable storage capacity of 1,010 acre-feet (table 3-2). Water is released downstream from Rubicon dam by either passing over the spillway or through one or both 10-inch-diameter globe valve controlled low-level outlets, which have a combined capacity of about 18 cfs at full reservoir pool.

Table 3-2. Reservoir summary for the Projects. (Source: SMUD, 2005; PG&E, 2005)

Reservoir	Drainage Area (square miles)	Normal Maximum Water Surface Elevation (feet msl)	Useable Storage (acre-feet)	Typical Daily Elevation Changes/Typical Annual Elevation Changes (feet)	Diversion Tunnel or Powerhouse
Rubicon	26.5	6,545	1,010	<0.5/11.8	Rubicon-Rockbound tunnel
Buck Island	6.0	6,436	648[a]	<0.5/11.5	Buck-Loon tunnel
Loon Lake	8.0	6,410	68,988	<0.5/36	Loon Lake powerhouse
Gerle Creek	28.7	5,231	483	1.5/9	Gerle Creek canal
Robbs Peak	15.2	5,231	30	<0.5/5	Robbs Peak powerhouse
Ice House	27.2	5,450	35,065[a]	<0.5/42	Jones Fork powerhouse
Union Valley	83.7	4,870	266,303[a]	<0.5/60	Union Valley powerhouse
Junction	147.0	4,450	2,140	20/32	Jaybird powerhouse
Camino	160.0	2,915	489	20/30	Camino powerhouse
Brush Creek	8.0	2,915	374	20[b]/<1	Camino powerhouse
Slab Creek	493	1,850	5,580	6/30	White Rock powerhouse
Chili Bar	598	997.5	1,088[c]	4.2/14.5	Chili Bar powerhouse

[a] Top of spillway or bulkhead gates, or stop logs in place.

[b] Brush Creek is rarely used in super peaking mode, but when it is, the typical daily change in elevation is about 20 feet.

[c] The as-constructed useable storage of Chili Bar reservoir is 1,339 acre-feet.

Because Rubicon reservoir is operated primarily as a diversion facility, the water level in the reservoir fluctuates with changing volumes of inflow, ranging between the minimum operating level of 6,533.2 feet and the maximum normal operating level of 6,545.0 feet. Water levels are also determined by the use of gates, which are normally installed in July and removed in October. During the summer recreational season of May 1 through September 10, the minimum operating pool level is increased by 6.0 feet to an elevation of 6,539.2 (figure 3-3). Although the daily water surface elevations are highly variable, the monthly median minimum water surface elevation is higher during the recreational season.

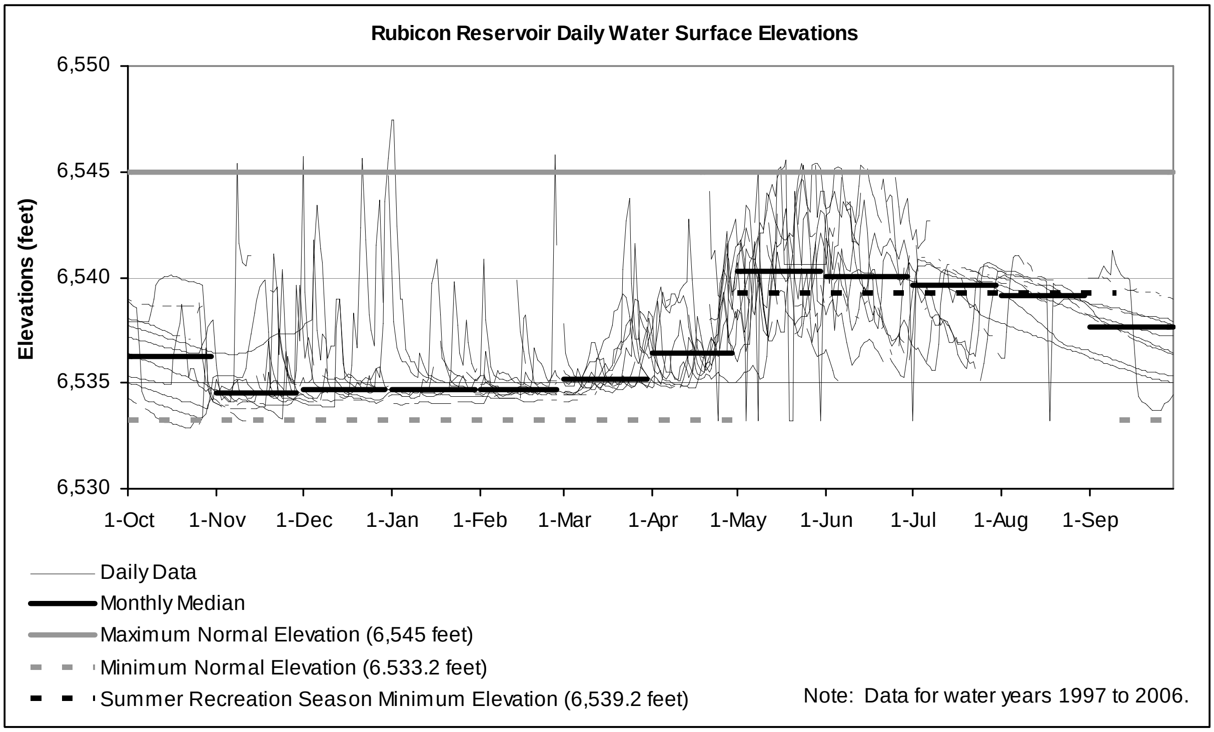

Figure 3-3. Rubicon reservoir daily water surface elevations. (Source: CDEC, 2007)

Buck Island Reservoir

The primary purpose of the Buck Island reservoir, like Rubicon reservoir, is diversion of high spring-time flow from the Rubicon River via the Buck-Loon tunnel to Loon Lake reservoir. Buck Island reservoir is not used for long-term storage; however, SMUD has water rights for storage up to 440 acre-feet in this reservoir, out of a total useable storage volume of 648 acre-feet. Water is released downstream from Buck Island dam by either passing over the spillway or through one 12-inch diameter, globe valve, low-level outlet, which has a capacity of about 11 cfs at full reservoir pool. The water level in Buck Island reservoir fluctuates between the minimum operating pool level of 6,424.5 feet and the maximum normal elevation of 6,436.0 feet. During the summer recreational season of May 1 through September 10, SMUD increases the minimum operating level by 6.5 feet to 6,431.0 feet, effectively narrowing the median range of maximum water elevation fluctuation from 11.5 to normally 5.0 feet (figure 3-4). As with Rubicon reservoir, the daily elevation changes are highly variable.

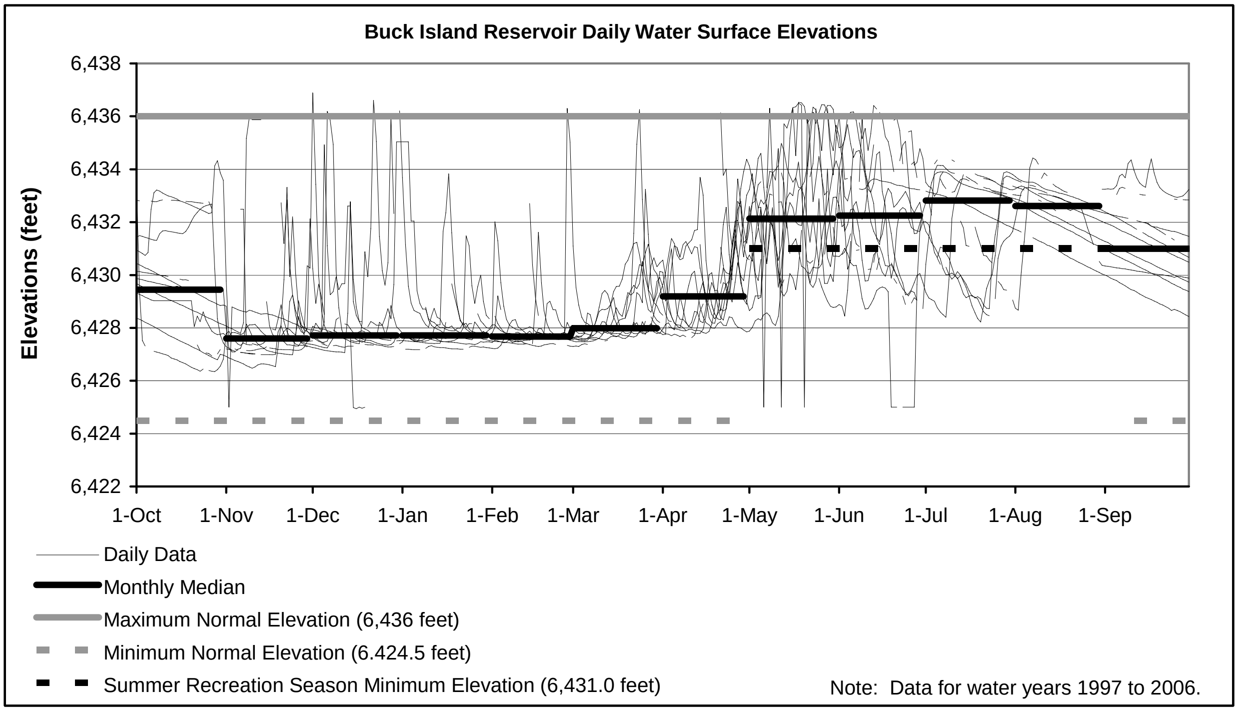

Figure 3-4. Buck Island reservoir daily water surface elevations. (Source: CDEC, 2007)

Loon Lake Reservoir

Loon Lake reservoir is the highest elevation storage reservoir in the UARP with a total useable storage volume of about 69,000 acre-feet. Water is released from the reservoir though the Loon Lake penstock to the Loon Lake powerhouse and then into Gerle Creek reservoir. Water is also released downstream from Loon Lake dam by either passing over the spillway or through one or more of two 10-inch-diameter, globe valves (maximum capacity of 41 cfs) or one 42-inch-diameter, Howell-Bunger valve (maximum capacity of 600 cfs). Variation in Loon Lake reservoir levels typically follows an annual cycle, with reservoir elevations reaching their highest levels during early summer months. The reservoir levels gradually lower throughout the summer months continuing into the fall and winter months. The water elevation slowly rises during the spring and early summer as the rain and snowmelt runoff refill the reservoir (figure 3-5).

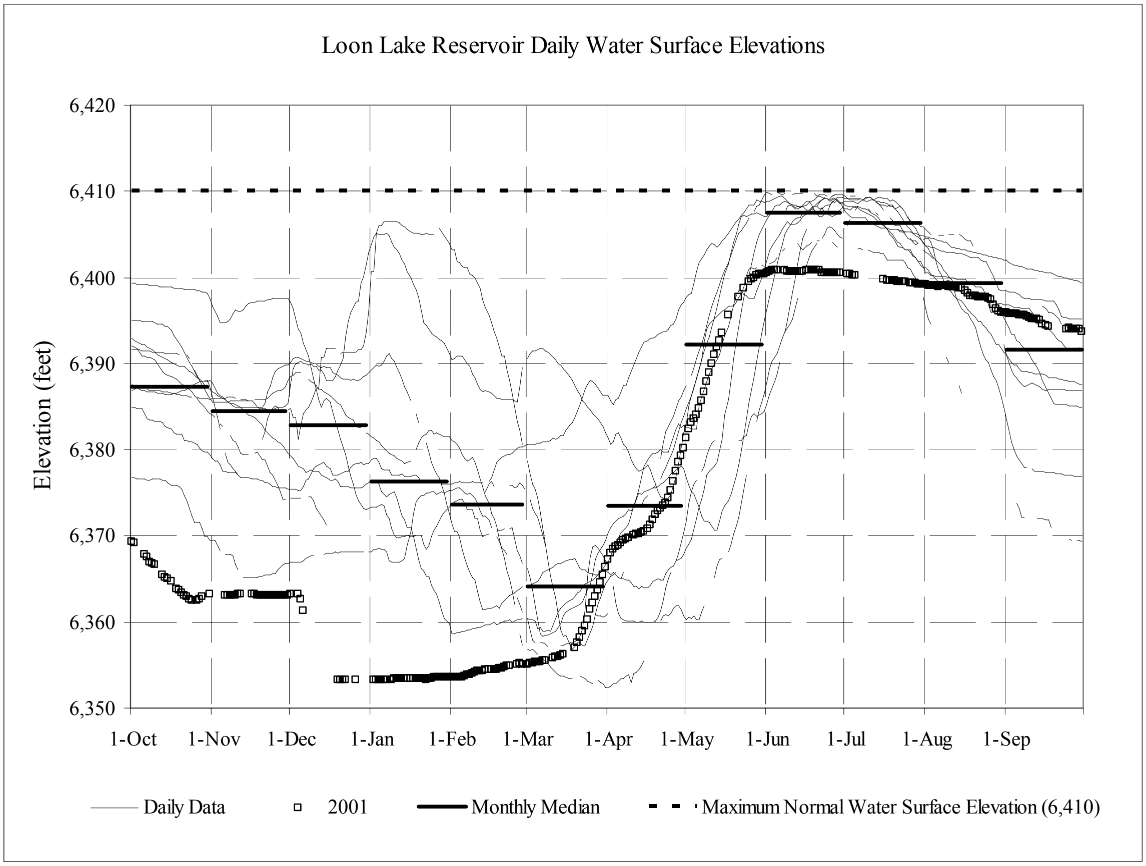

Figure 3-5. Loon Lake reservoir daily water surface elevations. (Source: CDEC, 2007)

Gerle Creek Reservoir

As with Rubicon and Buck Island, the primary purpose of the Gerle Creek reservoir is diversion of high spring-time flow and water re-diverted from upstream UARP facilities via the Gerle canal to Robbs Peak reservoir and then to Robbs Peak powerhouse on Union Valley reservoir. There are no storage rights at Gerle Creek reservoir, and the reservoir has a useable storage volume of 483 acre-feet. According to SMUD, daily average variation is about 1.5 feet and 9 feet annually (see table 3-2). Water is also released downstream from Gerle Creek dam by either passing over the spillway or through one 10-inch-diameter, globe valve, low-level outlet, which has a capacity of about 13 cfs at full pool.

Robbs Peak Reservoir

Robbs Peak reservoir, which has a useable storage volume of 30 acre-feet, primarily diverts water from the SFRR and the Gerle canal into the Robbs Peak tunnel and regulates inflow to the Robbs Peak powerhouse located on the northeast shore of Union Valley reservoir. Water is also released downstream from Robbs Peak dam by either passing over the spillway or through one 6-inch-diameter, diaphragm valve, low level outlet, which has a capacity of about 4 cfs at full pool. DWR requires that the Robbs Peak dam bulkhead gates be held in a full open position from October 1 through May 31, except that gate 2 may be closed for the full year. SMUD states that Robbs Peak reservoir has an average daily fluctuation of less than 0.5 foot and an annual fluctuation of about 5 feet (see table 3-2).

Ice House Reservoir

The primary purpose of Ice House reservoir is storage, and it has a useable storage volume of about 35,000 acre-feet. Water is released from the reservoir though the Jones Fork tunnel to the Jones Fork powerhouse located on the shoreline of the Union Valley reservoir. In addition, water can be released downstream from Ice House dam by either passing over the spillway or through one or both of two 10-inch-diameter globe valve low-level outlets and one 42-inch-diameter Howell-Bunger valve low-level outlet, which have a combined capacity of about 740 cfs at reservoir full pool. DWR requires that the spillway gates be held in the full open position from November 1 through April 1. Between April 1 and April 15, water may be impounded to the top of the spillway gates (elevation 5,445.0 feet). After April 15, water level may be increased to elevation 5,447.0 feet (figure 3-6). During October, the water level must be lowered gradually to elevation 5,436.5 feet, the spillway crest.

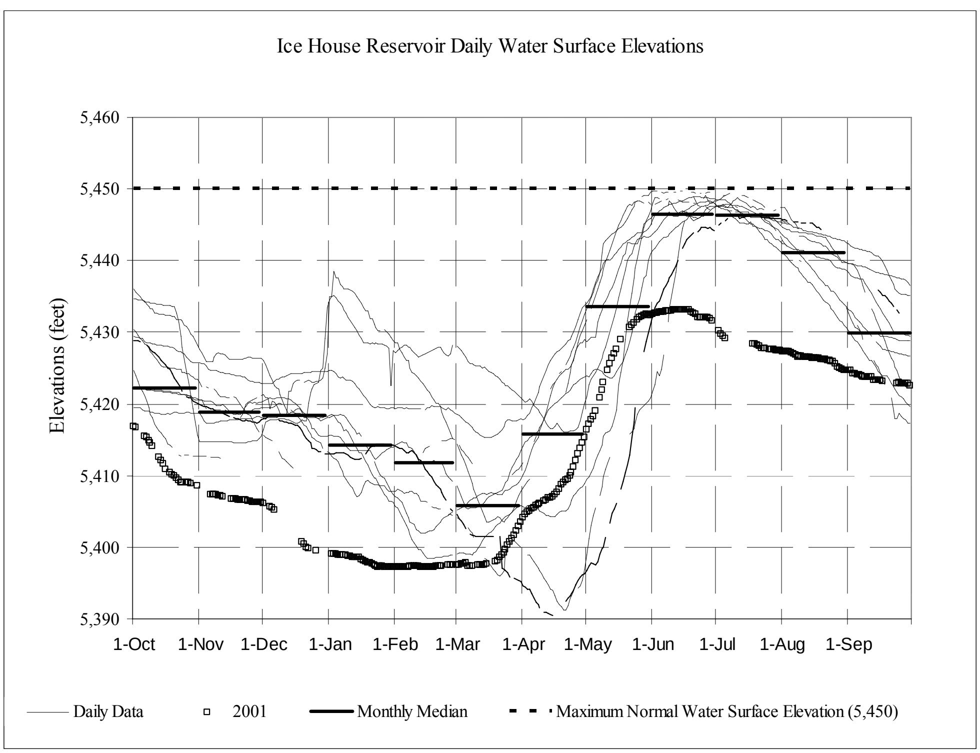

Figure 3-6. Ice House reservoir daily water surface elevations. (Source: CDEC, 2007)

Union Valley Reservoir

The primary purpose of Union Valley reservoir is storage, and it is the largest reservoir in the UARP and Chili Bar Project area, with a useable storage volume of about 266,000 acre-feet. Water is released from the reservoir though the Union Valley tunnel to the Union Valley powerhouse located on Junction reservoir, which serves as an afterbay for Union Valley powerhouse. Union Valley dam does not have a low level outlet. DWR requires that the spillway gates be held in the full open position from November 1 through April 1. Between April 1 and April 15, water may be impounded to elevation 4,865 feet. After April 15, water level may be increased to elevation 4,867.0 feet, near the maximum normal elevation of 4,870 feet (figure 3-7). During October, water level must be lowered gradually to elevation 4,855.0 feet, the spillway crest.

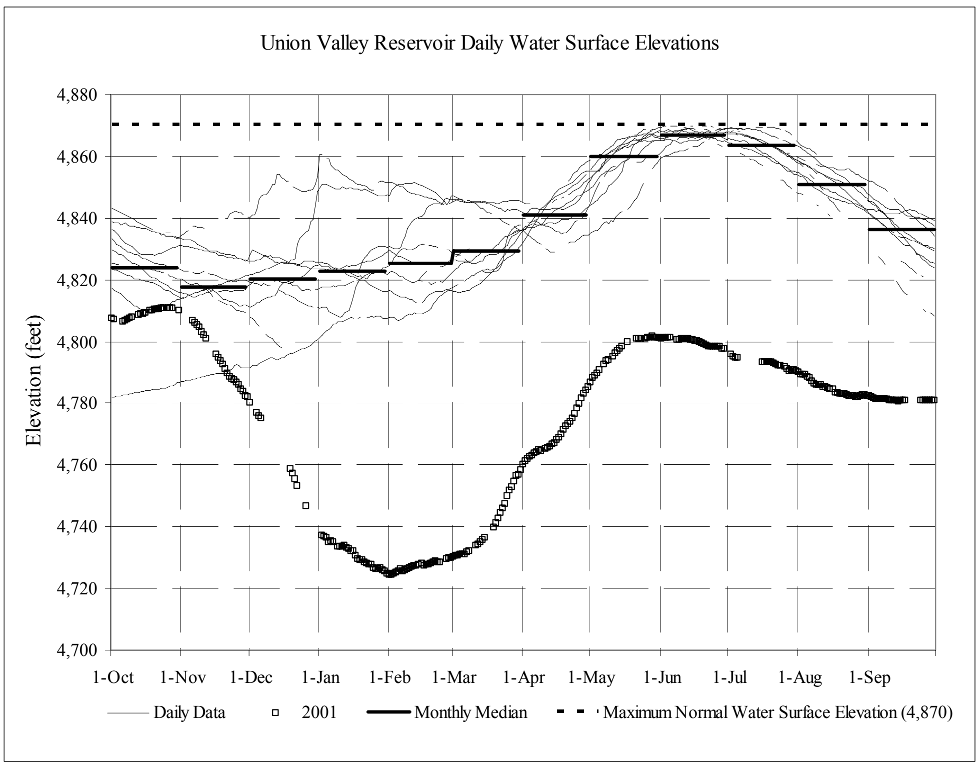

Figure 3-7. Union Valley reservoir daily water surface elevations. (Source: CDEC, 2007)

Junction Reservoir

The primary purpose of Junction reservoir is to act as a regulating afterbay for Union Valley powerhouse and a regulating forebay for the Jaybird tunnel, which leads to the Jaybird powerhouse. Water released from the Jaybird powerhouse flows directly into Camino reservoir. In addition, water is also released downstream from Junction dam by either passing over the spillway or through one 18-inch-diameter hollow cone valve low-level outlet, which has a maximum capacity of about 138 cfs at reservoir full pool (elevation 4,450 feet). Junction reservoir has a useable storage volume of 2,140 acre-feet, an average daily fluctuation of about 20 feet, and an annual fluctuation of about 32 feet (see table 3-2).

Camino Reservoir

Camino reservoir is a regulating afterbay for the Jaybird powerhouse and one of two regulating forebays for the Camino powerhouse. Brush Creek dam forms the other regulating forebay for the Camino powerhouse. Water is directed from Camino reservoir into the Camino tunnel, which joins the Brush Creek tunnel. Water is also released downstream from Camino dam by either passing over the spillway or through one 18-inch-diameter hollow cone valve low-level outlets, which has a capacity of about 112 cfs at full pool. Camino reservoir has a useable storage volume of 489 acre-feet, an average daily fluctuation of about 20 feet, and an annual fluctuation of about 30 feet (see table 3-2).

Brush Creek Reservoir

Unlike the Camino reservoir and other reservoirs within the UARP, Brush Creek reservoir is often operated to provide spinning reserves for reliability purposes. It is also used to generate maximum peak power during emergency and other short-term situations, such as when all available generating units are expected to operate at full load for short periods of time. Under this super-peaking operating mode, the daily water level may fluctuate up to 20 feet, ranging between the operating pool levels of 2,895.0 and 2,915.0 feet. During the appropriate nighttime periods of the next 2 to 3 days following this operating mode, SMUD typically shuts down the operation of the Camino powerhouse while operating the Jaybird powerhouse. Concurrently, the water exiting the Jaybird powerhouse is transported via the Camino and Brush Creek tunnels to refill Brush Creek reservoir. Water is released downstream from Brush Creek dam by either passing over the spillway or through a low-level outlet, which has a capacity of about 145 cfs at full pool. Brush Creek reservoir has a useable storage volume of 374 acre-feet and an average annual fluctuation of less than 1 foot (see table 3-2).

Slab Creek Reservoir

Slab Creek reservoir is a regulating afterbay for the Camino powerhouse and a regulating forebay for the White Rock powerhouse, which releases into PG&E's Chili Bar reservoir. Under the Proposed Action, Slab Creek reservoir also would function as the lower reservoir for the Iowa Hill development. Water is released from the reservoir through the White Rock tunnel. Water is also released downstream from Slab Creek dam by either passing over the spillway or through one 24-inch-diameter Howell-Bunger valve low-level outlet, which leads either to the Slab Creek powerhouse or a bypass facility if the powerhouse is not operating. The low-level outlet valve has a capacity of about 270 cfs at full pool. Slab Creek reservoir has a useable storage volume of 5,580 acre-feet, an average daily fluctuation of about 6 feet, and an annual fluctuation of about 30 feet (see table 3-2 and figure 3-8).

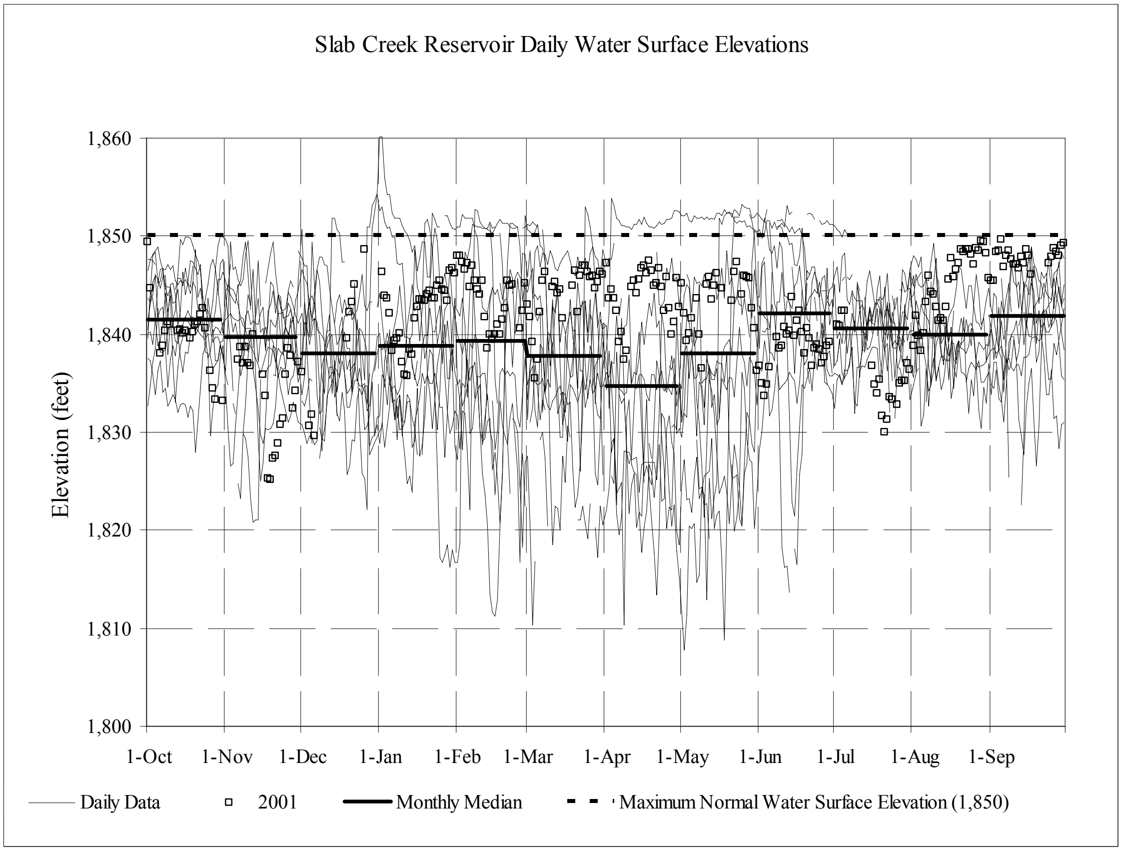

Figure 3-8. Slab Creek reservoir daily water surface elevations. (Source: CDEC, 2007)

Chili Bar Reservoir

PG&E's Chili Bar reservoir is a regulating afterbay for SMUD's White Rock powerhouse and a regulating forebay for PG&E's Chili Bar powerhouse. Water is released from the reservoir through the penstock leading to the powerhouse located near the base of the dam or though the spillway. PG&E describes the operation of Chili Bar as a reregulation facility from the upstream SMUD system to maintain the desired flow regime in the SFAR during peaking operations at White Rock powerhouse while providing minimum and recreational flow releases to downstream reaches. Chili Bar reservoir has a useable storage volume of 1,088 acre-feet, an average daily fluctuation of 4.2 feet and normally not exceeding 7 feet per day, and an annual variation of about 14.5 feet (see table 3-2).

Flow in Project Reaches

Twelve sections of river (about 81 river miles, excluding reservoirs) are affected by the UARP through either a bypass of water around the section of river via a Project tunnel or canal, or storage at and release of water from a UARP dam directly into the reach (see figure 3-1). These sections of river are called Project reaches, and are mostly named after the UARP facility from which the water is diverted or stored. The downstream end of each Project reach is established by a UARP facility (typically the normal high water line of the next downstream reservoir), a non-UARP reservoir, or the confluence with a major tributary.

The volume of water flowing in the different Project reaches is a function of three factors: (1) minimum releases at Project reservoirs; (2) accretion provided by various tributaries within the reaches; (3) and spill from the reservoirs. SMUD is currently required to release minimum water quantities for the protection of aquatic resources in downstream reaches. The minimum releases required by the current license generally vary by month and water year type. Four water year types are specified in the current license, with each defined by the total annual volume of water inflow to Folsom Lake, which is located downstream of the UARP on the main stem of the American River:

- Type 1—Inflow less than 1.0 million acre-feet
- Type 2—Inflow between 1.0 to 1.499 million acre-feet
- Type 3—Inflow between 1.5 to 1.999 million acre-feet
- Type 4—Inflow greater and equal to 2.0 million acre-feet.

Accretion is an important factor in determining flows in the Project reaches. A characteristic feature of the UARP area is the high level of seasonal variability in runoff, which dictates the distribution and volume of accretion that flows into the UARP reaches. The majority of the runoff in the different watersheds occurs during the snowmelt period, roughly between April and June, when melting snow runs off the dominant metamorphic and granitic rock surfaces. Little water is retained in the watersheds beyond the runoff period due to the shallow soil deposits overlaying the rock surfaces. Thus, the difference in volume of water flowing in Project reaches between spring and summer is substantial, ranging from many hundreds of cfs to less than 1 cfs, or in some cases no flow. The typical spring snowmelt runoff pattern of the upper reaches is replaced in the lower reaches by a winter runoff pattern. In the Junction, Camino, and Slab Creek reaches, for example, the accretion attains its highest point in February and March.

Spill from UARP reservoirs into the Project reaches occurs with varying levels of frequency and magnitude. In general, spills are less frequent at the three large storage reservoirs, Loon Lake, Union Valley, and Ice House. These reservoirs often have sufficient storage capacity to capture the snowmelt flows without spilling, except in wetter water years. The afterbay/forebay reservoirs (such as Junction, Camino, Gerle Creek, and Robbs Peak) spill more frequently due to their limited size compared to the volume of accretion flows that originate within their watersheds.

The existing flow regime in each Project reach is discussed below. Tables 3-3 through 3-11 (at the end of this discussion) summarize the reach data and terminology, current required minimum streamflows and streamflow data for the reaches with seasonally adjusted minimum streamflow requirements and USGS gages in the Project reaches.

Rubicon Dam Reach

The existing flow regime in the Rubicon dam reach is highly variable, due primarily to accretion flows associated with snowmelt runoff. The existing release schedule for Rubicon dam requires a year-round minimum release of 6 cfs as measured at USGS gage no. 11427960 (Rubicon River below Rubicon Lake) or natural inflow from the Rubicon River. During the late summer/early fall period, when inflow falls below 1 cfs or to zero SMUD usually releases 1 cfs from the dam. Generally, accretion in the Project reach is also zero during this low-flow period, which results in the 1 cfs release extending throughout the entire reach, even past Miller Creek, which typically dries up in summer. The sole augmentation of flow in this reach during this period occurs at the confluence with the Little Rubicon River, where the 1 cfs released by SMUD from Buck Island reservoir enters the Rubicon River.

During the snowmelt runoff, flows in the reach are substantially higher than the minimum release value of 6 cfs because of the substantial accretion runoff. Monthly median values for accretion throughout the reach during the snowmelt period climb to values of approximately 200 to 250 cfs. Winter base flows are generally low, however, due to the fact that much of the precipitation that falls on the Project reach watershed is in the form of snow that remains frozen during winter. Spill at Rubicon reservoir occurs during the spring snowmelt period, generally in wetter water years. Flow is diverted at Rubicon Lake by the Rubicon –Rockbound tunnel to Rockbound reservoir. Flow in the diversion tunnel typically peaks in May with a monthly mean and median of 300 cfs, and reaches its minimum in September with a monthly mean and median less than 15 cfs.

Rockbound Dam Reach

The Rockbound dam reach is a 0.3-mile ungaged segment of stream that lies between Rockbound Lake, a non-UARP facility, and Buck Island reservoir. Rockbound Lake is a natural lake with a small non-UARP masonry dam at its outlet. At Rockbound Lake, dam maintenance and operation are CDFG's responsibility. Because the dam outlet facilities are currently inoperable, flows out of Rockbound Lake are the result of water passing over the dam into the stream reach. The existing flow regime in the stream reach is a combination of water diverted from the Rubicon River at Rubicon reservoir (and passed through the Rubicon-Rockbound tunnel into Rockbound Lake) and natural flows in Highland Creek, which also enter Rockbound Lake. SMUD estimates that Highland Creek (the main natural tributary to Rockbound Lake) has peak flows of about 100 cfs during high snowmelt periods. During low-flow periods (such as during the summer and early fall), inflow to the lake from all sources often ceases. During these times, flows out of Rockbound Lake into the reach are at constant levels of less than 1 cfs from leakage at the outlet facilities of the masonry dam.

Buck Island Dam Reach

The existing flow regime in the Buck Island dam reach is very similar to that of the Rubicon dam reach. Once the snowmelt runoff has ceased, generally by July, flows in the entire watershed quickly fall to zero. This is true of Highland Creek, the feeder stream that provides the majority of natural inflow to Buck Island reservoir, and of the watershed downstream of the reservoir. There are no tributaries of significance along the 2.5-mile reach of the Little Rubicon River before its confluence with the Rubicon River, resulting in very minor accretion values during the dry months. The year-round minimum release schedule for Buck Island reservoir is 1 cfs, measured at USGS gage no. 11428400 (Little Rubicon River below Buck Island dam) for all months and water year types. This reservoir release is augmented by snowmelt accretion in April and May, although it is of a reduced volume compared to the Rubicon River. Spill at Buck Island dam, which is not presently measured by the downstream USGS gage, into the reach generally coincides with the spill events at Rubicon reservoir and occurs primarily in wet water years. Flow is diverted at Buck Island reservoir by the Buck Island-Loon Lake tunnel to Loon Lake reservoir. Flow in the diversion tunnel typically peaks in May and June with a monthly mean and median near 300 cfs, and reaches its minimum in August and September with a monthly mean and median less than 20 cfs.

Loon Lake Dam Reach

The existing flow regime in the Loon Lake dam reach is similar in nature to that of the other high elevation Project reaches. The existing license requires a year-round minimum release of 8 cfs from Loon Lake into Gerle Creek during all months and all water year types as measured at USGS gage no. 11429500 (Gerle Creek below Loon Lake). Unlike Rubicon and Buck Island reservoirs, which have limited storage capacity, releases at Loon Lake during the summer/fall period are not contingent upon the natural inflow from Ellis Creek, which typically dries up during summer. Instead, because there is greater storage capacity, releases from Loon Lake reservoir remain fixed at 8 cfs all summer and fall. Generally, during this low-flow period, accretion is insignificant, which results in about 8 cfs, throughout the course of the 8.5-mile-long reach to Greek Creek reservoir.

During the snowmelt runoff, flows in the reach are substantially higher than the minimum release value of 8 cfs. SMUD estimates the total-reach accretion amounts during the snowmelt period reach as about 100 to 150 cfs in AN and BN water years. The substantial storage capacity of Loon Lake reservoir and its location at the uppermost end of the watershed result in very infrequent spill, which is presently measured at the USGS gage below the dam. SMUD states that daily flows from reservoir releases and accretion through the reach during the winter and spring are quite variable, with short duration peaks in winter reaching highs near 1,000 cfs in some years. Flow is diverted at Loon Lake reservoir to the Loon Lake powerhouse (measured by USGS gage no. 11429340). SMUD states the Loon Lake powerhouse is typically operated as a daily peaking unit with high load settings and is turned off during non peaking periods. The average daily flow at the Loon Lake powerhouse peaks in June, with a mean and maximum in excess of 200 cfs. The powerhouse is not operated many days during many months other than during the spring. Water is discharged from the Loon Lake powerhouse to Gerle Creek reservoir via a 3.8-mile-long tunnel.

Robbs Peak Dam Reach

The existing flow regime in the Robbs Peak dam reach is a function of releases from Robbs Peak and Gerle Creek dams, spill events at both dams, and accretion along the 5.9-mile-long reach of the SFRR down to its confluence with the main stem Rubicon River. Major inflow sources to Gerle Creek dam include the discharge from the Loon Lake powerhouse and Gerle Creek. At the small Gerle Creek reservoir, water is diverted to Robbs Peak reservoir via a 1.9-mile-long canal (see figures 3-1 and 3-2). The release from Gerle Creek dam enters the Robbs Peak dam reach 1.1 miles downstream of Robbs Peak dam. The current license requires a combined release from the two dams ranging from 5 to 11 cfs measured at USGS gage no. 11430000 (SFRR below Gerle Creek) depending on month and water year type. These releases constitute the primary sources of flow at the confluence of the SFRR and Gerle Creek, as each segment of the reach extends about 1 mile, with little contribution from accretion. Downstream of the confluence of SFRR and Gerle Creek, the reach drops precipitously through a deeply incised canyon with no major tributaries. Accretion within the reach is low given the lack of tributaries. During the spring runoff period, the median monthly accretion throughout the reach is between 40 and 100 cfs in BN and AN water years. Similarly, accretion in summer/fall is about 5 to 10 cfs.

Flow from Robbs Peak reservoir is diverted by a 3.6 mile tunnel and penstock to the Robbs Peak powerhouse along the shoreline of Union Valley reservoir, within the Silver Creek portion of the SFAR watershed. Because Robbs Peak powerhouse relies largely on water from Loon Lake and lesser amounts from

Gerle Creek and Robbs Peak reservoirs, Robbs Peak powerhouse operates similarly to Loon Lake powerhouse as a daily peaking unit with high load settings and is turned off during non peaking periods.

Ice House Dam Reach

The existing flow regime in the Ice House dam reach is similar to that of the other high elevation Project reaches although the elevation of the reach is about 1,000 feet lower than the others. The existing release schedule at Ice House dam (as measured at USGS gage no. 11441500, SFSC below Ice House dam), ranges from winter lows of 3 cfs to summer highs of 15 cfs in wet years, but is less variable in other water year types. Despite the fact that inflow to Ice House reservoir from the SFSC typically falls to very low values in late summer and early fall, releases from Ice House dam during this low-flow period are between 5 and 15 cfs because of the reservoir's storage capacity. Generally, during this low-flow period, accretion in the reach below the dam is low with normal rates less than 10 cfs, which results in the 5 to 15 cfs releases accounting for a substantial amount of the stream flow throughout the course of the 11.5-mile-long reach.

During the snowmelt runoff, flows in the Ice House reach are substantially higher than the minimum release values because of the substantial accretion runoff from tributaries. Daily flows in the reach during winter and spring are quite variable, with short duration peaks in winter reaching highs of over 1,000 cfs. Like the other high elevation reaches, winter base flows are generally low because precipitation that falls on the watershed in the form of snow remains frozen during winter. Ice House reservoir does not spill regularly. Flow is diverted at Ice House reservoir to the Jones Fork powerhouse (measured by gage no. 11440900) on the shoreline of Union Valley reservoir. The Jones Fork powerhouse is typically operated as a daily peaking unit with high load settings and is turned off during non peaking periods. The amount of flow diverted to Jones Fork powerhouse typically peaks in June, with median monthly flows slightly above 70 cfs, and decreases to flows less than 10 cfs in October and November.

Junction Dam Reach

In contrast to the upstream Project reaches, the flow regime in the Junction dam reach is influenced by different timing of minimum releases, accretion, and spill events. The minimum release schedule from Junction dam ranges from a low of 5 cfs to a high of 20 cfs depending upon month and water year type. Flows up to 40 cfs are measured by USGS gage no. 11441800 (Silver Creek below Junction dam). Flows in the reach are augmented by accretion from small tributaries that enter Silver Creek over the 8.3-mile reach. However, because of the lower elevation of the Project reach watershed, the timing of accretion flow is shifted with respect to that of the higher elevation Project reaches. Most of the precipitation that falls into the reach watershed does so as rain during winter storms. Therefore the pattern of accretion runoff peaks in February and March, with median monthly flows of between 100 and 150 cfs in BN and AN water years. Another feature of the accretion pattern evident in the Junction dam reach is the higher volume of inflow entering Silver Creek in the summer/fall. In contrast to the upper reaches of the UARP, the watersheds in the lower reaches have deeper soil layers overlaying the bedrock, resulting in more moisture retention into the summer/fall, and thus, more accretion during the low-flow period. The resulting daily flows in Silver Creek downstream of Junction dam range from summer/fall lows of 20 to 40 cfs to winter highs of 100 to 200 cfs. The pattern of flow in the reach is more variable because the high flow events are dominated by winter rain events rather than by a sustained snowmelt.

Spill events occur in AN and Wet water years, typically during winter storms, due in part to the inflow from SFSC and Little Silver Creek, a direct tributary to Junction reservoir. February and March spill rates during normal and wet years range from about 500 to 2,000 cfs. Flow is diverted at Junction reservoir to the Jaybird powerhouse (measured by gage no. 11441780) located at Camino reservoir. SMUD states that the normal operation of Jaybird powerhouse is continuous baseload due to discharge problems with two generators, but preferred operation is full load daily peaking. The amount of flow diverted to Jaybird powerhouse typically peaks in May with median monthly flows near 900 cfs and decreases to median flows near 350 cfs in October and November.

Camino Dam Reach

The existing flow regime in the Camino dam reach is very similar to that of the Junction dam reach, and the timing of flows in the reach is driven by the similar influences. The minimum release schedule of Camino dam is the same as Junction dam, ranging from 5 to 20 cfs, depending upon month and water year type. Flow is measured at USGS gage no. 11441900 (Silver Creek below Camino dam), which also measures spillage from the dam. The volume and timing of accretion entering the Camino dam reach differs from the Junction dam reach due to its lower elevation and lack of substantial tributaries in its 6.2 mile distance. Due to the lower elevation of the reach, most of the winter precipitation falls as rain, resulting in highest flows occurring in the winter. The accretion pattern in summer and fall in the Camino dam reach is similar to that described in the Junction dam reach, but the volume is lower. The median monthly accretion levels in the Camino dam reach are generally less than 10 cfs, and the resulting daily flows in the Camino dam reach range from summer lows of approximately 10 to 20 cfs to winter highs of between 50 and 100 cfs.

SMUD states that spills into the Camino dam reach occur in Wet and AN years, mostly in the winter months of February and March, and normal spill rates are about 500 to 2,000 cfs. Flow is diverted at Camino reservoir to the Camino powerhouse (measured by gage no. 11441895), located upstream of Slab Creek reservoir. According to SMUD, normal unit operation is near full load during peak periods of the day, when water is available. The amount of flow diverted to Camino powerhouse typically peaks in July through September with median monthly flows over 700 cfs and decreases to median flows near 350 cfs in October and November.

The confluence of Silver Creek with the SFAR occurs about 2.8 miles upstream of the Camino powerhouse. The El Dorado Project (FERC Project No. 184) is located on the SFAR and consists of four lakes in the upper portion of the watershed and operated by EID to supplement flows in the SFAR. EID operates these lakes to retain spring and early summer snowmelt for releases later in the year. This allows EID to meet the consumptive needs of its downstream water users during the drier July through the early winter period. EID diverts water from the SFAR at a diversion dam about 22 river miles upstream of the Camino powerhouse as well as from small tributaries along the south side of the SFAR above the confluence with Silver Creek. EID withdraws a total of 15,080 acre-feet per year at rates up to 40 cfs in April through October and 10 to 20 cfs the reminder of the year (FERC, 2003). The water diverted into the canal, which has an annual mean flow of 100 cfs (FERC, 2003), in excess of that needed for downstream consumptive users is directed to the El Dorado powerhouse located along the SFAR just upstream of the Camino powerhouse. According to the USGS (USGS, 2007), flows in the SFAR downstream of the El Dorado diversion dam, as measured at USGS gage 11439500 (SFAR near Kyburz), peak in May with a monthly median flow near 1,000 cfs and quickly decrease to monthly median flows near 50 cfs during the July through November.

Brush Creek Dam Reach

The existing flow regime at Brush Creek dam is primarily the result of releases from Brush Creek dam and accretion over the 2.2-mile Project reach. Minimum releases from the dam range between 2 and 6 cfs, depending on month and water year type, as shown in table 3-9. These flows are measured at USGS gage no. 11442700 (Brush Creek below Brush Creek reservoir). No major tributaries enter Brush Creek along its short and steep descent to Slab Creek reservoir, therefore the only flow augmentations to the dam releases are the accretion flows that accumulate within the immediate watershed of the stream segment. SMUD states that the median monthly accretion during the winter runoff period range between 10 to 20 cfs and drops to 1 to 2 cfs in summer and fall.

Slab Creek Dam Reach

The existing minimum release schedule at Slab Creek dam ranges from 10 to 36 cfs, depending on month and water year type, and flows are measured at USGS gage no. 11443450 (SFAR near Camino), which also measures spillage from Slab Creek dam. Reach flows are augmented by several tributaries that flow into the SFAR along the 8.0-mile reach, including Iowa Canyon, Mosquito, and Rock Creek. Rock Creek, which is located about 5 miles downstream of Slab Creek dam, is the largest of the tributaries, draining a watershed of 74.5 square miles. On Rock Creek, there are diversion weirs that divert water to the Rock Creek powerhouse (FERC Project P-3189 operated by Enel North America Inc.), which is operated in a run-of river-mode and only when inflow is greater than the minimum flow requirements (FERC, 2003). Combined inflow to the SFAR from the powerhouse and bypassed reach[28] of Rock Creek peak in March and April, with flows near 50 cfs, and low flows occur in August through October, with flows slightly under 10 cfs. SMUD estimates that during February and March, these tributaries contribute median monthly accretion of about 200 to 300 cfs in BN and AN water years and 15 to 30 cfs during the summer/fall low flow period.

Spill at Slab Creek dam occurs primarily during winter and spring. Winter storms, such as rain-on-snow events in the upper SFAR Basin, can result in large, short-duration flows entering Slab Creek reservoir and spill events at the dam. Also, in Wet and AN water years, the SFAR spring snowmelt often leads to flows that exceed the capacity of Slab Creek reservoir and the White Rock tunnel, resulting in spillage at the dam. The AN and Wet year spring spill events are generally longer in duration (lasting for weeks and months) and lower in magnitude, generally augmenting flow in the reach by less than 10,000 cfs.

Flow is diverted by a 4.9 mile tunnel from Slab Creek reservoir to the White Rock powerhouse (measured by gage no. 11443460) on Chili Bar reservoir. Normal unit operation is near full load during peak periods of the day, when water is available, and the powerhouse is commonly shutdown during off peak periods. The amount of flow diverted to White Rock powerhouse typically peaks in May, with median monthly flows near 2,100 cfs, and decreases to median flows near 450 cfs in October and November. The Slab Creek powerhouse is located at the base of Slab Creek dam and has a maximum hydraulic capacity of 36 cfs. The powerhouse uses the minimum flow releases for power generation.

[28]Median flows for USGS gage no. 11444280, Rock Creek powerhouse near Placerville, and USGS gage no. 11444201, Rock Creek near Placerville.

Chili Bar Dam Reach

The existing minimum release at Chili Bar dam is 100 cfs, but according to PG&E, due to Project operations, the minimum flow released is typically 200 cfs. This flow is measured at USGS gage no. 11444500 (SFAR near Placerville) and also measures powerhouse flow and dam spillage. Flows in the reach are augmented by several tributaries such as Greenwood and Weber creeks in the 19.1-mile reach downstream of Chili Bar dam before the tailwater associated with the large Folsom reservoir. As is the case with the Slab Creek dam reach, accretion from these low elevation tributaries can be substantial during runoff from winter rain events, but accretion is low during the June through October period.

PG&E operates the Chili Bar powerhouse near the base of the dam as a daily peaking plant during the mid June through October period or when water is not available to operate the plant at full capacity. This operation normally results in the flow changing from about 200 to about 2,000 cfs during most days, but in drier years the flows typically peak between 1,100 and 1,500 cfs. On other days or periods when more flow is available, outflow from White Rock powerhouse and spillage over Chili Bar dam can cause daily flows to reach over 3,600 cfs. Median daily flows as measured at USGS gage no. 11444500, peak at 2,300 cfs in May and are below 600 cfs in October and November. Short-duration spillage at Chili Bar dam occurs on a relatively regular basis, similar to Slab Creek dam, from winter storm events. Longer duration spillage flows are common during normal and wet years during peak snowmelt periods from the upper watershed.

Tables 3-4 through 3-10 summarize the current minimum streamflow requirements for the stream reaches which vary by water year type and or month. The current minimum streamflow requirement for the SFAR below Chili Bar dam is 100 cfs regardless of the water year type.

Table 3-3. Data for Project reaches. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

Section	Reach Name	Upstream and Downstream Termini	Length (miles)	Elevation Range (feet, from base of dam)	Average Gradient (percent)
Main Stem	Rubicon dam	Rubicon dam–Miller Creek	4.2	6,509–6,046	1.9
Little Rubicon	Rockbound dam	Rockbound dam–Buck Island reservoir	0.3	6,529–6,436	7.2
	Buck Island dam	Buck Island dam–Rubicon River	2.5	6,413–5,945	2.9
Gerle Creek	Loon Lake dam	Loon Lake dam–Gerle reservoir	8.5	6,320–5,231	2.3
Gerle Creek (cont.)	Gerle Creek dam	Gerle Creek dam–SFRR	1.2	5,170–4,980	3.5
SFRR	Robbs Peak dam	Robbs Peak dam–Rubicon River	5.9	5,817–3,540	5.5
Silver Creek	SFSC	Ice House dam–Junction reservoir	11.5	5,300–4,450	1.4
	Main Stem	Junction dam–Camino reservoir	8.3	4,290–2,915	3.2
		Camino dam–SFAR	6.2	2,810–2,055	2.3
SFAR	Brush Creek	Brush Creek dam–Slab Creek reservoir	2.2	2,710–1,850	9
	Main Stem	Silver Creek–Slab Creek reservoir	2.8	2,055–1,850	1.2
	Main Stem	Slab Creek dam–Chili Bar reservoir	8	1,650–995	1.5
	Main Stem	Chili Bar dam–Folsom reservoir	19.1	930–430	0.5

Table 3-4. Current minimum streamflow requirements (cfs) for SFRR below Robbs Peak dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	1	1	3	3
November	1	1	1	1
December	1	1	1	1
January	1	1	1	1
February	1	1	1	1
March	1	1	1	1
April	1	1	1	1
May	1	1	3	3
June	1	1	3	3
July	1	1	3	3
August	1	1	3	3
September	1	1	3	3

Table 3-5. Current minimum streamflow requirements (cfs) for Gerle Creek below Gerle Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	4	4	7	7
November	4	4	4	4
December	4	4	4	4
January	4	4	4	4
February	4	4	4	4
March	4	4	4	4
April	4	4	4	4
May	4	4	7	7
June	4	4	7	7
July	4	4	7	7
August	4	4	7	7
September	4	4	7	7

Table 3-6. Current minimum streamflow requirements (cfs) for SFSC below Ice House dam. (Source: SMUD, 2005, as modified by staff)

Month	**Type 1**	**Type 2**	**Type 3**	**Type 4**
October	5 or NF	5 or NF	12 or NF	12 or NF
November	5 or NF	5 or NF	10/4 or NF	10/4 or NF
December	5 or NF	5 or NF	4 or NF	4 or NF
January	5 or NF	5 or NF	3 or NF	3 or NF
February	5 or NF	5 or NF	3 or NF	3 or NF
March	5 or NF	5 or NF	3 or NF	3 or NF
April	5 or NF	5 or NF	3 or NF	3 or NF
May	5 or NF	5 or NF	8 or NF	8 or NF
June	5 or NF	5 or NF	8 or NF	8 or NF
July	5 or NF	5 or NF	15 or NF	15 or NF
August	5 or NF	5 or NF	15 or NF	15 or NF
September	5 or NF	5 or NF	15 or NF	15 or NF

Note: NF – natural flow

Table 3-7. Current minimum streamflow requirements (cfs) for Silver Creek below Junction dam. (Source: SMUD, 2005, as modified by staff)

Month	**Type 1**	**Type 2**	**Type 3**	**Type 4**
October	5	10	15	20
November	5	6	8	10
December	5	6	8	10
January	5	6	8	10
February	5	6	8	10
March	5	6	8	10
April	5	6	8	10
May	5	10	15	20
June	5	10	15	20
July	5	10	15	20
August	5	10	15	20
September	5	10	15	20

Table 3-8. Current minimum streamflow requirements (cfs) for Silver Creek below Camino dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	5	10	15	20
November	5	6	8	10
December	5	6	8	10
January	5	6	8	10
February	5	6	8	10
March	5	6	8	10
April	5	6	8	10
May	5	10	15	20
June	5	10	15	20
July	5	10	15	20
August	5	10	15	20
September	5	10	15	20

Table 3-9. Current minimum streamflow requirements (cfs) for Brush Creek below Brush Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	2	2	3	3
November	4	4	6	6
December	4	4	6	6
January	4	4	6	6
February	4	4	6	6
March	4	4	6	6
April	4	4	6	6
May	4	4	6	6
June	2	2	3	3
July	2	2	3	3
August	2	2	3	3
September	2	2	3	3

Table 3-10. Current minimum streamflow requirements (cfs) for SFAR below Slab Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	36	36	36	36
November	36/10	36/10	36	36
December	10	10	36	36
January	10	10	36	36
February	10	10	36	36
March	10	10	36	36
April	10	10	36	36
May	10	10	36	36
June	36	36	36	36
July	36	36	36	36
August	36	36	36	36
September	36	36	36	36

Table 3-11. Monthly discharge (cfs) statistics for gages in the Project area. (Source: USGS, 2007)

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Rubicon Development	**USGS Gage No. 11427940 Rubicon-Rockbound Tunnel (water years 1992–2005)**							**USGS Gage No. 11427960 Rubicon River below Rubicon Lake (water years 1992–2005)**						
Mean	58.0	365.4	313.5	115.9	16.1	2.8	101.8	5.9	7.5	7.2	6.6	4.9	3.0	5.9
Median	35.4	331.5	266.5	37.0	0.1	0.0	25.0	5.8	7.4	7.1	6.6	6.2	1.6	6.6
Max.	875	973	896	858	248	105	1,180	8.8	9.3	9.2	8.6	8.0	7.9	9.4
Min.	4.2	0.0	0.0	0.0	0.0	0.0	0.0	3.7	6.0	5.7	0.8	0.3	0.1	0.1
10% Exceed.	113.7	705.1	671.1	344.5	52.7	7.5	329.0	7.2	8.6	8.2	7.8	7.6	7.0	7.7
90% Exceed.	10.8	118.6	16.0	0.0	0.0	0.0	0.0	4.8	6.6	6.3	5.9	1.1	0.8	1.3
Buck Island Development	**USGS Gage No. 11428300 Buck-Loon Tunnel (water years 1992–2005)**							**USGS Gage No. 11428400 Little Rubicon River below Buck Island Dam (water years 1992–2005)**						
Mean	76.4	462.8	392.6	138.1	18.4	2.5	129.3	1.3	1.4	1.4	1.3	1.2	1.2	1.3
Median	48.0	429.5	335.5	35.0	0.6	0.1	31.0	1.2	1.3	1.3	1.2	1.2	1.2	1.3
Max.	940	1,160	1,070	1,040	313	80	1,160	1.8	2.0	1.8	1.6	1.7	1.5	2.0
Min.	5.7	16.0	0.5	0.0	0.0	0.0	0.0	0.7	1.0	1.0	1.0	1.0	1.0	0.0
10% Exceed.	157.8	899.0	854.2	441.5	54.4	1.3	427.0	1.4	1.6	1.6	1.4	1.4	1.4	1.5
90% Exceed.	14.4	152.2	19.9	0.2	0.0	0.0	0.0	1.1	1.2	1.2	1.1	1.1	1.1	1.1
Loon Lake Development	**USGS Gage No. 11429340 Loon Lake Powerhouse (water years 1992–2005)**							**USGS Gage No. 11429500 Gerle Creek below Loon Lake (water years 1992–2005)**						
Mean	117.4	188.1	273.4	233.3	185.4	101.0	150.1	10.4	13.7	10.3	10.6	9.7	9.8	10.6

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Median	40.5	143.5	222.0	199.5	152.5	12.0	52.0	10.1	10.0	9.9	9.5	9.5	9.5	9.9
Max.	796	1,030	990	935	869	773	1,030	27.0	403	16	50	13	13	403
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	8.2	8.0	8.9	8.3	8.3	8.0
10% Exceed.	352.7	436.1	664.7	507.0	461.7	368.5	434.0	12.0	14.0	12.0	12.0	12.0	12.0	12.0
90% Exceed.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	9.1	8.9	9.2	8.9	8.7	8.9
Robbs Peak Development	**USGS Gage No. 11429300 Robbs Peak Powerhouse (water years 1992–2005)**							**USGS Gage No. 11430000 SF Rubicon River below Gerle Creek (water years 1992–2005)**						
Mean	252.4	500.6	404.8	252.0	184.4	101.7	267.6	20.5	40.3	14.1	10.5	10.5	10.7	19.2
Median	197.6	494.5	312.5	216.5	152.5	3.0	184.0	8.8	11.0	11.0	11.0	11.0	11.0	11.0
Max.	1,042	1,190	1,180	1,150	874	758	1,220	2,018	3,200	203	20	14	26	8,050
Min.	6.6	0.5	0.0	0.0	0.0	0.0	0.0	5.2	5.3	5.1	5.2	5.1	5.1	5.1
10% Exceed.	533.7	932.4	943.1	529.3	469.7	378.2	681.1	13.0	15.0	13.0	12.0	13.0	13.0	13.0
90% Exceed.	45.2	73.0	1.0	0.5	0.5	0.0	0.5	6.1	6.1	6.6	6.6	6.0	6.1	6.0
Ice House Development	**USGS Gage No. 11440900 Jones Fork Powerhouse (water years 1988–2005)**							**USGS Gage No. 11441500 South Fork of Silver Creek (water years 1988–2005)**						
Mean	56.8	77.7	93.4	61.4	62.0	67.9	63.3	8.0	13.4	26.5	16.5	13.4	13.5	11.6
Median	27.4	31.5	65.5	31.5	43.0	26.5	34.0	6.7	9.7	9.4	16.0	16.0	16.0	6.2
Max.	270	287	285	285	254	264	287	418	1,250	457	250	20	25	2,840
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	5.1	5.1	5.2	5.1	5.1	3.0
10% Exceed.	158.3	256.3	262.0	172.5	162.2	194.2	180.0	8.7	11.0	13.0	19.0	19.0	20.0	17.0

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
90% Exceed.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	5.8	5.6	5.7	5.6	5.5	4.8
Junction Development	**USGS Gage No. 11441780 Jaybird Powerhouse (water years 1992–2005)**							**USGS Gage No. 11441800 Silver Creek below Junction Dam (water years 1992–2005)**						
Mean	512.6	735.3	737.0	678.0	757.1	688.4	598.7	11.2	18.2	17.9	18.3	18.5	18.5	14.2
Median	440.6	777.0	654.0	647.5	758.0	723.5	492.0	12.4	21.0	21.0	21.0	21.0	21.0	11.0
Max.	1,331	1,400	1,400	1,490	1,390	1,370	1,490	26.9	30.0	23.0	27.0	30.0	28.0	37.0
Min.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	5.7	5.6	5.6	5.7	5.7	5.6	5.4
10% Exceed.	1,032.5	1,390	1,390	1,237	1,280	1,200	1,287	13.9	22.0	22.0	22.0	23.0	22.0	22.0
90% Exceed.	74.7	74.7	181.8	280.3	337.8	194.7	106.0	6.8	11.0	11.0	11.0	11.0	11.0	6.9
Camino Development	**USGS Gage No. 11441895 Camino Powerhouse (water years 1988–2005)**							**USGS Gage No. 11441900 Silver Creek below Camino Dam (water years 1988-2005)**						
Mean	514.4	661.2	667.9	673.1	749.5	680.1	585.8	73.7	95.3	117.8	120.5	86.6	78.5	80.7
Median	402.9	378.0	520.5	636.5	761.0	705.0	453.0	15.1	15.3	16.9	18.4	19.6	20.5	20.1
Max.	1,407	1,560	1,510	1,530	1,440	1,470	1,560	5,904	6,868	7,177	6,941	2,247	2,017	6,504
Min.	1.2	0.0	0.0	0.0	4.0	0.0	0.0	5.7	5.6	5.6	5.6	5.6	5.5	5.3
10% Exceed.	1,057.7	1,440	1,450	1,160	1,260	1,162	1,310	62.5	101.0	214.5	215.5	210.4	195.3	184.7
90% Exceed.	107.1	85.0	131.3	279.4	338.0	245.9	116.0	7.5	7.3	7.2	7.0	7.0	6.9	6.5
Slab Creek Development	**USGS Gage No. 11443460 Whiterock Powerhouse (water years 1988–2005)**							**USGS Gage No. 11443500 SFAR near Camino, CA (water years 1988–2005)**						
Mean	974.4	1,884.3	1,482.6	971.8	841.9	759.1	1,062.7	130.5	282.5	287.4	93.1	36.9	37.3	122.0

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Median	810.2	1,680	1,055	795.5	768.0	723.0	755.0	36.4	37.0	38.0	37.0	37.0	37.0	37.0
Max.	3,304	3,940	3,910	3,860	2,710	2,740	3,950	10,249	12,400	4,260	2,800	43	42	48,900
Min.	0.0	226.0	1.0	0.0	0.0	0.0	0.0	13.3	10.0	28.0	36.0	29.0	29.0	10.0
10% Exceed.	1,903	3,530	3,271	1,876	1,520	1,360	2,600	68.2	248.6	905.1	40.0	40.0	40.0	40.0
90% Exceed.	272.2	541.6	324.9	314.4	308.7	233.9	229.0	13.7	10.0	36.0	36.0	36.0	36.0	10.0
	Brush Creek Development USGS Gage No. 11442700 Brush Creek below Brush Creek Dam (water years 1988–2005)							**Chili Bar Development USGS Gage No. 11444500 SFAR near Placerville (water years 1988–2005)**						
Mean	6.1	6.1	3.5	3.2	3.2	3.2	5.1	1,238.1	2,377.6	1,883.1	1,114.8	925.6	838.3	1,316.1
Median	6.3	6.6	3.4	3.4	3.4	3.4	4.4	960.9	1,835	1,195	903.0	836.5	766.5	854.0
Max.	97.6	9.3	8.8	6.9	4.1	7.6	620	15,064	16,900	7,000	5,770	2,760	2,890	57,100
Min.	3.8	4.2	2.2	2.1	2.1	2.1	2.1	142.0	210.0	125.0	114.0	130.0	113.0	98.0
10% Exceed.	6.7	7.1	4.4	4.0	3.8	3.9	7.0	2,335.8	4,360	4,789	2,016	1,600	1,480	3,020
90% Exceed.	4.1	4.4	2.4	2.4	2.3	2.4	2.6	337.0	583.4	400.8	388.0	390.4	342.0	313.4

Note: All data for 1988 to 2005 water years.

Water Use

As table 3-12 shows, SMUD currently holds five licenses and one permit issued by the Water Board for water rights related to the UARP. These water rights authorize SMUD to directly divert and store water to generate hydroelectric power, provide recreation, and protect wildlife at its UARP facilities. PG&E is also listed as a water user for hydroelectric power use at its Chili Bar Project facilities. The current water rights licenses and permits incorporate the minimum instream flow releases mandated in the current Commission license. To improve water quality and benefit aquatic resources, the Proposed Action would increase the instream flow releases mandated in the FERC license.

Table 3-12. Summary of water rights in the UARP and Chili Bar Projects. (Source: Water Board, 2005)

License/ Permit/ Priority (date)	Source(s)	Quantity: Direct Diversion	Quantity: Storage	Quantity Cap	Diversion Season	Beneficial Use
License 11073 Application 12323 2/13/1948	SFSC Silver Creek	400 cfs at Ice House, Union Valley, Junction, and Camino dams	49,700 acre-feet annually in Ice House reservoir 195,000 acre-feet annually in Union Valley reservoir	459,300[a] acre-feet annually (max. total storage 238,900 acre-feet annually)	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Recreation; Power at Jones Fork, Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses
License 11074 Application 12624 7/29/1948	Rubicon River Little Rubicon River (aka Rockbound Creek) Gerle Creek SFRR	500 cfs at Rubicon dam 200 cfs at Buck Island dam 325 cfs at Loon Lake and Gerle dam 175 cfs at Robbs Peak dam	450 acre-feet annually in Rubicon reservoir, 440 acre-feet annually in Buck Island reservoir, 92,000 acre-feet annually in Loon Lake reservoir, 141,500 acre-feet annually in Union Valley reservoir	281,100[b] acre-feet annually (max. total storage 226,900 acre-feet annually)	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Recreation; Wildlife Protection and Enhancement; Power at Loon Lake, Robbs Peak, Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses

License/ Permit/ Priority (date)	Source(s)	Quantity: Direct Diversion	Quantity: Storage	Quantity Cap	Diversion Season	Beneficial Use
License 10495 Application 14963 8/12/1952	Silver Creek	400 cfs at Union Valley, Junction, and Camino dams	NA	NA	Direct diversion: 1/1–12/31	Power at Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses
	SFAR	800 cfs at Slab Creek and Chili Bar dams	NA	NA		
License 10496 Application 20522 12/12/62	SFAR Brush Creek	1,900 cfs at Brush Creek, Slab Creek and Chili Bar dams	NA	NA	Direct diversion: 1/1–12/31	Power at White Rock, Camino, Slab Creek and Chili Bar powerhouses
License 10513 Application 22110 4/23/1965	SFAR	800 cfs[c] at Slab Creek and Chili Bar dams	NA	NA	Direct diversion: 1/1–12/31	Power at White Rock, Chili Bar and Slab Creek powerhouses
Permit 19025 Application 26768 3/30/81	SFSC	270 cfs at Ice House dam	60,000 acre-feet annually in Ice House and Union Valley reservoirs	NA	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Power at Union Valley and Jones Fork powerhouses

[a] The total amount of water to be taken from the sources (direct diversion plus collection to storage) shall not exceed 459,300 acre-feet annually. The total amount of water to be placed to beneficial use (flow through Jaybird powerhouse) under license 11073 and license 10495 shall not exceed 528,400 acre-feet annually.

[b] The quantity of water to be put to beneficial use at Robbs Peak powerhouse shall not exceed 250,000 acre-feet annually.

[c] The maximum average amount diverted in any 30-day period through the White Rock powerhouse from Slab Creek dam under Licenses 10513, 10495, and 10496 shall not exceed 3,500 cfs.

On May 24, 2005, SMUD filed two water rights applications with the Water Board: (1) application no. 31595 for sources from the Rubicon River and (2) application no. 31596 for diversions from Silver Creek and SFAR sources. The applications involve the use of SMUD's existing facilities, including increases in individual storage rights in reservoirs above the volumes authorized by SMUD's existing water right licenses and permit. Water proposed to be stored under these applications would not exceed the total quantity that SMUD is currently licensed to store under licenses 11073 and 11074. In its water rights application, SMUD states that its application does not propose a change to the historical operations of the UARP.

Application 31595 requests a permit to directly divert water from Rubicon River sources to maximize use of its existing conveyance and power generation facilities. Because the water would be moved from the Middle Fork American River watershed to the SFAR watershed, it would flow into Folsom Lake by an alternate channel system. SMUD seeks to store the water in Rubicon, Buck Island, Gerle Creek, and Robbs Peak reservoirs for later release to provide for downstream recreational uses, releases for fish enhancement, and enhanced power generation.

Application 31596 requests a permit to divert water to storage from the Rubicon River, Silver Creek, and SFAR systems into the Camino Junction, Brush Creek, and Slab Creek reservoirs. SMUD seeks the additional storage to maintain consistent reservoir levels to maximize efficiency of power generation and to provide higher lake levels for recreation. The stored water would consist of a mix of new diversions and of re-diversions of water discharged from existing UARP facilities upstream.

According to the Water Board, Silver Creek, the American River, and their tributaries are listed as fully appropriated under Water Right Order 98-08, the Declaration of Fully Appropriated Stream Systems. Water right applications for diversions from stream systems that have fully appropriated status under Water Right Order 98-08 are subject to special conditions for acceptance, including limitations on seasons of diversion. However, the Water Board allows acceptance of water right applications that propose non-consumptive use of water, including hydropower generation, from fully appropriated sources. Water directly diverted under these applications would flow to Folsom Lake via the SFAR instead of the Middle Fork of the American River. SMUD made a case to the Water Board for its applications to fall within the definition of non-consumptive use. However, according to the Water Board, the notice of acceptance of these applications does not constitute a definitive finding by the Water Board that (1) the proposed use does not substantially diminish the quantity or quality of water in the source; or (2) the proposed use does not regulate the flow in the source in such a manner as to impair any other existing reasonable and beneficial use, including instream use.

Placer County Water Agency uses water of the Middle Fork of the American River for its Middle Fork American River Project (FERC No. 2079), which lies downstream of SMUD's UARP facilities in the Rubicon River watershed. Placer County Water Agency filed a protest letter (letter from F.E. Francis and W.S. Huang, Attorneys for Placer County Water Agency, Auburn, CA, dated January 23, 2007) with the Water Board against SMUD's 2005 application for new water rights licenses. The protest is based on the Water Agency's analysis that shows that SMUD has diverted water in excess of amounts permitted by the current licenses, which has resulted in a reduction of energy production at the Middle Fork American River Project. The Water Board will make a final determination regarding the water rights application following its normal procedures, which might include a hearing, if necessary.

Within the UARP or Chili Bar Project areas, there are no consumptive diversions such as those on the SFAR upstream of the confluence with Silver Creek at the El Dorado Project.

Water Quality

The existing and potential beneficial uses of waterbodies in the study area for the UARP and the Chili Bar Project, as determined by the Central Valley Water Board's Basin Plan, 4th Edition (Central Valley Water Board, 2004) are presented in table 3-13. Although SMUD provided information on the beneficial uses for Desolation Valley Lakes, the Water Board considers it to apply only to lakes within Desolation Valley and therefore not applicable to waters affected by either of the Projects being evaluated in this EIS. Table 3-14 presents state standards and objectives for temperature, DO, pH, coliform bacteria, selected metals, and other physical parameters. The values presented include criteria set in the Basin Plan, drinking water standards, and California Toxics Rule. The highest level of a contaminant that is allowed in drinking water, maximum contaminant level (MCL), is included for several parameters. Primary MCLs are set to protect human health, whereas secondary MCLs are set to protect the odor, taste, and appearance of drinking water. There are no numerical or narrative criteria for nutrients.

General Water Quality

General water quality is largely dependent on the geologic and hydrologic characteristics of a basin. Project area waters are soft, with hardness ranging from less than 1 mg to about 20 mg $CaCO_3$/L. Most total alkalinity measurements are below 10 mg $CaCO_3$/L, indicating a low capacity to buffer changes in pH. Concentrations of total suspended and dissolved solids are low, with values generally less than 10 mg/L. Water in the reservoirs is relatively clear, with Secchi depths ranging from about 10 to 30 feet. The trophic status of the reservoirs range from mesotrophic to oligotrophic, based on Secchi depth and total nitrogen and phosphorus concentrations. The maximum nitrate concentration in each reservoir and stream reach is generally well below the concentration of 1.0 mg/L, which SMUD used to characterize source waters that can stimulate growth of algae. However, large algal mats have been observed in the lower portion of the Junction dam reach, and excessive algal growth has been reported to occur in the Chili Bar dam reach (DTA and Stillwater Sciences, 2005a,b). Large amounts of algae also have been reported to occur in portions of the Ice House, Loon Lake, and Slab Creek dam reaches (DTA and Stillwater Sciences, 2005b). Organic compounds (including oil and grease, methyl-t-butyl ether, and total petroleum hydrocarbons) are below detection limits.

Table 3-13. Designated beneficial uses of surface waters in the study area. (Source: Central Valley Water Board, 2004)

Beneficial Use	**Middle Fork**[a]	**SFAR, Upstream of Placerville**[b]	**SFAR, Placerville to Folsom Lake**[c]
MUN: Municipal and domestic supply	Existing	Existing	Existing
AGR: Agriculture (irrigation and/or stock watering)	Existing	--	Existing
POW: Hydropower	Existing	Existing	Existing
REC-1: Water contact recreation	Existing	Existing	Existing
REC-2: Non-contact water recreation	Existing	Existing	Existing
WARM: Warm freshwater habitat	Potential	Potential	Existing
COLD: Cold freshwater habitat	Existing	Existing	Existing
SPWN: Cold freshwater habitat spawning	Existing	Existing	--
WILD: Wildlife habitat	Existing	Existing	Existing

Note: -- – not designated

[a] Applicable to surface waters of the Rubicon River and its tributaries including the Rubicon, Buck Island, Loon Lake, Gerle Creek, and Robbs Peak reaches.

[b] Applicable to surface waters associated with the Ice House, Union Valley, Junction, Camino, Brush Creek, and Slab Creek reaches.

[c] Applicable to surface waters associated with the Chili Bar Project.

Table 3-14. Water quality objectives to support designated beneficial uses in the study area. (Sources: Central Valley Water Board, 2004; CDHS, 2002; 40 CFR § 131.8)

Parameter	Objective/Standard
Temperature	Natural water temperatures of basin waters shall not be altered unless it can be demonstrated to the satisfaction of the Central Valley Water Board that such alteration does not affect beneficial uses. At no time or place, should water temperature be increased by more than 5°F (2.8°C) above natural receiving water temperature.
Dissolved oxygen	Monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. DO concentrations shall not be reduced below 7.0 mg/L.
pH	From 6.5 to 8.5 units, and changes of no more than 0.5 unit.
Fecal coliform bacteria	Based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200 MPN per 100 mL, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400 MPN/100 mL.
Settleable solids	Shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
Turbidity	Shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: 1 NTU for natural turbidity of 0 to 5 NTU, 20 percent for 5 to 50 NTU, 10 NTU for 50 to 100 NTU, and 10 percent for natural turbidity greater than 100 NTU.
Chemical constituents	Water designated for use as domestic or MUN shall not contain concentrations of chemical constituents in excess of the MCLs specified in the various provisions of Title 22 of the California Code of Regulations.
Aluminum	Primary MCL 1,000 μg/L, Secondary MCL 200 μg/L
Iron (California Toxics Rule)	Secondary MCL 300 μg/L
Lead[a]	Primary MCL: At a minimum, water designated for use as domestic or MUN shall not contain lead in excess of 15 μg/L.
	CCC of 0.13 μg/L, CMC of 3.44 μg/L
Mercury (California Toxics Rule)	Primary MCL 2.0 μg/L
Cadmium[a]	Primary MCL of 5 μg/L, CCC of 0.37 μg/L, CMC of 0.32 μg/L
Copper[a]	Secondary MCL 1,000 μg/L, CCC of 1.25 μg/L, CMC of 1.54 μg/L
Nickel[a]	Primary MCL of 100 μg/L, CCC of 7.41 μg/L, CMC of 66.75 μg/L
Silver[a]	Secondary MCL 100 μg/L, instantaneous maximum of 0.07 μg/L
Zinc[a]	Secondary MCL 5,000 μg/L, CCC of 16.79 μg/L, CMC of 16.66 μg/L

Note: mg/L – milligrams per liter

μg/L – micrograms per liter

CCC – criterion continuous concentrations

CMC – criterion maximum concentrations

MCL – maximum contaminant level

mL – milliliter

MPN – most probable number

MUN – municipal supply

NTU – nephelometric turbidity units

[a] The Basin Plan's toxicity water quality objective is to maintain waters free of toxic substance concentrations that produce detrimental physiological responses in human, plant, animal, and aquatic life. Therefore, we use criteria set in the California Toxics Rule (40 CFR § 131.8) to assess the support of these beneficial uses. These criteria are for dissolved metals, rather than total metals, are dependent on hardness, and include levels of CCC and CMC. Listed criteria were calculated based on a typical hardness of 10 mg/L as $CaCO_3$.

None of the Project reservoirs or stream reaches was included on the 2002 section 303(d) list of water quality limited waterbodies for any water quality parameters (Central Valley Water Board, 2003).

Temperature—Table 3-15 presents a summary of thermal characteristics of each of the reservoirs along with other factors that have the potential to affect water temperature within and/or downstream of the reservoir. Five of the reservoirs (i.e., Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino) do not typically thermally stratify. Each of these reservoirs has relatively small storage capacity and an average retention time of less than 5 days. Rockbound and Loon Lake, which are located at upper elevations, are dimictic[29], with turnover occurring prior to icing over and again in the spring after the ice cover melts. In contrast, several of the lower elevation reservoirs (i.e., Ice House, Union Valley, Junction, Brush Creek, and Slab Creek) do not ice over and are monomictic, with turnover occurring once in the late fall and remaining well mixed until spring. SMUD's water temperature profiling of Slab Creek reservoir indicates that the reservoir develops only weak and unstable summer stratification conditions. This lack of a strong stratification is in contrast to the upstream storage reservoirs (Loon, Union Valley, and Ice House) or even Rockbound Lake, which all strongly stratify during the summer.

[29]Lakes and reservoirs that freeze over and normally go through two stratifications and two mixing cycles a year.

Table 3-15. Summary of selected reservoir characteristics that affect water temperatures along with vertical profiles of water temperature collected by applicants, 2000 to 2004. (Source: DTA, 2005a, as modified by staff)

Reservoir	Normal Maximum Storage Capacity and Water Surface Elevation	Max. Depth (feet)	Average Retention Time (days)	Low-Level Outlet	Water Temperature (°C)[a]	Thermal Stratification Characteristics
Rubicon	1,450 acre-feet at 6,545 feet	9[b]	4.6	Centerline 6,523 feet, capacity 18 cfs	6.1 to 15.7 (1.2 on May 12, 2004)	Does not thermally stratify
Rockbound	1,010 acre-feet at 6,529 feet	82[b]	--	None	5.1 to 16.9 (9.1 on September 17, 2003)	Dimictic, develops strong thermal stratification with a 40-foot-deep epilimnion
Buck Island	1,070 acre-feet at 6,436 feet	33[b]	2.5	Centerline 6,420 feet, capacity 11.6 cfs	5.8 to 16.8 (2.2 on June 26, 2003)	Does not thermally stratify
Loon Lake	76,200 acre-feet at 6,410 feet	165	142.5	Centerline 6,327 feet, capacity 640 cfs	4.9 to 17.0 (7.7 on September 16, 2003)	Dimictic, weak thermal stratification
Gerle Creek	1,260 acre-feet at 5,231 feet	51	--	Centerline 5,186 feet, capacity 13.6 cfs	5.2 to 17.2 (2.3 on May 6, 2004)	Does not thermally stratify
Robbs Peak	30 acre-feet at 5,231 feet	--	--	Centerline 5,196 feet, capacity 4.3 cfs	No profile data	Does not thermally stratify
Ice House	45,960 acre-feet at 5,450 feet	138	162.3	Centerline 5327.5 feet, capacity 46.8 cfs	5.1 to 19.0 (12.9 on June 12, 2003)	Monomictic, develops strong thermal stratification with a 40-foot-deep epilimnion
Union Valley	277,290 acre-feet at 4,870 feet	360	261.6	None	5.1 to 20.3 (12.2 on October 1, 2002)	Monomictic, develops strong thermal stratification with a 60-foot-deep epilimnion

Reservoir	Normal Maximum Storage Capacity and Water Surface Elevation	Max. Depth (feet)	Average Retention Time (days)	Low-Level Outlet	Water Temperature (°C)[a]	Thermal Stratification Characteristics
Junction	3,250 acre-feet at 4,450 feet	141	1.5	Centerline 4,335 feet, capacity 138 cfs	5.7 to 14.3 (7.9 on May 5, 2004)	Monomictic, develops a thin (<10-foot-deep) epilimnion
Camino	825 acre-feet at 2,915 feet	76	0.3	Centerline 2,840 feet, capacity 112 cfs	9.4 to 10.1 0.0	Does not thermally stratify
Brush Creek	1,530 acre-feet at 2,915 feet	140	--	Centerline 2,775 feet, capacity 145 cfs	5.7 to 20.1 (11.2 on September 16, 2003)	Monomictic, develops strong thermal stratification with a 50-foot deep epilimnion
Slab Creek	16,600 acre-feet at 1,850 feet	186	2.2	Centerline 1,680 feet, capacity 263 cfs	5.7 to 19.1 (10.1 on May 4, 2004)	Monomictic, develops a thin (<10-foot-deep) epilimnion
Chili Bar	3,139 acre-feet at 997.5 feet	61[b]	1.3	Centerline 924 feet, capacity 1,100 cfs	8.2 to 17.5 (4.1 on September 15, 2003)	Little thermal stratification

Note: -- – not available

[a] Overall range of water temperatures measured in reservoir along with the maximum difference in water temperatures in any profiles and the corresponding date.

[b] Based on vertical profiles of water quality.

Table 3-16 summarizes the hourly water temperature data recorded with thermographs in the stream reaches during the relicensing studies conducted in 2000 through 2004. Hourly temperature data were collected during different periods at the sites. The table summarizes the hourly measurements by providing the absolute range of temperatures recorded, the maximum of the mean daily temperatures for each day (maximum mean temperature), and the months that had at least one day with a mean daily temperature that exceeded 20.0°C[30] for each of the monitoring sites. The summary indicates that temperatures remain relatively cool:

- throughout Loon Lake reach (8.5 miles);
- throughout Gerle Creek reach (1.2 miles);
- in the lower portion of the Robbs Peak reach (about 4 miles);
- in the upper portion of Ice House reach (about 7 miles);
- throughout Junction reach (8.3 miles);
- in the upper end of Camino reach (about 3 miles)
- throughout Brush Creek reach (2.2 miles);
- in the Upper portion of Slab Creek reach (about 4 miles) and
- in the upper portion of Chili Bar dam reach (about 7 miles).

Seasonally warm temperatures occur:

- throughout Rubicon reach (4.2 miles);
- throughout Buck Island reach (2.5 miles);
- in the upper end of Robbs Peak reach (about 2 miles);
- in the lower end of Ice House reach (about 4 miles);
- throughout SFAR reach (2.8 miles);
- in the lower portion of Slab Creek reach (about 4 miles); and
- in the lower portion of Chili Bar dam reach (about 12 miles).

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[30]We used daily average temperatures of greater than 20.0°C as an indicator of thermal conditions that may limit cold freshwater habitat. This is consistent with the Water Control Board's approach for several other locations in the Sacramento River Basin.

Table 3-16. Summary of hourly water temperature (°C) data collected by applicants for selected sites, 2000 to 2004.[a] (Source: DTA, 2005a, as modified by staff)

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean[b]	Months with Mean >20.0°C[c]
Rubicon Reservoir Tributary[d]					
	Rubicon River upstream of Rubicon reservoir (RR4)[d]	–1.9	26.8	21.3	July to August
Rubicon Dam Reach (4.2 miles)					
	Rubicon River at Rubicon dam (RR3)	–0.2	22.7	22.2	July to August
	Rubicon River upstream of Rubicon Springs (RR2)	0.0	24.1	21.9	July to August
	Rubicon River downstream of Little Rubicon River (RR1)	–0.1	23.7	22.9	June to August
Buck Island Dam Reach (2.5 miles)					
	Little Rubicon at Buck Island dam (LRR2)	–0.4	23.6	22.9	June to September
	Little Rubicon River upstream of Rubicon River (LRR1)	0.0	26.4	23.7	July to August
Loon Lake Dam Reach (8.5 miles)					
	Gerle Creek at Loon Lake dam (GC6)	0.7	17.1	16.9	None
	Gerle Creek upstream of Jerrett Creek (GC5)	–0.2	19.1	15.8	None
	Gerle Creek downstream of Barts Creek (GC4)	0.0	20.1	18.2	None
	Gerle Creek upstream of Gerle Creek reservoir (GC3)	–0.3	24.3	19.8	None
Gerle Creek Dam Reach (1.2 miles)					
	Gerle Creek at Gerle Creek dam (GC2)	–0.2	18.6	18.4	None
	Gerle Creek upstream of S.F. Rubicon River (GC1)	0.0	19.3	17.0	None
Robbs Peak Dam Reach (5.9 miles)					
	S.F. Rubicon River upstream of Robbs Peak forebay (SFRR4)[d]	–0.6	24.5	21.3	July
	S.F. Rubicon River at Robbs Peak forebay dam (SFRR3)	–0.3	23.1	22.5	July to August

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean[b]	Months with Mean >20.0°C[c]
	SF Rubicon River upstream of Gerle Creek (SFRR2)	0.0	20.2	18.4	None
	S.F. Rubicon River downstream of Gerle Creek (SFRR1)	–0.2	20.4	18.8	None
	S.F. Rubicon River 2 miles downstream of Gerle Creek (SFRR.5)[e]	3.0	19.7	18.1	None
Ice House Reservoir Tributary					
	S.F. Silver Creek upstream of Ice House reservoir (SFSC6)[d]	0.0	21.7	19.7	None
Ice House Dam Reach (11.5 miles)					
	S.F. Silver Creek at Ice House dam (SFSC5)	2.8	8.6	8.0	None
	S.F. Silver Creek upstream of Ice House dam road (SFSC4)	–0.2	13.9	8.6	None
	S.F. Silver Creek downstream of Ice House dam road (SFSC3)	0.1	15.9	10.8	None
	S.F. Silver Creek midway between burn area (SFSC2)	–0.1	26.0	20.7	July to August
	S.F. Silver Creek upstream of Junction reservoir (SFSC1)	–0.2	26.0	21.3	July to August
Junction Dam Reach (8.3 miles)					
	Silver Creek at Junction dam (SC4)	–0.2	13.4	11.2	None
	Silver Creek upstream of Jaybird powerhouse (SC3)	–0.1	22.0	20.2	July
Camino Dam Reach (6.2 miles)					
	Silver Creek at Camino dam (SC2)	0.0	15.3	12.7	None
	Silver Creek upstream of SFAR (SC1)	0.5	25.5	23.2	May to August
SFAR Reach (2.8 miles)					
	SFAR upstream of Silver Creek (SFAR12)[d]	–0.1	26.7	24.3	June to September
	SFAR downstream of Silver Creek (SFAR11)	0.0	25.9	23.7	June to September

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean [b]	Months with Mean >20.0°C [c]
	SFAR downstream of Camino powerhouse (SFAR10)	0.4	24.7	21.9	July to August
Brush Creek Dam Reach (2.2 miles)					
	Brush Creek upstream of Brush Creek dam (BC3) [d]	5.8	18.6	16.9	None
	Brush Creek at Brush Creek dam (BC2)	1.9	19.0	18.7	None
	Brush Creek upstream of Slab Creek reservoir (BC1)	3.7	20.5	19.9	None
Slab Creek Dam Reach (8.0 mile)					
	SFAR at Slab Creek dam (SFAR9)	2.7	16.7	16.3	None
	SFAR downstream of walking bridge (SFAR8)	2.1	19.0	16.8	None
	SFAR at Mosquito Bridge (SFAR7)	1.2	24.0	21.6	May to July
	Rock Creek upstream of SFAR (RC1) [d]	2.6	24.4	23.2	July to September
	SFAR upstream of White Rock powerhouse (SFAR6)	2.8	26.7	24.4	June to September
	SFAR downstream of White Rock powerhouse (SFAR5)	1.8	30.4	19.4	None
Reach Downstream of Chili Bar (19.1 miles)					
	SFAR at Chili Bar dam (SFAR4)	4.5	17.9	17.2	None
	SFAR upstream of Dutch Creek (SFAR3)	3.6	21.3	18.7	None
	SFAR downstream of Greenwood Creek (SFAR2)	4.2	22.6	21.3	July
	SFAR upstream of Weber Creek (SFAR1)	4.2	23.6	21.7	June to July

[a] Not all sites were monitored in all years.

[b] Max. Mean indicates the maximum of all of the average temperatures for each of the days monitored.

[c] Months with Mean >20.0°C indicates the month(s) with at least one day having a mean temperature of greater than 20.0°C.

[d] Not affected by the Projects.

[e] Less than two full seasons of data collected.

In addition, the summary provides information on several stream reaches that are not affected by the Projects. Relatively cool streams include the SFSC inflow to Ice House reservoir and Tells Creek inflow to Union Valley reservoir. Seasonally warm temperatures occur in the Rubicon River inflow to Rubicon reservoir, Big Silver Creek and Jones Fork Silver Creek inflow to Union Valley reservoir, SFAR upstream of the Silver Creek confluence, and Rock Creek inflow to SFAR.

Dissolved Oxygen and pH—DO concentrations usually remain above the 7.0-mg/L criterion in the upper portions of the reservoirs. However, DO concentrations of less than 7.0 mg/L were measured in nine of the twelve reservoirs during late summer and early fall (table 3-17). Based on average DO concentrations for 0.5-meter increments, the majority of these low DO concentrations ranged from 5.0 to 6.9 mg/L, although average DO concentrations of less than 5.0 mg/L occurred:

- Near the middle of Rockbound Lake in the bottom 10 feet during early October 2002.
- In deep water at various locations in the Union Valley reservoir during fall and in the Jones Fork arm of the reservoir in the late summer. Hypoxic (DO <2.0 mg/L) conditions were measured in the bottom 6.5 to 26 feet of the reservoir during mid-October to early November of 2002.
- In Ice House reservoir in the bottom 13 to 41 feet during late September to mid-November.
- Throughout the entire water column of Junction reservoir in mid-September 2004.
- Near the middle of Brush Creek reservoir in the bottom 6.5 to 36 feet during mid-September to early November. Hypoxic conditions in bottom 8.5 feet in mid-September 2003.

Results of the seasonal pH monitoring of vertical profiles in the reservoirs ranged from 5.8 to 8.5 standard units. Generally, pH levels decreased with depth in the reservoirs and were lowest near the bottom of the reservoirs. Seven of the 12 reservoirs had pH values below the lower allowable limit of 6.5 units, but none of them exceeded the upper limit of 8.5 units (table 3-17).

Results of the 2002 to 2004 periodic monitoring program of stream reaches indicate that DO levels generally satisfy the applicable water quality criteria, although low DO concentrations were measured at a few stream sites during the late summer and early fall. These included DO concentrations of less than 7.0 mg/L at two UARP affected stream sites (5.5 mg/L in the outflow from Loon Lake on October 8, 2002, and 4.7 mg/L in the SFAR outflow from Slab Creek reservoir on September 13, 2004), one Chili Bar Project affected stream site (6.1 mg/L in the SFAR downstream of Greenwood Creek on September 13, 2004), and one stream site not affected by either Project (3.7 mg/L in Rocky Basin Creek on September 17, 2003).

Table 3-17. Summary of the range of water quality data in reservoirs for all vertical profiles and the maximum fluctuation within any of the profiles, 2002 through 2004. (Source: DTA, 2005a, as modified by staff)

Location	Number of Vertical Profiles	Range of DO Concentrations (mg/L)	Range of DO Percent of Saturation	Range of pH
Rubicon reservoir	4	8.3 to 12.0 (0.4 on 10/7/02)	77 to 102 (4 on 10/7/02)	6.7 to 7.8 (0.5 on 10/7/02)
Rockbound lake	5	4.1 to 12.9 (5.0 on 10/7/02)	42 to 110 (62 on 10/7/02)	6.1 to 7.7 (0.9 on 10/7/02)
Buck Island reservoir	6	5.4 to 11.8 (1.9 on 9/21/04)	53 to 99 (18 on 9/21/04)	6.5 to 7.9 (0.5 on 9/21/04)
Loon Lake reservoir	21	5.6 to 12.7 (5.2 on 9/16/03)	57 to 104 (41 on 9/16/03)	5.8 to 7.7 (0.9 on 9/16/03)
Gerle Creek reservoir	7	7.6 to 12.1 (1.5 on 9/15/04)	72 to 125 (19 on 9/15/04)	6.1 to 7.4 (1.0 on 9/15/04)
Union Valley reservoir	32	0.8 to 11.8 (7.9 on 11/06/02)	6 to 116 (90 on 11/06/02)	5.8 to 7.9 (1.1 on 10/16/02, 10/31/02, and 9/14/04)
Ice House reservoir	28	2.3 to 13.2 (6.8 on 11/14/02)	20 to 117 (79 on 10/24/02)	6.0 to 8.5 (1.4 on 11/06/02)
Junction reservoir	5	3.4 to 12.6 (2.3 on 9/16/03)	29 to 110 (23 on 9/16/03))	6.2 to 7.8 (0.7 on 5/13/03)
Camino reservoir [a]	2	9.4 to 9.5 (0.1 on 11/13/02)	82 to 102 (2 on 11/13/02)	6.8 to 7.3 (0.1 on 11/13/02 and 9/12/04)
Brush Creek reservoir	6	1.6 to 10.4 (7.7 on 9/16/03)	14 to 103 (89 on 9/16/03)	6.1 to 7.7 (0.9 on 9/16/03)
Slab Creek reservoir	17	4.8 to 14.0 (2.4 on 9/15/03)	46 to 116 (17 on 9/13/04)	6.5 to 7.8 (0.5 on 6/25/03)
Chili Bar reservoir	13	4.9 to 14.3 (3.4 on 9/13/04)	51 to 123 (36 on 9/13/04)	6.7 to 7.8 (0.7 on 11/13/02)

Note: The values within the "( )"s are the maximum fluctuations within vertical profile and the date(s) that this was measured.

Monitoring results for pH in the stream reaches ranged from 4.9 to 8.7, indicating that pH is occasionally outside the allowable range of 6.5 to 8.5. Of the 221 riverine pH measurements, 24 (11 percent) were below 6.5 and 1 (<1 percent) was greater than 8.5. Most of the sites monitored in the headwaters of the Rubicon River had at least one low pH value; whereas only four of the SFAR Basin sites had low pH values. Two of these four sites are upstream of the Projects' effects. The other two sites are a short distance downstream of Ice House and Camino reservoirs. The only pH value above 8.5 was measured in the SFAR at the most downstream site monitored, just upstream of the Weber Creek confluence.

Metals and Polychlorinated Biphenyls—The applicants sampled reservoir and stream reaches for metals, total hardness and total cyanide during seven sampling events in 2002 to 2004 to monitor conditions during fall turnover, the first major rain, spring runoff, and summer low flow. Hardness in the UARP and Chili Bar Project reservoirs ranged from 1 to 9 mg/L as $CaCO_3$. Hardness in UARP-affected reaches and non-project reaches ranged from approximately 1 to 20 mg/L, while hardness in the reach downstream of Chili Bar dam ranged from about 7 to 12 mg/L. All of these results show that surface waters in the area are soft.

Analyses for metals consisted of total metals in 2002 and 2003 and were expanded to also include the dissolved fraction of metals in 2004. Comparison of the results of this sampling effort to the Primary and Secondary MCLs indicates that the concentrations of metals generally satisfy the Primary and Secondary MCLs in reservoirs and stream reaches of the Projects. Although 10.8 percent of the 406 total lead samples and 3.7 percent of the 215 total mercury samples exceeded the corresponding Primary MCLs, QA/QC test results indicate that these high concentrations were likely a result of contamination from sampling devices used in 2003 and 2004. Sample results for total iron and total aluminum exceeded the corresponding secondary MCL in 4.2 and 0.7 percent of the samples, respectively.

Table 3-18 displays the percent of the dissolved fraction samples for cadmium, copper, lead, nickel, silver, and zinc that exceed the corresponding criterion continuous concentrations (CCC) and criterion maximum concentrations (CMC). This analysis indicates that most samples had concentrations that were below the CCC and CMC for most of these metals. In streams, more than 10 percent of the samples exceeded the CCC and/or the CMC for copper and lead. Both the UARP and Chili Bar Project-affected stream reaches tended to exceed the CCC and CMC for copper more than the reaches not affected by the Projects. Due to contamination of the samples collected in 2004 from the sampling device, it is not possible to determine how frequently the lead CCC or CMC was exceeded in the reservoirs. However, it appears that the frequency of exceedance of the CCC and CMC in the Project reservoirs is about the same as in Project-affected stream reaches, based on comparison of the total recoverable lead levels for both stream and reservoir sites in samples collected in 2002 and 2003. Dissolved copper concentrations exceeded the CCC and CMC in half of the samples from Chili Bar reservoir and 21.7 percent of the samples from the UARP reservoirs. More than 10 percent of the samples from Chili Bar reservoir exceeded the CCC and CMC for cadmium and zinc.

The applicants analyzed bioaccumulation of trace metals using samples of four piscivorous fish species collected from five UARP reservoirs and Chili Bar reservoir. Sampling these piscivorous fish is expected to document near maximum effects of biomagnifications on body burdens. The applicants analyzed one composite fish fillet

Table 3-18. Frequency of dissolved cadmium, copper, lead, nickel, silver, and zinc water samples that exceed the corresponding CCC and CMC criteria, 2004. (Source: DTA, 2005b)

	CCC/CMC Criteria Exceedance[a]				
Metal	**Non-Project Affected Reaches**	**UARP Affected Reaches**	**Chili Bar Project Affected Reaches**	**UARP Reservoirs**	**Chili Bar Reservoir**
Cadmium	0/0	1.5/4.5	0/0	2.9/2.9	12.5/12.5
Copper	3.3/3.3	16.6/16.6	33.3/33.3	21.7/21.7	50/50
Lead	33.3/0	33.3/0	11.1/0	[b]	[b]
Nickel	0/0	0/0	0/0	0/0	0/0
Silver	NA/6.6	NA/1.5	NA/0	NA/2.9	NA/0
Zinc	0/0	4.5/4.5	0/0	0/0	16.2/16.2

Note: NA – indicates not applicable.

[a] Values are reported as the percent of samples that exceed the CCC followed by "/" and the percent of samples that exceed the CMC.

[b] Reservoir samples were contaminated with lead from the Kemmerer sampler and thus lead results are not valid.

sample and one composite fish liver sample collected from each reservoir. Table 3-19 provides descriptions of the composite fish tissue samples and the concentration of trace metals in them, along with screening values intended to protect humans from consumption of contaminated fish. As expected, the fish liver samples generally had higher concentrations of all of the metals analyzed.

Arsenic concentrations in some fish fillets exceeded the screening values set to protect recreational and subsistence anglers. The recreational screening value of 0.026 milligram per kilogram (mg/kg) was exceeded in samples from three of the reservoirs (Ice House, Union Valley, and Gerle Creek). Since the detection level for arsenic was higher than the screening value for subsistence anglers, it is not possible to determine whether fish from the other three sampled reservoirs also exceed the subsistence screening value. The applicants analyzed the fish samples for total mercury, not methylmercury. However, EPA (2000) recommends the use of total mercury as a conservative surrogate for methylmercury in fish tissue since most of the mercury accumulated in fish is generally in the form of methylmercury and methylmercury analysis is relatively expensive. Comparison of the total mercury concentrations to the concentrations of screening values set for methylmercury suggests that contamination of piscivorous fish in Slab Creek and Union Valley reservoirs may be at harmful levels for recreational anglers. This conservative approach also suggests that mercury

Table 3-19. Trace metal concentrations (mg/kg) in composite fish fillet and fish liver samples (shown in parentheses) from selected UARP and Chili Bar Project reservoirs, samples collected on December 16, 2003.[a] (Source: DTA, 2005b; EPA, 2000)

Metal	**Screening Values[a]**	**Loon Lake**	**Gerle Creek**	**Union Valley**	**Ice House**	**Slab Creek**	**Chili Bar**
Composite sample description		6 brown trout with fork lengths of 13.5 to 14.8 inches	1 brown trout with fork length of 20.1 inches	4 smallmouth bass with fork lengths of 11.8 to 15.7 inches	7 rainbow trout with fork lengths of 8.4 to 13.4 inches	1 brown trout with fork length of 19.1 inches	8 Sacramento pikeminnow with fork lengths of 9.4 to 12.8 inches
Silver	--	<0.002 (1.74)	<0.002 (1.86)	<0.002 (0.013)	<0.002 (0.22)	<0.002 (0.17)	<0.002 (<0.002)
Aluminum	--	0.37 (<0.02)	<0.02 (6.55)	<0.02 (21.2)	<0.02 (<0.02)	<0.02 (<0.02)	<0.02 (<0.02)
Arsenic	Rec 0.026, Subs 0.00327	<0.02 (0.38)	0.028[b] (1.19)	0.06 (0.12)	0.16 (0.099)	<0.02 (0.038)	<0.02 (0.051)
Cadmium	Rec 4.0, Subs 0.491	0.0080 (0.62)	0.0008[b] (0.83)	<0.0004 (0.64)	<0.0004 (0.025)	<0.0004 (0.029)	0.0013 (0.019)
Chromium	--	0.094 (0.139)	0.093 (0.121)	0.086 (0.161)	0.080 (0.156)	0.089 (0.09)	0.066 (0.118)
Copper	--	0.48 (87.8)	0.52 (126)	0.47 (4.11)	0.46 (35.3)	0.44 (9.74)	0.39 (2.12)
Manganese	--	0.037 (1.11)	0.0009[b] (0.43)	0.13 (0.97)	0.12 (1.47)	0.012 (1.17)	<0.0006 (0.41)
Nickel	--	<0.001 (0.015)	<0.001 (0.034)	0.009 (<0.001)	<0.001 (<0.001)	<0.001 (0.007)	<0.001 (0.006)
Lead	--	<0.0004 (<0.0024)	<0.0004 (0.012)	<0.0004 (0.015)	<0.0004 (0.0018)	<0.0004 (<0.0004)	0.0043 (<0.0004)
Selenium	Rec 20, Subs 2.457	0.32 (9.14)	0.39 (30.6)	0.21 (0.99)	0.19 (0.91)	0.086 (1.31)	0.14 (0.72)
Zinc	--	4.92 (25.0)	3.53 (52.6)	4.19 (17.8)	4.32 (22.9)	3.60 (27.8)	8.05 (12.0)

Metal	Screening Values[a]	Loon Lake	Gerle Creek	Union Valley	Ice House	Slab Creek	Chili Bar
Mercury	Rec 0.4, Subs 0.049[c]	0.137 (--)	0.321 (--)	0.419 (--)	0.036 (--)	0.595 (--)	0.075 (--)

Note: -- – indicates no guideline criteria from selected literature sources or data available, as appropriate.

[a] Screening values are directly comparable to concentrations in fish tissues typically eaten by humans (i.e., fillets), but not liver samples. “Rec” screening values set to protect recreational anglers, based on fish consumption rate of 17.5 grams (g)/day, 70 kg body weight and, for carcinogens, 10^{-5} risk level and 70-year lifetime. “Subs” screening values set to protect subsistence anglers, based on fish consumption rate of 142.4 g/day, 70 kg body weight and, for carcinogens, 10^{-5} risk level and 70-year lifetime.

[b] Value is below reporting limit, but above the method detection limit.

[c] As methylmercury, although it is recommended that total mercury be analyzed and the conservative assumption be made that all mercury is present as methylmercury since most mercury in fish and shellfish tissue is present primarily as methylmercury (NAS, 1991, as cited by EPA, 2000; Tollefson, 1989, as cited by EPA, 2000; Tollefson, 1989) and because of the relatively high cost of analyzing for methylmercury. This approach is deemed to be most protective of human health and most cost-effective (EPA, 2000).

contamination of piscivorous fish in three of the other reservoirs (Gerle Creek, Loon Lake, and Chili Bar) may be harmful to subsistence anglers. All of the cadmium and selenium concentrations measured in fish fillets were less than the corresponding screening values set for recreational and subsistence anglers.

Coliform Bacteria—During the summer of 2003, SMUD and PG&E sampled 21 different locations for fecal coliform in a manner consistent with the applicable water quality standard (i.e., 5 samples in a 30-day period). All of these 30-day periods include the holiday weekend of either Independence Day or Labor Day, and are therefore representative of the high recreational season. Table 3-20 summarizes the results of this sampling effort.

Table 3-20. Summary of fecal coliform sampling results for UARP reservoirs and reaches and the reach downstream of Chili Bar, based on five samples collected during a 30-day period in summer 2003 [a] showing location with exceedances of criteria. (Source: DTA, 2005b)

Site	Range (MPN/100 mL)	Geometric Mean (MPN/100 mL)	Samples in Excess of 400/100 mL criterion (MPN/100 mL on date)
Union Valley reservoir at Camino Cove	<1–3,180	38	**3,180** on 6/23 **1,200** on 7/01
Union Valley reservoir at Fashoda Beach	<1–600	10	**600** on 6/23
Union Valley reservoir at Jones Fork Campground	<1–2,900	17	**550** on 6/23 **2,900** on 7/01
Jones Fork Silver Creek at Ice House Road	165–1,500	**468**	**730** on 6/23 **1,500** on 7/22
Big Silver Creek at bike bridge	37–1,160	133	**1,160** on 7/22
SFAR downstream of Miner's Cabin	<1–6,100	159	**6,100** on 7/01 **438** on 7/08
SFAR downstream of Greenwood Creek	<1–728	31	**578** on 7/01 **728** on 7/08
SFAR upstream of Hastings Creek	28–3,900	**322**	**3,900** on 7/01 **462** on 7/08
SFAR downstream of Weber Creek	<1–9,300	**327**	**660** on 6/25 **9,300** on 7/01 **1,350** on 7/08

Notes: MPN/100 mL is most probable number/100 milliliter.

Bold values exceed applicable criterion.

[a] Each sampling period included either Independence Day or Labor Day weekend.

Fecal coliform concentrations generally satisfied the applicable criteria in the sampled reservoirs. However, the 400 most probable number (MPN)/100 mL criterion that is not to be exceeded in more than 10 percent of the samples was exceeded in 20 to 40 percent of the samples from all three of the Union Valley reservoir sample sites. The 400 MPN/100 mL criterion also was exceeded at two sites in tributaries to Union Valley reservoir that are not affected by the Projects, and four sites in the Chili Bar bypassed reach. Although the highest values and most frequent exceedances occurred at the most downstream site, which is located downstream of Weber Creek and about 1 mile upstream of Folsom Lake, SMUD reported that fecal coliform concentrations did not increase in an upstream to downstream direction on each day sampled. The geometric mean remained below the 200 MPN/100 mL criterion for 18 of the 21 sample sites. This criterion was exceeded at the two most downstream sites in the Chili Bar bypassed reach and at a site in Jones Fork Silver Creek that is upstream of the Project's influence.

3.3.2.2 Environmental Effects

Water Quantity

The Settlement Agreement's proposed minimum streamflow schedules and water level regimes for Project-influenced reaches and reservoirs include a variety of alternative measures for each Project development. Because measures related to streamflow primarily pertain to protecting and enhancing aquatic and riparian habitat and recreational opportunities, we discuss the specific aspects of these measures in sections 3.3.2.2, *Water Quality;* 3.3.3.2, *Aquatic Resources*; 3.3.4.2, *Terrestrial Resources*; and 3.3.6.2, *Recreational Resources*. In this section we discuss the effects of the proposed water level regimes on reservoirs affected by the UARP and Chili Bar Project operations as well as the means to ensure compliance with the proposed minimum streamflow schedules and water levels.

Reservoir Levels

Under Proposed Article 1-23, *Reservoir Levels*, SMUD would within 6 months of license issuance meet or exceed the end-of-the-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs (table 3-21) and would manage reservoir levels at Rubicon, Buck Island, Gerle, Junction, Brush, and Slab Creek reservoirs to meet seasonal targets as described below. This measure and other reservoir level related measures also pertain to protecting and enhancing aquatic and riparian habitat, recreational opportunities, and aesthetics; therefore, we also discuss additional aspects of these measures in sections 3.3.3.2, *Aquatic Resources*; 3.3.4.2, *Terrestrial Resources*; 3.3.6.2, *Recreational Resources;* and 3.3.8.2*, Aesthetic Resources.*

Table 3-21. Loon Lake, Union Valley, and Ice House reservoir levels by water year. (Source: SMUD and PG&E, 2007)

	End-of-Month Reservoir Elevation				
Reservoir/Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
Loon Lake					
July	6,388	6,395	6,399	6,400	6,400
August	6,382	6,389	6,394	6,393	6,393
September	6,379	6,385	6,390	6,390	6,390
Union Valley					
July	4,816	4,836	4,856	4,856	4,856
August	4,803	4,827	4,835	4,841	4,842
September	4,796	4,818	4,830	4,830	4,830
Ice House					
July	5,435	5,437	5,440	5,441	5,441
August	5,430	5,433	5,434	5,435	5,434
September	5,420	5,429	5,430	5,431	5,430

Rubicon and Buck Island Reservoirs—SMUD would attempt to maintain the water surface in Rubicon and Buck Island reservoirs at as high an elevation as practicable, and with a minimum of fluctuation, from May 1 to September 10 of each year in order to secure the maximum recreational benefits. Both of these high elevation reservoirs are remote and due to access issues, the gates are manually installed in June or July and are removed in mid- to late September or October. As described in Proposed Article 1-1, *Minimum Streamflows*, SMUD would maintain an overwintering minimum pool of 6,527 feet in elevation in Rubicon reservoir for the protection of aquatic species.

Gerle Reservoir—SMUD would attempt to maintain the water surface in Gerle reservoir at as high an elevation as practicable, and with a minimum of fluctuation, from May 1 to September 10 of each year. If SMUD anticipates the reservoir will be drawn down below 5,225 feet during this time period, SMUD would consult with the Forest Service, Water Board, FWS, and CDFG.

Junction and Brush Creek Reservoirs—SMUD would maintain the seasonal reservoir levels at Junction and Brush Creek reservoirs within the range of levels measured between 1975 through 2000 based on the databases maintained by DWR and SMUD.

Slab Creek Reservoir—SMUD would attempt to maintain the reservoir level above 1,830 feet in elevation during daylight hours between 10:00 a.m. and 8:00 p.m. during the period from July 1 through September 30. SMUD would also attempt to limit daily fluctuations to less than 7 feet per day during daylight hours between 10:00 a.m. and 8:00 p.m. from July 1 through September 30. The minimum reservoir elevation and maximum daily fluctuation would be reassessed and modified if necessary to accommodate (1) the operation of the proposed Iowa Hill development, should it be constructed; (2) the recreational use at Slab Creek reservoir; and (3) other applicable factors.

Water Levels during a Super Dry Water Year—A super dry (SD) year is defined as any critically dry (CD) year that is immediately preceded by a dry or CD water year or any dry water year type that is immediately preceded by any combination of two dry or CD water year types. In the event of a SD year, SMUD would, by March 10, notify the Forest Service, CDFG, and the Water Board about their concerns related to reservoir levels. By June 1 of a SD year, SMUD would confer with the Forest Service, CDFG, Water Board, and the Consultation Group to discuss reservoir operations plans and reservoir levels during the SD water year. Upon approval by the Forest Service, the Commission, Water Board, and CDFG. SMUD would implement the revised operations while balancing, as discussed in the Settlement Agreement, a wide range of aquatic, recreation, water supply, and power generation issues for a SD year.

Our Analysis

End of Month Water Levels

The proposed end-of-month water levels at Loon Lake, Ice House, and Union Valley are somewhat similar to historical operation of all three reservoirs. However, the Settlement Agreement includes a wide range of proposed measures including increased minimum flows, pulse flows, ramping rates, recreational releases and others that would affect reservoir water levels while providing enhancement to water quality and aquatic, terrestrial, recreational, and other resources.

As part of the Settlement process, CDFG modeled the operations of the UARP and Chili Bar Project using the HEC-ResSim[31] model to help evaluate the effects of various streamflow and reservoir elevation targets. In addition to reservoir and streamflow requirements, the model also included energy generation based on the Settlement Agreement and several other factors. The model included

[31]HEC-ResSim is a computer reservoir system simulation program developed by the U.S. Army Corps of Engineers for performing reservoir operation modeling under a variety of operational goals and constraints.

simulation of Project operations under current measures and operation practices, designated as the "Base Case." Simulation of the Proposed Action, including the proposed minimum flows, pulse flows, reservoir elevation, maintenance, and other measures using the historical inflow data, is designated in the following figures as the "Settlement Agreement." Output from the model included streamflow data, power generation, reservoir elevation data, and other information at both 30-minute and 1-day intervals for the 1975 to 2000 water years.

Table 3-22 shows the water year types for water years 1992 through 1999. Figures 3-9 through 3-11 are representative of the reservoir levels in Loon Lake, Ice House reservoir, and Union Valley reservoir for water years 1992 through 1999 (a grouping of years that include a reasonable representation of water year types) from the output of the HEC-ResSim model under the Proposed Action. These figures show that in almost all cases, SMUD could achieve the end-of-month target elevations while meeting the proposed minimum streamflow schedules included in the Settlement Agreement. However, as shown in the figures, the end-of-month water levels would not have been met at the reservoirs in 1992, which under the Settlement Agreement would have been classified as an SD year as, discussed later in this section.

Table 3-22. Water year types for 1992–1999. (Source: SMUD, 2005)

Year	Water Year Type
1992	Dry
1993	Above Normal
1994	Critically Dry
1995	Wet
1996	Above Normal
1997	Wet
1998	Wet
1998	Above Normal

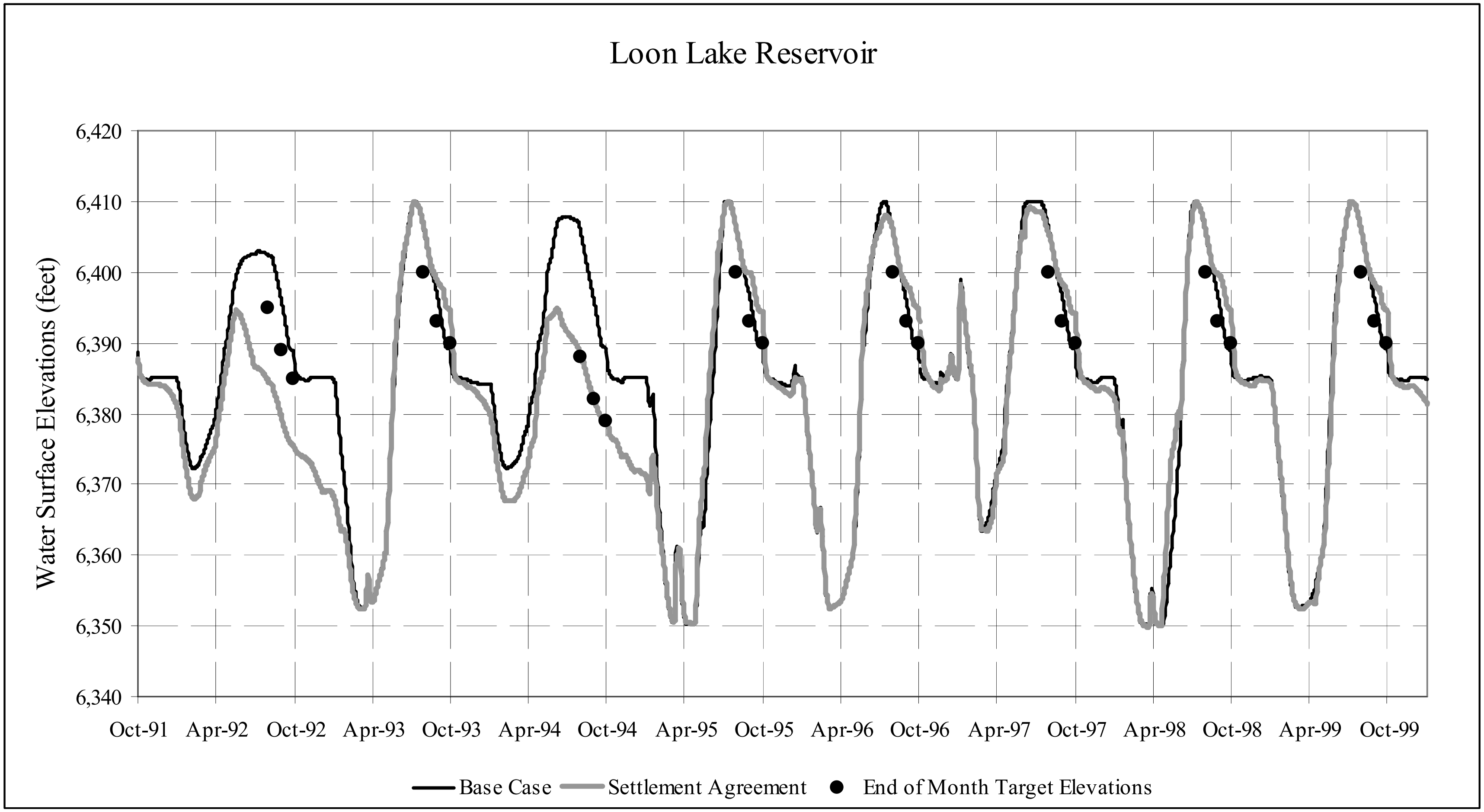

Figure 3-9. Loon Lake reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

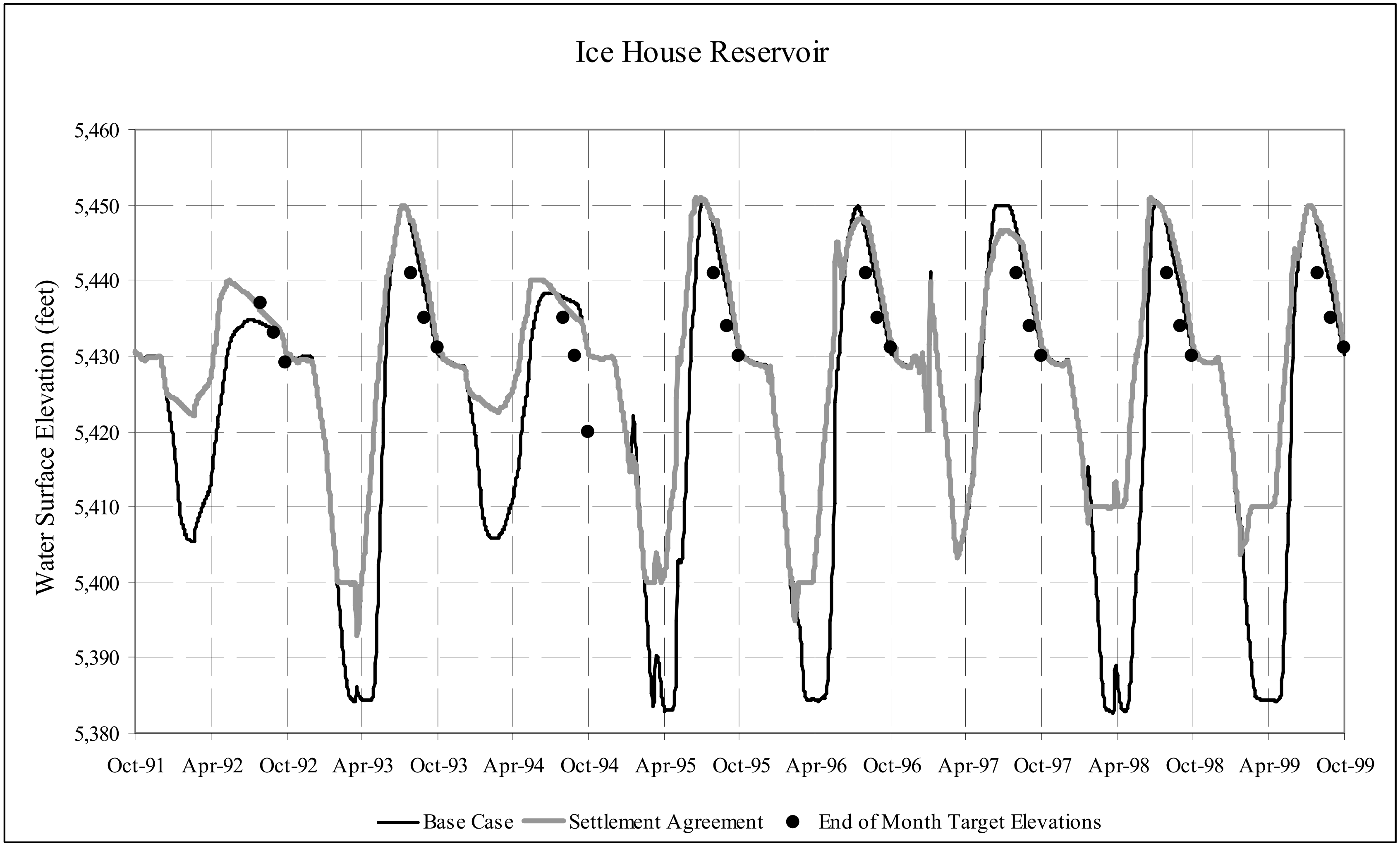

Figure 3-10. Ice House reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

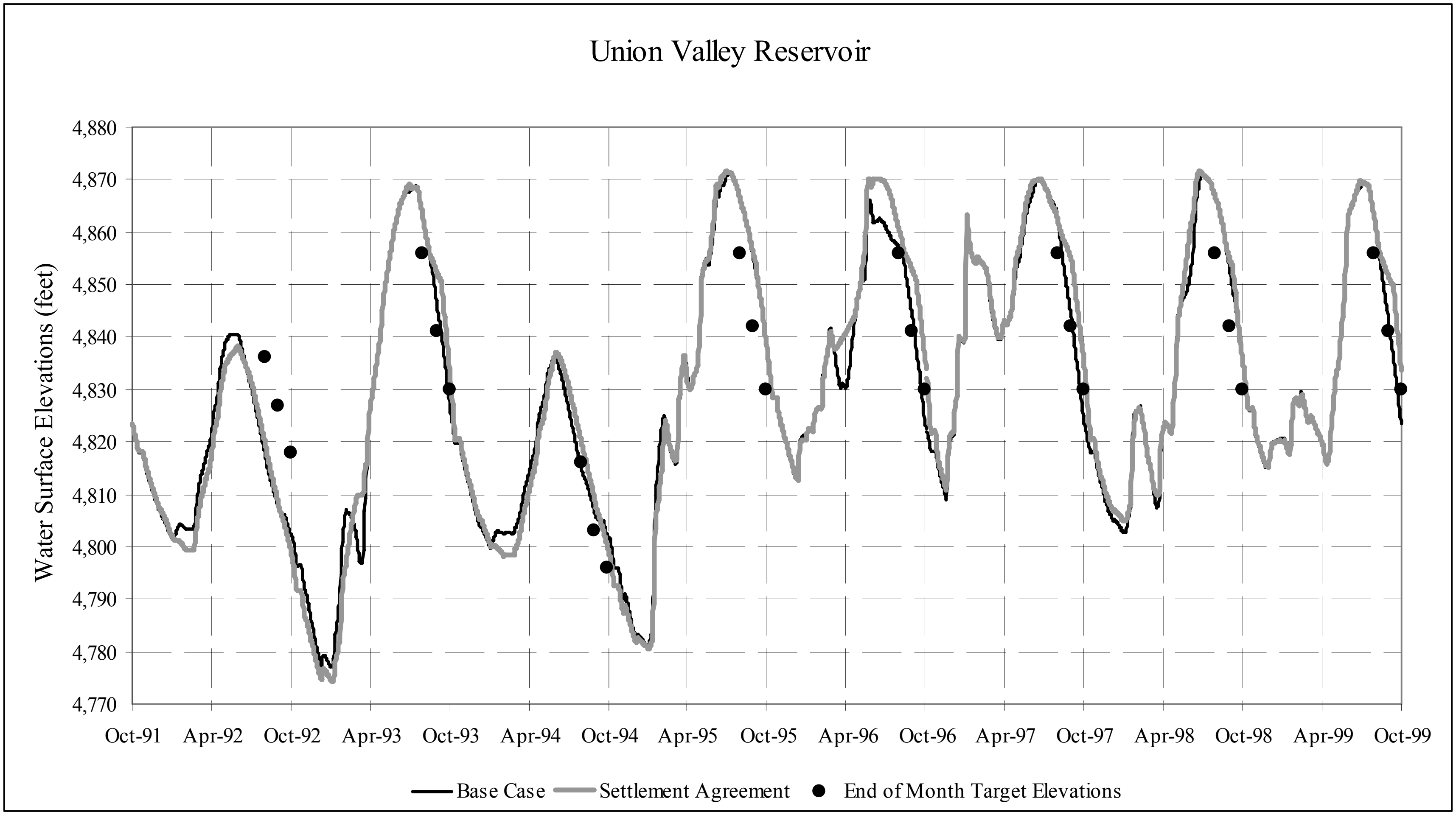

Figure 3-11. Union Valley reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

Water Levels during a Super Dry Water Year

Review of the water year type records indicate the SD water year types have occurred three times between 1975 and 2005 (1977, 1988, and 1992). HEC-ResSim modeling indicates that water levels in the three main storage reservoirs could fail to meet the CD end-of-month targets during these years. Figure 3-12 shows the Base and the Proposed Action water levels during these SD years at Union Valley reservoir, the largest storage reservoir. This figure is representative of several important aspects, including the variation in severity of SD years. Another key feature of this figure is the additional drawdown that would have occurred in 1977, when measures included in the Settlement Agreement would have resulted in additional drawdown during the summer.

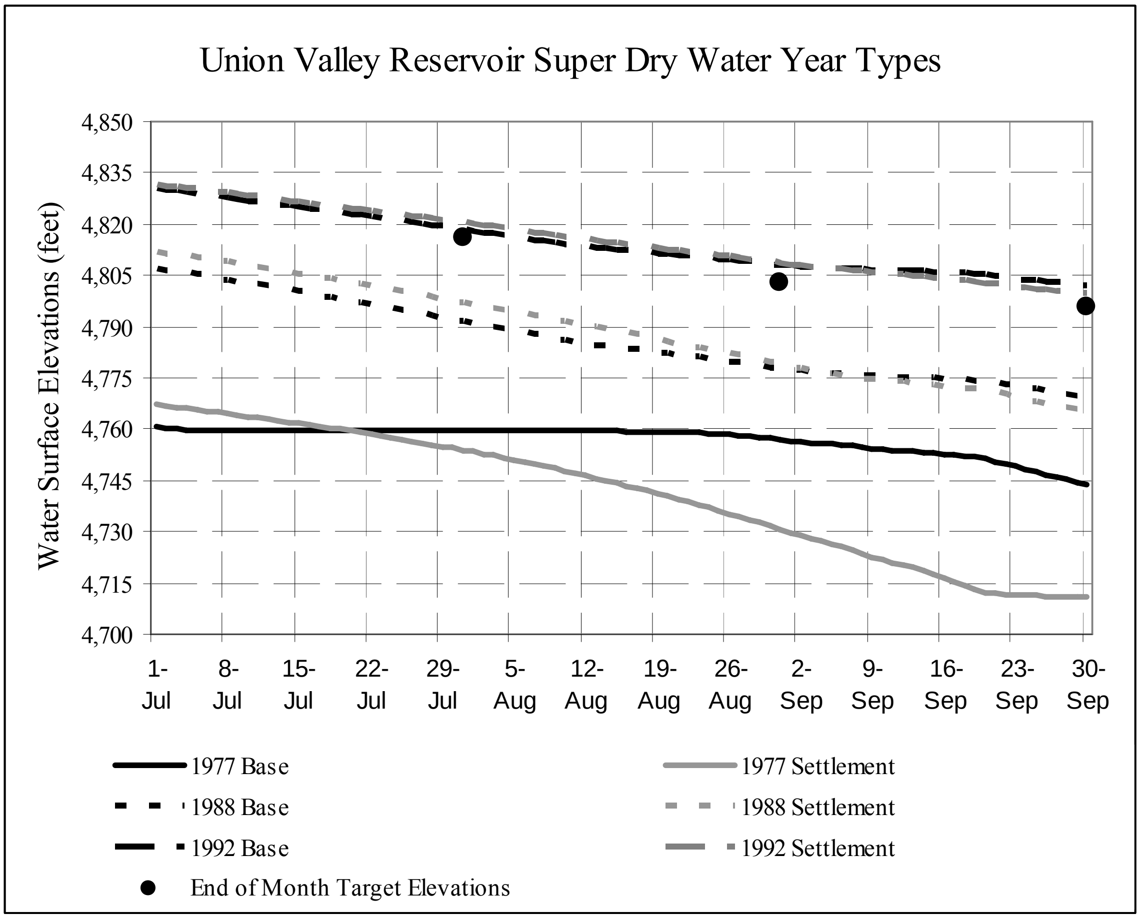

Figure 3-12. Union Valley reservoir modeled base and Proposed Action water surface elevations from July to September 30 for 1977, 1988, and 1992. (Source: CDFG, 2007, as modified by staff)

Rubicon and Buck Island Reservoirs

HEC-ResSim modeling of the effects of the Proposed Action on the reservoir levels at Rubicon and Buck Island reservoirs showed that fluctuations of the water levels of these two reservoirs would still occur and be somewhat similar to existing conditions. Existing conditions for the past 8 years at these reservoirs are shown in figures 3-13 and 3-14. Many of these fluctuations, especially early in the May through September 10 period as shown in figures 3-13 and 3-14, are due to rapidly varying inflow to the reservoirs. These high elevation reservoirs have limited storage capacity and are affected by changes in the inflow to the reservoirs, normally driven by snowmelt. However, these graphs do show a relatively stable water surface elevation during low inflow conditions, which normally start during July and extending through the recreational season. In addition, the manual installation of the gates at these reservoirs normally occurs in early June or July and they are removed in mid- to late September or October. Not provided in the graphs are overwintering reservoir elevations at Rubicon reservoir. Modeled elevations during the winter period are similar to existing operations and did not fall below elevation 6,532 feet, 5 feet above the proposed minimum pool elevation.

Gerle Reservoir

HEC-ResSim modeling of the measures in the Proposed Action analyzed its effects on the reservoir levels at Gerle reservoir and showed that fluctuations of the water levels of this reservoir would still occur. This is partly because Gerle reservoir operates as an afterbay for Loon Lake powerhouse and as a forebay for the canal leading to Robbs Peak reservoir and powerhouse. Many of the variations in the early part of the May 1 to September 10 period (see figure 3-15) are the result of limited storage capacity and rapid variations in inflow similar to the Rubicon and Buck Island reservoirs. These graphs also show that SMUD would not be able to maintain the reservoir at an elevation of 5,225 feet, the trigger elevation for consulting with the Agencies.[32]

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[32]For simplicity purposes, the transition between Gerle Creek reservoir and the Gerle Creek canal was modeled as an uncontrolled outlet. However, in actuality, there are gates at the headworks to the Gerle Creek canal, and it is expected that SMUD would use these gates to help maintain the elevation of Gerle Creek reservoir at or above 5,225 feet during the summer recreation season. Under current conditions, fish passage from Gerle Creek reservoir to Gerle Creek seems to be more of a function of streambed geometry above the maximum level of the reservoir than of reservoir level, and reservoir levels do not substantially affect fish passage to Gerle Creek.

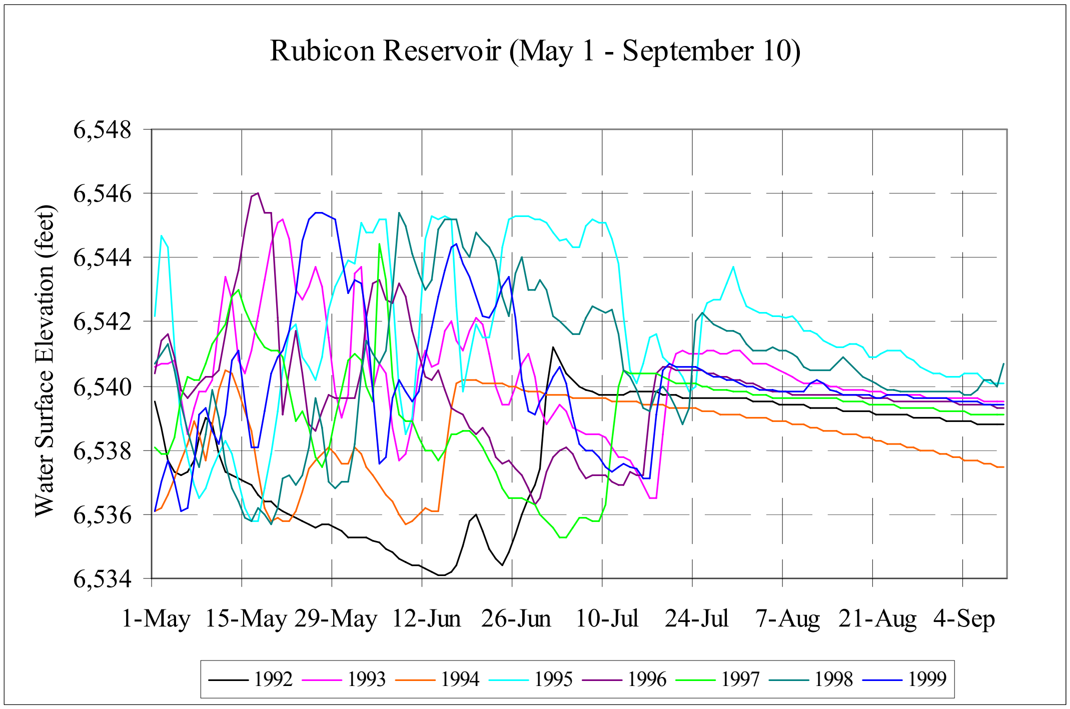

Figure 3-13. Rubicon reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007, as modified by staff)

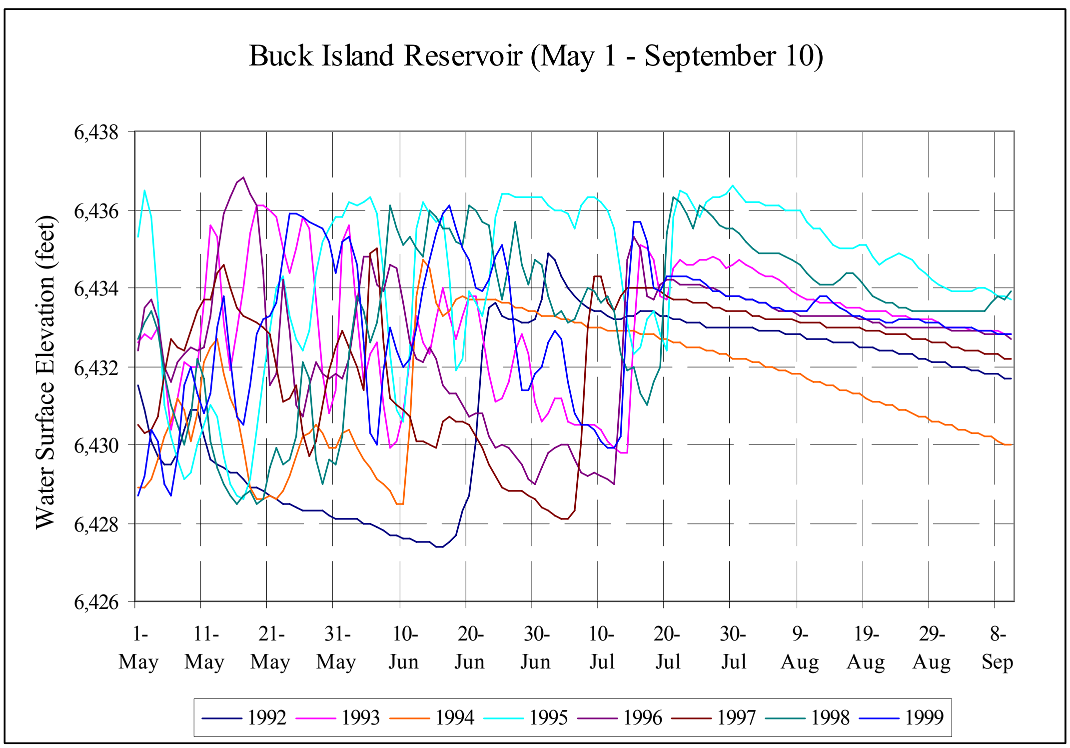

Figure 3-14. Buck Island reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007, as modified by staff)

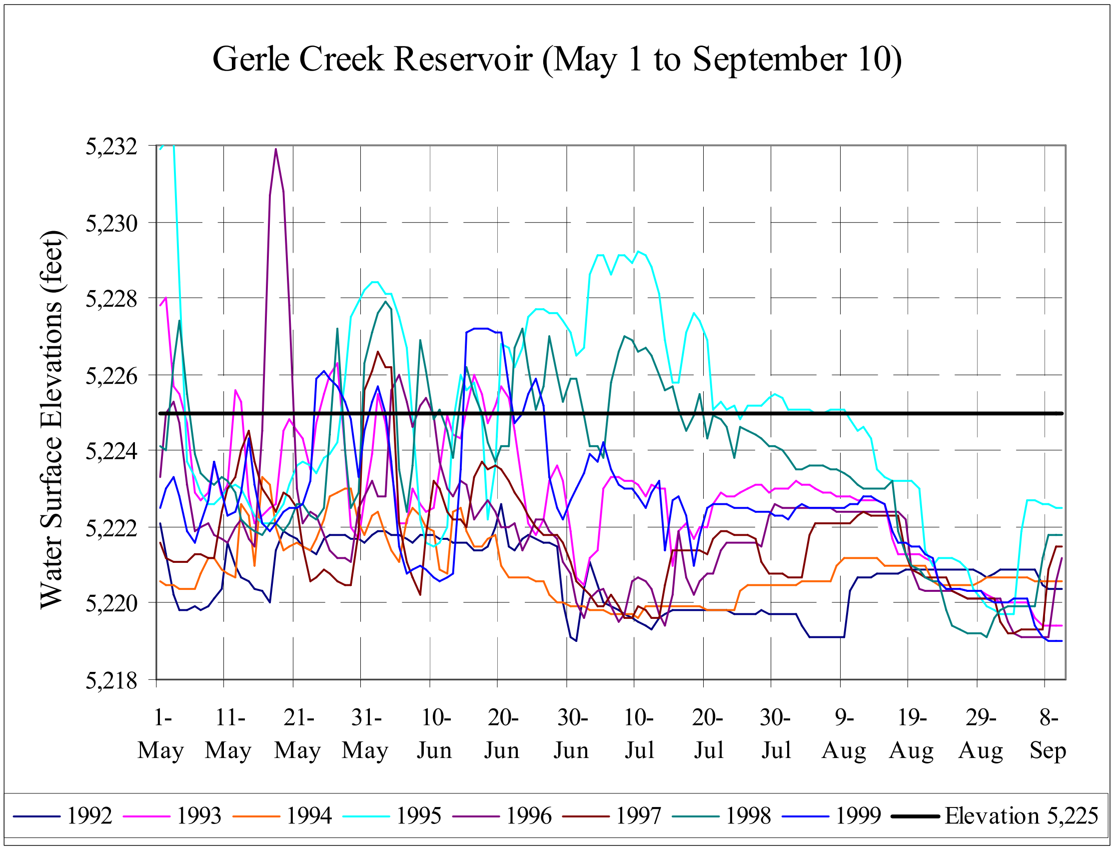

Figure 3-15. Gerle Creek reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007 as modified by staff)

Junction and Brush Creek Reservoirs

Both of these reservoirs serve as afterbays and forebays for downstream and upstream powerhouses. In the past, SMUD has operated them with water variations of approximately 20 feet per day during peaking operations. HEC-ResSim modeling of the Proposed Action indicates that this type of variation would continue to occur, largely the result of continued daily peaking operations and the limited storage capacity of the reservoirs.

Slab Creek Reservoir

HEC-ResSim modeling of the effects of the Proposed Action's measures on reservoir levels at Slab Creek reservoir shows that daily fluctuation at this reservoir would occur, but would be likely to be less than under existing conditions. Existing daily fluctuations at this reservoir are normally about 6 feet, with only a few days per year over 7 feet. Figure 3-16 provides representative short-interval data of historical and modeled water surfaces in Slab Creek reservoir for July 1 through September 30, 1999. This figure shows a substantial decrease in the daily fluctuation of Slab Creek reservoir and indicates that water levels remain above elevation 1,830.[33]

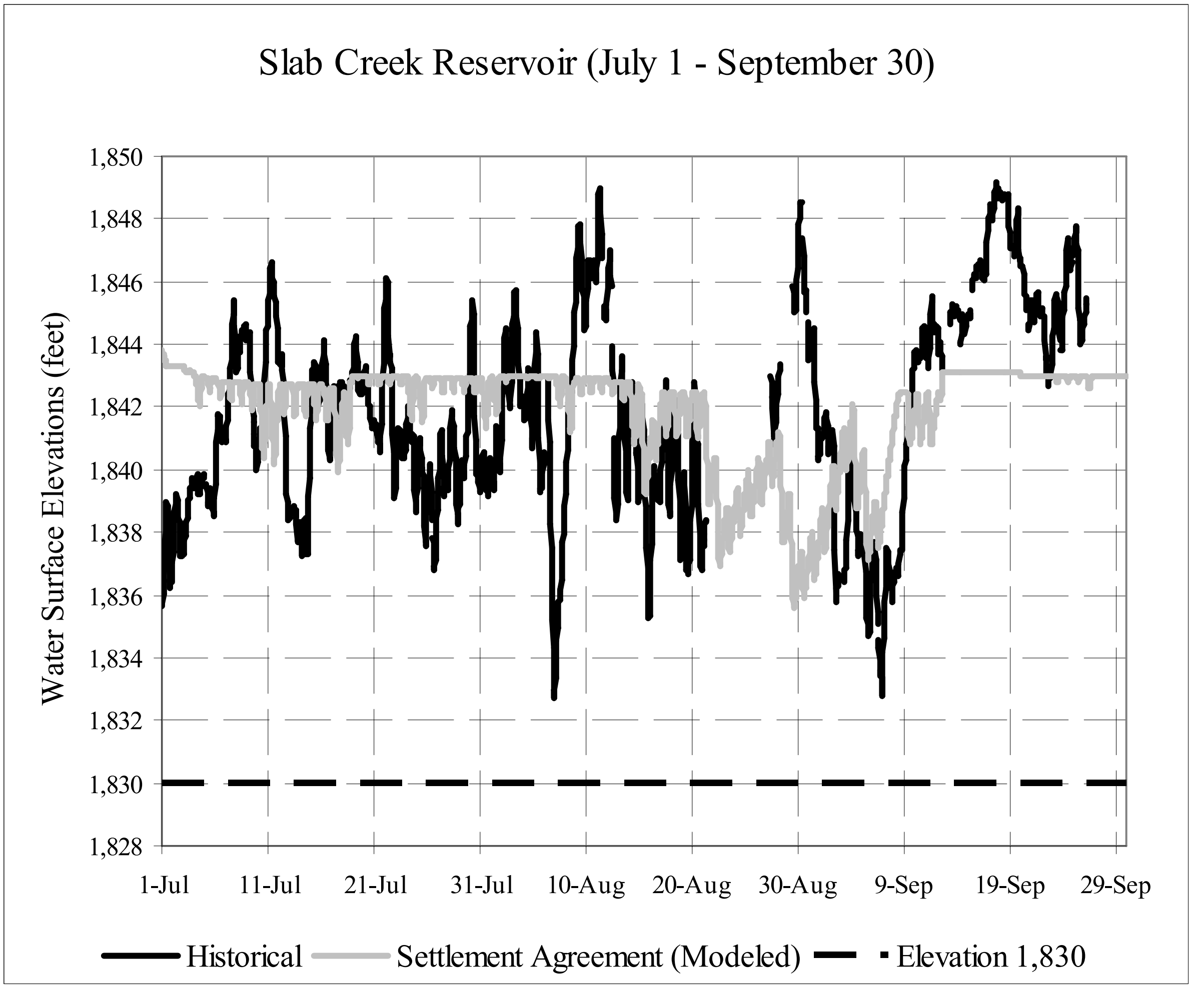

Figure 3-16. Slab Creek reservoir historical one hour and modeled half hour elevations between May 1 and September 10 1999. (Source: CDFG, 2007; CDEC, 2007, as modified by staff)

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[33]For model simplicity purposes, coordinated operations between Slab Creek reservoir and Chili Bar reservoir was simulated using the implicit storage balance option within HEC-ResSim. In addition, the target elevation for Slab Creek reservoir was set at a constant elevation of 1,843 feet. The reservoir fluctuation depicted in the model output is primarily a result of these modeling simplifications. It is expected that the daily fluctuation in Slab Creek reservoir water surface elevations (absent effects from the Iowa Hill development) will be similar to historical operations.

Flow and Water Level Monitoring—Flow and water level gages are in place on many Project-affected reaches and reservoirs (tables 3-23 and 3-24).

Table 3-23. Existing streamflow gages in the UARP area. (Source: SMUD, 2005, USGS, 2007)

Existing USGS Gage No.	Gage name
11427960	Rubicon River below Rubicon dam, near Meeks Bay[a]
11428400	Little Rubicon River below Buck Island dam[b]
11429500	Gerle Creek below Loon Lake dam
11430000	SFRR below Gerle Creek
11441500	SFSC near Ice House
11441800	Silver Creek below Junction dam near Pollock Pines[c]
11441900	Silver Creek below Camino dam
11442700	Brush Creek below Brush Creek dam near Pollock Pines
11443500	South Fork of the American River near Camino

[a] measures flows below 10 cfs, does not measure dam spillage.
[b] measures flows below 2 cfs, does not measure dam spillage.
[c] measures flows up to 40 cfs, does not measure dam spillage.

Table 3-24. Existing reservoir gages in UARP area. (Source: SMUD, 2005, CDEC, 2007)

Existing USGS No.	Existing DWR Abbreviation	Reservoir Name
NA	RBL	Rubicon
11429350	LON	Loon Lake
11429600	GLL	Gerle Creek
11441100	ICH	Ice House
11441001	UNV	Union Valley
11441760	JNC	Junction
11441890	CMI	Camino
11442690	BHC	Brush Creek
11443450	SLB	Slab Creek

Currently, SMUD maintains these gages and conducts monitoring and other procedures under the supervision of, and in conjunction with, USGS. Under Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, SMUD would maintain gages at almost all the current locations to monitor stream flows and reservoir levels, as well as conduct gage installation, rating, and measurements.

PG&E's existing and proposed compliance point for flows released from the Chili Bar Project is the existing USGS gage no. 11444500 (SFAR near Placerville). Under Proposed Article 2-8, *Streamflow and Reservoir Elevation Gaging*, PG&E also proposes to monitor the water level of Chili Bar reservoir to ensure compliance.

Our Analysis

We have reviewed the existing gaging and determined that SMUD would need to modify the current gaging in order to demonstrate compliance with the proposed minimum streamflow schedules in several of the downstream reaches.

Measuring flows below Rubicon dam. USGS gage no. 11427960 (Rubicon River below Rubicon dam) is a measuring device located in the outlet pipes of Rubicon dam and computes flow up to 10 cfs; it does not measure flow from the spillway. An auxiliary, but non-recording, gage is located about 1,300 feet downstream from the dam at a point where flow from the spillway has rejoined the channel. Currently, the recording gage is suitable for measurement of the existing 6 cfs or natural flow minimum flow requirement. However, the proposed minimum flows are above 10 cfs during the March through June period of most water year types, as shown in table 3-36. To demonstrate compliance with the proposed minimum streamflow schedule, SMUD would need to establish a means to measure outflow in excess of 10 cfs. This might be possible by converting the existing downstream non-recording gage to a fully operational and recording gage station or by other methods. In addition, according to SMUD, the current maximum low level outlet capacity is 18 cfs, so SMUD would need to modify the outlet pipe and/or structure to allow compliance with streamflows of 20 cfs (April) or 35 cfs (May) during BN, AN, or wet water year types. To monitor compliance with the proposed pulse events, SMUD could install a gage downstream of the confluence of the channel from spillways on the main and auxiliary dams and the low level outlet to monitor the recommended pulse flow event of at least 600 cfs for 3 consecutive days. Alternatively, if deemed feasible by USGS, the Forest Service, and other parties, SMUD could use the existing Rubicon reservoir water surface recorder and develop a rating curve to measure the amount of flow over the Rubicon reservoir spillway. However, it might be technically challenging to measure the flows accurately due to the length of the spillway crest. Because the Rubicon dam and reservoir are in the Desolation Wilderness Area, SMUD would need Forest Service approval of any physical modification to Project facilities necessary to monitor compliance with the proposed pulse events.

Measuring flows below Buck Island dam. USGS gage no. 11428400 (Little Rubicon River below Buck Island dam, near Meeks Bay) is a water stage recording V-notch sharp-crested weir near the low level outlet of the dam. This gage currently measures up to 2 cfs and does not measure flow from the spillway; it is suitable for measuring the current minimum flow requirement of 1 cfs. Because the proposed minimum flows are above 2 cfs during the March through June period of most water year types, as shown in table 3-37, SMUD would need to establish a means to measure outflow in excess of 2 cfs and up to 8 cfs, such as modifying the existing weir measurement structure.

Measuring flows below Gerle Creek and Robbs Peak dams. USGS gage no. 11430000 (SFRR below Gerle Creek, near Georgetown) is a water stage recorder located about 600 feet downstream of the confluence with Gerle Creek and about 1.2 miles downstream from Gerle Creek dam. Currently this gage measures both minimum flows and spillage over the dam. This gage is also used to also measure minimum flows from Robbs Peak dam, which is located about 1.1 miles upstream on the SFRR. SMUD states that manual staff gaging downstream of each dam is currently used in conjunction with the SFRR gage data. A rectangular weir staff gage is located at the base of Robbs Peak dam that provides gage data to correctly adjust releases from both Robbs Peak and Gerle Creek reservoirs. The gaging data is currently used to measure flows released from each dam during low flow periods. Accretions in the reaches below these two dams during the summer months are not substantial between the dams and the existing gage. It would be difficult to install new flow gaging stations in the areas below these two dams because of the general stairstep boulder/bedrock nature of the stream channels. Installation of gages at these locations would have both short-term and long-term environmental consequences (e.g., potential erosion and sedimentation, destabilization of existing slopes, disturbance of aquatic and riparian habitat, potential degradation of the local visual quality, and potential disturbance of cultural sites). Plans for the gaging stations could provide site-specific details regarding how these effects would be addressed. Consultation with USGS for the development of these gage sites, if part of a new license, would help ensure future compliance with USGS standards for flow measurement.

Measuring flows below Junction dam. USGS gage no. 11441800 (SFSC below Junction dam, near Pollock Pines) is located in the outlet pipe from Junction dam. Currently this gage does not measure flow above 40 cfs and does not have the ability to measure flow over the spillway. SMUD states that the low level outlet pipe from Junction dam has a maximum capacity of 138 cfs. Minimum flows in excess of 40 cfs, as shown in table 3-44, are proposed for the months of April, May, and June in some water years. In order to demonstrate compliance with the proposed minimum streamflow schedule, SMUD would need to establish a means to measure flow in excess of the current 40 cfs, such as modifying the existing measurement structure.

Measuring flows below Loon Lake dam, Ice House dam, Camino dam, Brush Creek dam, and Slab Creek dam. USGS gage no. 11429500 (Gerle Creek below Loon Lake dam, near Meeks Bay) is a water-stage recorder and V-notch sharp-crested weir about 0.3 miles below the dam. USGS gage no. 11441500 (SFSC near Ice House) is a water stage recorder with concrete control, located about 0.4 mile downstream from the dam. USGS gage no. 11441900 (Silver Creek below Camino dam) is a water stage recorder located about 0.4 mile downstream from the dam and measures low flow and dam spillage. USGS gage no. 11442700 (Brush Creek below Brush Creek dam, near Pollock Pines) measures flow in the outlet pipe from Brush Creek dam. According to SMUD, the low level outlet pipe from Brush Creek dam has a maximum capacity of 145 cfs. USGS gage no. 11443500 (SFAR near Camino) measures flow with an acoustic velocity meter approximately 1000 feet below the dam. Currently these gages measure both minimum flows and spillage over the dams and would be sufficient to measure the proposed minimum streamflow schedules, including the proposed pulse flows and/or recreational streamflows.

Operation of reservoir water level elevation gages. Currently, SMUD operates and maintains all of the water level gages listed in table 3-24, and SMUD reports the water levels on an hourly basis to the DWR.[34] This type of monitoring is needed as part of Project operations to coordinate multiple reservoirs, powerhouses, tunnels, and other structures within the Project area, and would be expected to continue. The effects of the Iowa Hill development would include changes in the water-level fluctuations in Slab Creek reservoir, with a general withdrawal of water during the night and increased inflow during the day during generation.

Measuring flows below Chili Bar dam. USGS gage no. 11444500 (SFAR near Placerville) measures flow with a water-stage recorder approximately 700 feet downstream of the dam. Currently this gage measures both minimum flows and spillage over the dam and would be sufficient to measure any reasonable flow regime, including possible recreational streamflows.

Streamflow and Reservoir Elevation Gaging Plan

Under Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, SMUD would, within 1 year after license issuance, develop and submit to the Commission for approval a streamflow and reservoir elevation gaging plan that meets USGS standards and includes a minimum of 10 streamflow gage locations (see table 3-23) and nine reservoir elevation compliance gaging locations (see table 3-24). This plan would be approved by the Water Board prior to filing with the Commission. SMUD would detail in the plan the maintenance and operation of all of the above mentioned streamflow and reservoir elevation gages, with the exception of USGS gage no.

[34] The data are available online at http://cdec.water.ca.gov/reservoir.html.

11430000 (SFRR below Gerle Creek). This gage would be replaced by new gages, one below Gerle Creek reservoir and one below Robbs Peak reservoir.

As part of the Settlement Agreement, SMUD also proposes to: (1) install and maintain simple staff gages at the put-ins for the Slab Creek and Ice House recreational boating runs and perform an investigation to determine whether telemetry equipment can be installed at Rubicon River below Rubicon dam and Little Rubicon River below Buck Island dam to monitor conditions and/or control operations, both within 2 years of licensing; and (2) provide real time information at 15-minute intervals for all streamflow and reservoir elevation gages.

Under Proposed Article 2-8, *Streamflow and Reservoir Elevation Gaging*, PG&E would, within one year after license issuance, develop and file for approval from the Commission a stream flow and reservoir elevation gaging plan, which would meet USGS standards. This plan, which would be approved by the Water Board prior to filing with the Commission, would address compliance streamflow gaging below Chili Bar dam at the existing USGS gage no. 11444500 (SFAR near Placerville) and water level compliance at Chili Bar reservoir.

The Placer County Water Agency recommends that SMUD implement a gaging system of SMUD's facilities that would verifiably and effectively monitor, report, and limit the rate of water diversion at SMUD's diversions facilities in the Rubicon River watershed. To effectively perform these functions, gaging would be required at the diversion gage locations shown in table 3-25 and real-time telemetry reporting capability would need to be installed, maintained, and made available to PCWA and other resource agencies.

Table 3-25. Existing diversion structure gages in Rubicon River watershed area of the UARP. (Source: SMUD, 2005)

Existing USGS Gage Number	Gage Name
11427940	Rubicon–Rockbound tunnel
11428300	Buck Island–Loon tunnel
11429340	Loon Lake powerhouse
11429300	Robbs Peak powerhouse

Our Analysis

SMUD and PG&E already monitor, or in some cases provide assistance to the USGS for monitoring and recording, many hydrological indicators, such as reservoir water level and stream flow in the Project area. Daily, and in many cases hourly or shorter interval, data recording allows SMUD and PG&E to manage their facilities for hydroelectric generation and document environmental compliance within the terms of their existing licenses. The configuration of future flow and water level monitoring gages would depend on the operating conditions that may be specified in new licenses.

Developing a coordinated gage installation plan, in consultation with resource and land management agencies, as well as USGS, would ensure that any new gages necessary to measure the flows and water levels that may be specified in a new license would provide accurate data consistent with applicable USGS standards. It also would provide documentation of the justification for the type of new gage (i.e., a gage with real-time telemetry capabilities or a gage without such capabilities) that is installed at each site and any needed modifications to existing streamflow or reservoir elevation gages. Other specific details of the streamflow gaging and reservoir elevation plans are discussed below.

Currently, real-time reporting is not available on any diversion structure located within the Rubicon River watershed area of the UARP. Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, does not include gaging at the diversion structures listed in table 3-25. Although the installation of real-time telemetry and other equipment to monitor, report, and limit the diversion flow at these structures, as suggested by Placer County, would provide information on the quantity of water diverted from these structures, we see no nexus between the requested gaging and this relicensing proceeding. In fact, this would seem to be a matter that would fall under the jurisdiction of the Water Board.

Public Information Services

Under Proposed Articles 1-25 and 2-14, *Public Information Services*, SMUD and PG&E would provide real-time streamflow and reservoir level information to the public via staff gages in the reservoirs, web sites, and toll free telephone numbers.

Our Analysis

<u>Staff gages for recreational boating at the put-ins for Slab Creek and Ice House boating runs.</u> Staff gages at these sites would allow boaters to observe the actual water level before launching on these whitewater runs. These gages would be roughly calibrated to flow levels that are too low, too high, or suitable for recreational boating activities. This measure is discussed in more detail in section 3.3.6.2, *Recreational Resources*.

<u>Telemetry equipment on gages on the Rubicon River below Rubicon dam and on the Little Rubicon River below Buck Island dam.</u> As is the case with possible modification to the existing gage, or replacement of the gage below Rubicon dam, SMUD and the Forest Service would need to concur that telemetry equipment is economically and technologically feasible, and whether it could be installed consistent with law, regulations, and policies applicable to the Desolation Wilderness Area.

<u>Provide real-time information at 15-minute intervals for all stream flow and reservoir elevation gages within the UARP area.</u> Currently, real-time reporting is not available to the public on any streamflow gaging sites within the UARP area. Hourly real-time reservoir levels are available on the CDEC web site. Real-time information for all streamflow and reservoir elevation locations can normally be easily and

inexpensively collected in either 1-hour or 15-minute intervals and made available to the public, which would allow the public, operators of downstream projects such as the Chili Bar Project and Middle Fork American River Project, and others to coordinate their activities and operations based on this information.

Chili Bar streamflow and reservoir gaging plan. Flow compliance monitoring for releases from Chili Bar reservoir would necessitate the continuing operation of gage no. 11444500 located below Chili Bar dam. Currently this is not a real-time USGS gage, but flows and gage heights at 1-hour intervals are available on the CDEC website for this streamflow gage. Reservoir level compliance would likely entail an upgrade of the current system that PG&E uses to monitor the water level within Chili Bar reservoir.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. Minimum flows, pulse flows, ramping rates, streamflow and reservoir elevation gaging, and public information services would be as described in the Proposed Action. As a result, the effects of the UARP-only Alternative would be the same as discussed under the Proposed Action with the exception that Slab Creek reservoir would not experience the daily and weekly fluctuations from operation of the pumped-storage facility.

Effects of Project Operations on Water Quality

Operation of the Projects has the potential to affect water temperatures, water quality, and algae. The available information that serves as the basis for our analysis regarding the effects of Project operations on water temperatures is not consistent between reaches. SMUD used water temperature observations and the SNTEMP model (Theurer et al., 1984) to simulate the effects of altered flow regimes on water temperatures in the Ice House, Camino, and Slab Creek dam reaches; and it used CE-QUAL-W2 (Wells, 2000) to simulate the effects of the proposed Iowa Hill development on water temperatures within Slab Creek reservoir. Water temperature was not modeled for the other UARP or Chili Bar Project-affected reaches and our analysis is by necessity based on observed temperatures.

The results of hourly temperature measurements made during 2000 to 2004 are used to represent existing conditions for all reaches. We compare the mean temperature for each day (i.e., 24-hour period), which we refer to below as “mean temperature”, to 20.0°C as an indicator of whether thermal conditions fully support cold water fishes. The lack of directly comparable information, as discussed above, resulted in our using two approaches to evaluate the effects of flows on water temperatures, depending on whether or not modeling had been done. For the reaches that were modeled, our analysis focuses on the applicants’ water temperature simulations for 2002, a BN water year type. To determine the potential effects of proposed operations on water temperature in Project reaches that were not modeled, we consider the changes in the proportion of total flow for BN water year types that would be supplied by the corresponding dam release (as opposed to the percentage provided by natural accretion). The existing minimum streamflow schedules referred to in our analysis are shown in tables 3-4 through 3-10 in section 3.3.2.2, *Water Quantity*. A summary of the temperatures in 2000–2004 referred to in our analysis are shown in table 3-16, and the elevations of the low water intakes and outlets are shown in table 3-15 in section 3.3.2.1, *Water Quality.* In addition, we evaluate the effects of proposed minimum flows and operation of the proposed Iowa Hill development below using the results of SMUD's CE-QUAL-W2 simulations. The results of our analyses of these issues are summarized in table 3-26, and are discussed below.

Table 3-26. Summary of general water temperature characteristics for the UARP and Chili Bar Project affected reaches under existing and proposed minimum instream flows and proposed Iowa Hill operations.[a] (Source: Staff)

Reach	Existing Operations [b]	Proposed Operations [c]
Rubicon	Warm late spring to summer releases. In comparison to dam release temperatures, major warming in May and June transitioning to minor to moderate cooling in July, which continues through September. Frequently >20°C in portions of the reach in July and August.	Temperatures slightly reduced compared to existing conditions in May and June, but negligible change in July–September.
Buck Island	Warm late spring to summer releases. Moderate to major warming within the reach during May–June, transitioning to minor cooling in July, which continues through September. Frequently >20°C throughout the reach in July and August.	Temperatures slightly reduced in May and June, but negligible effects in July–September.
Loon Lake	Cool releases through mid-September. Moderate warming in May, major warming in June–August, and minor cooling in late September. Remain <20°C throughout the bypassed reach.	Temperatures moderately reduced in June and July, and slightly reduced in May and August.
Gerle Creek	Moderate warming in May–July followed by minor warming in August and minor cooling in September. Remain <20°C throughout the bypassed reach.	Temperatures somewhat reduced during May through mid-August, and slightly increased in September.
Robbs Peak	Moderate warming in May–July, minor cooling in August, and moderate cooling in September. Remains <20°C in most years, but frequently >20°C in Dry years.	Temperatures somewhat reduced during May through mid-August, and slightly increased in September.

Reach	Existing Operations [b]	Proposed Operations [c]
Ice House	Cold May–September releases. Major warming May–September. Infrequently >20°C in July and August in the lower half of the reach.	Based on temperature simulations for a BN year, temperatures would be reduced 3 to 4°C in June and reduced about 2°C in July. The cooling effect would be smaller at both the upper and lower ends of the reach, although temperatures would likely remain <20°C throughout the entire reach.
Junction	Cool May–September releases. Major warming May–September. Rarely >20°C at lower end of reach in July.	Temperatures substantially reduced in May–July, maintaining <20°C. Temperatures slightly increased in August and September of AN and Wet water years due to lower minimum flow releases.
Camino	Moderate release temperatures. Major warming in May–September. At the lower end of the reach, >20°C frequently in July, occasionally in June and August, and rarely in May.	Based on temperature simulations for a BN year, temperatures at the lower end of the reach would be reduced substantially in May–July, and remain virtually the same in August and September. Temperatures would be >20°C less often than under the existing conditions.
SFAR	At the upper end of the reach warm inflows from both the SFAR and Camino dam reach resulting in >20°C frequently in July and August, occasionally in June, and rarely in September.	Minimal to no measurable effects on temperatures.
Brush Creek	Major warming in May–July and moderate warming in August–September. Remains <20°C throughout the bypassed reach.	Temperatures somewhat reduced throughout the reach.
Slab Creek	Moderate release temperatures. In the reach upstream of White Rock powerhouse, major warming in May–September. In the lower portion of this section, frequently >20°C in June–August.	Based on temperature simulations for a BN year, temperatures substantially reduced at the lower end of the reach, although temperatures of >20°C could continue to occur in June–August. Pumping/generation cycling of the proposed Iowa Hill development would result in slightly cooler conditions (<1 °C) within Slab Creek reservoir and the streamflow releases from Slab Creek dam.
Chili Bar	Major warming in June–September and moderate warming in May. The lower end of the reach is rarely >20°C.	Temperatures slightly reduced May–September, likely to levels that remain <20°C.

[a] General trends based on mean temperatures.
[b] For Existing Operations, effects are presented as a comparison to release temperatures from the respective dam.
[c] For Proposed Operations, effects are presented as a comparison to existing conditions.

Our Analysis

Rubicon Dam and Buck Island Dam Reaches

The thermal regime of releases from both Rubicon and Buck Island reservoirs, which do not thermally stratify, have the same general seasonal pattern as in the Rubicon River inflow to Rubicon reservoir. The mean daily temperatures at the upstream end of the Rubicon dam reach are about 3 to 6°C in early May, increase to about 12°C in mid- to late June, rapidly increase to over 20°C in mid-July, then gradually cool after mid-August. Warmer temperatures occur earlier in the season during Dry water years. The temperature of releases from Buck Island dam into the Little Rubicon River follow the same general pattern as the Rubicon dam releases, but they are about 1.5 to 3°C warmer in late spring to early summer, and slightly (<1°C) warmer in late summer.

The Rubicon dam and Buck Island dam reaches experience similar changes in water temperature. Based on mean daily temperatures, both reaches experience substantial warming (increases of about 1.5 to 3.5°C) in May and June, a transition from warming to cooling in July, and cooling in August and September. These characteristics are closely linked to the relationship between accretion and release flows. Typically, accretion flows account for more than 90 percent of the total flow during May and June, but less than 15 percent of the total flow in August and September. Downstream of the confluence of the two rivers, water temperatures tend to closely follow those of the Little Rubicon River.

Under the Settlement Agreement, the primary objectives for the Rubicon River downstream of Rubicon dam and the Buck Island dam reach are to provide cold freshwater habitat for healthy trout and mountain yellow-legged frog populations, and less conducive conditions for California roach, speckled dace, and golden shiners. The Settlement Agreement also attempts to reduce elevated aluminum concentrations that may adversely affect aquatic organisms.

Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from both dams during May and June, but would not change releases during July through September, with the exception of releasing 1 cfs when natural flows are less than 1 cfs (tables 3-36 and 3-37, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would slightly lower May and June water temperatures in both bypassed reaches, but not change water temperatures during July through September. Although the settlement parties indicated that the proposed flow regime is intended to address the elevated aluminum concentrations in Rubicon reservoir, there is no evidence that they would substantially reduce aluminum concentrations nor is there any evidence that the aluminum concentrations are Project related. In order to conclusively determine whether aluminum concentrations are reduced in the reservoir, aluminum concentrations would need to be monitored after the new flow regime is implemented.

Loon Lake Dam Reach

Mean daily temperatures typically remain below 20°C in the bypassed reach between Loon Lake dam and Gerle Creek reservoir. Loon Lake dam releases are made from the low-level outlet, which is at a depth of 83 feet below the reservoir's normal maximum level, resulting in mean daily release temperatures of about 4 to 6°C in early May, slowly and steadily increasing to about 12°C by late August to mid-September. During drawdown of Loon Lake in the late summer of some years, mean daily temperatures of reservoir releases increase to 15 to 17°C at a faster rate. Within this bypassed reach, mean daily temperatures increase about 1.5°C in May, about 5°C in June and August, about 7°C in July, and decrease in late September. Much of this warming of the cool deepwater releases from Loon Lake appears to result from ambient air temperatures and solar insolation within 2 miles of the dam. Thermal characteristics of the Loon Lake dam reach appear be highly influenced by the cool late spring and summer releases from the dam and accretion from tributaries and other sources. Typically, releases account for less than 10 percent of the total flow during May, about 30 percent of the total flow in June, about 70 percent of the total flow in July, and 90 percent of the flow in August and September.

Under the Settlement Agreement, the primary objectives for the Loon Lake dam reach are to provide cold freshwater habitat for healthy rainbow trout, brown trout, and mountain yellow-legged frog populations. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases during May through September of most years, with the largest increases occurring in May and June (table 3-38, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would slightly lower May and August water temperatures, and moderately lower water temperatures during June and July.

Gerle Creek Dam and Robbs Peak Dam Reaches

Streamflow releases from both Gerle Creek reservoir and Robbs Peak reservoir, which do not thermally stratify, have mean daily temperatures that do not exceed 20°C in most years, although releases from Robbs Peak dam frequently exceed 20°C in July and August of Dry water years. Mean daily temperatures of releases from Gerle Creek dam are about 5 to 7°C in early May, increase to about 12°C in mid- to late June, and increase to their peak of about 15 to 18°C in late August or early September. Warmer temperatures occur earlier in the season during Dry water years, reaching 12°C as early as late May. The temperature of releases from Robbs Peak dam into the SFRR were warmer and much more variable than Gerle Creek dam releases, which are highly influenced by deep-water releases from Loon Lake, reaching their peak mean daily temperatures of 18 to 22°C in late July to August. In 2001, a Dry water year, mean daily temperatures of Robbs Peak dam releases exceeded 20°C continuously from July 14 through August 16, indicating that coldwater fishes are not fully supported.

Based on differences in mean daily temperatures within the Gerle Creek and Robb Creek releases, the temperatures of streamflow releases from Gerle Creek dam and Robbs Peak dam increase about 1.5 to 2°C during May through July before reaching the Gerle Creek/SFRR confluence. In August, these reaches tend to transition from increasing to reducing temperatures as a result of ambient air temperatures becoming cooler. The cooler ambient air temperatures lower mean daily temperatures about 0.5 to 1.5°C in September. Inflow from the Gerle Creek dam reach had little effect on temperatures, with the largest effects being an increase of about 0.5°C in September. These thermal characteristics are closely linked to release temperatures from Gerle Creek dam, which are sometimes affected by drawdowns of Loon Lake and Robbs Peak dam.

Under the Settlement Agreement, the objectives include providing cold freshwater habitat for healthy mountain yellow-legged frog populations in the Gerle Creek dam reach, and providing cold freshwater habitat for healthy mountain yellow-legged frog and foothill yellow-legged frog populations in the SFFR downstream of Robbs Peak dam. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from both Gerle Creek dam and Robbs Peak dam during May through September, with the largest increases occurring in May and June (tables 3-39 and 3-40, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would somewhat lower water temperatures during May through mid-August, and slightly increase water temperatures in September. We anticipate that the largest reduction in temperatures would occur in the SFRR because the proposed minimum streamflow releases are more than four times the current requirements in May and June.

Ice House Dam Reach

Mean daily temperatures generally remain below 20°C in most of the SFSC bypassed reach between Ice House dam and Gerle Creek reservoir. Releases from the Ice House dam low-level outlet, which is at a depth of approximately 122 feet below the reservoir's normal maximum level, are drafted from the hypolimnion of Ice House reservoir, resulting in mean daily release temperatures of about 5 to 7°C from May through September. About two thirds of this reach flows through a large area that was burned by the Cleveland Fire in 1992 and that is not fully revegetated. Water temperature increases are moderate upstream of the area that was burned, but they are substantial within the burned area. Between the dam and about 0.5 mile upstream of the burn, mean daily temperatures increased about 2 to 3.5°C in May through August and about 1°C in September, although temperatures remain below 12°C.

Between the dam and the lower end of the reach, mean daily temperatures increase about 11 to 12°C in June through August, and about 7°C in May and September. The monitoring results indicate that mean daily temperatures occasionally exceed 20°C in the area affected by the burn in July and August, and that they nearly reach 20°C in June of some years. Thermal characteristics in the Ice House dam reach are highly influenced by the cool spring through summer releases from the hypolimnion of Ice House reservoir, the open unshaded burn area, and accretion from tributaries and other sources. Based on required minimum flows for BN water years, dam releases account for about 15 to 20 percent of the total flow in May and June and about 50 percent of the total flow in July through September.

Under the Settlement Agreement, one of the primary objectives for the Ice House dam reach is to provide temperatures that allow for management of native coldwater fish species and improve habitat conditions for foothill yellow-legged frog populations. Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases during May through July of all years, and August and September of CD and Dry water years (table 3-42, see section 3.3.3, *Aquatic Resources*, below). These higher minimum streamflow releases would reduce water temperatures throughout much of the bypassed reach.

Comparison of simulated daily mean and daily maximum temperatures indicates that the existing hypolimnetic releases result in cooler than existing conditions throughout much of the reach. Simulated temperatures for existing conditions were as much as 15°C cooler (7°C for existing versus 22°C for natural) just downstream of the dam, about 3 to 4°C cooler than existing temperatures near the middle of the reach, and virtually the same at the lower end of the reach. Comparison of simulated temperatures for the existing and proposed operations suggests that proposed operations would result in mean temperatures in June that about 3 to 4°C lower than under existing operations and about 2°C lower in July. This cooling effect would be smaller at both the upper and lower ends of the reach. However, it appears that mean daily temperatures of 20°C or less would be maintained throughout the entire reach. Recovery of vegetation in the burn area is expected to slowly increase shading of this reach and thereby reduce input of solar energy and somewhat lower temperatures in the lower half of the reach through any new license term.

Junction Dam Reach

Mean daily temperatures rarely exceed 20°C in Silver Creek between Junction dam and Camino reservoir, the Junction dam reach. At Junction dam, releases to the bypassed reach are typically provided through the low-level outlet, which is at a depth of 115 feet below Junction reservoir's normal maximum level. Mean daily release temperatures are about 4 to 7°C in early May, increase to about 7 to 11°C by early June, and remain in that temperature range through September. Considerable warming occurs in the reach, as is evidenced by mean daily temperatures just upstream of Camino reservoir averaging about 5°C higher than at the release in May and September, and 7 to 8.5°C higher in June through August. Limited monitoring conducted during July through September of 2004 indicates that release temperatures increase by about 1°C within 0.5 miles of the dam.

It appears that the water temperature in this reach is primarily controlled by the quantity and temperature of releases from Junction dam, and accretion from tributaries and other sources in the reach. Based on accretion and required minimum streamflow releases for BN water years, releases account for about 25 to 30 percent of the total flow during May and June and about 55 to 60 percent of the total flow in July through September.

Under the Settlement Agreement, an objective for the Junction dam reach is to provide temperatures that allow for management of native coldwater fish species and improve habitat conditions for foothill yellow-legged frog breeding. Another objective is to reduce the presence of an unidentified algae species that has proliferated throughout the reach. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from Junction dam during May through July of all water year types, in August of Dry and CD water years, and September of CD water years (table 3-44, see section 3.3.3, *Aquatic Resources*, below).

In addition, this proposed article would somewhat reduce minimum streamflow releases from Junction dam in August and September of AN and Wet water years. We anticipate that the large increases in May through July minimum streamflow releases would substantially reduce temperatures in the reach. We anticipate that the proposed reduction of minimum streamflow releases for August and September of AN and Wet water years would increase temperatures in the reach, although this warming effect is expected to be minimal since the proposed reductions in streamflow are small. Mean daily temperatures under the proposed minimum streamflow releases are expected to remain below 20°C, although water temperatures have not been monitored recently during AN or Wet water years so there is a possibility that mean daily temperatures could exceed 20°C. We anticipate that warmer water temperatures would occur in edgewater habitat that has slower velocities and is not thoroughly mixed with the main flow of the river.

In order to maintain mean daily temperatures of no more than 20°C in the Junction dam reach, Proposed Article 1-1, *Minimum Streamflows*, also includes a clause that would require SMUD to release a block of water for temperature control in Wet water years. If water temperature measured in Silver Creek immediately upstream of Camino reservoir exceeds a mean daily temperature of 20ºC in July, August, or September of a Wet water year, SMUD would be required to release additional water into Silver Creek below Junction dam as directed by the Agencies. A block of water shall not exceed 1,044 acre-feet for July, 491 acre-feet for August, or 475 acre-feet for September. Within 1 year of license issuance, SMUD would, in consultation with the Agencies, develop a plan for the block of water that addresses, at a minimum: notification protocols for temperature exceedances, emergency temperature operation contingencies, and ecological monitoring needs associated with use of the block of water. Reserving the block of water, monitoring water temperatures at the lower end of the Junction dam reach, and developing a plan for notification protocols and ecological monitoring needs associated with the block of water would facilitate making informed decisions of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary.

During the settlement process, pulse flows were strongly considered for this reach to address the stagnant conditions that contribute to excessive algae growth and limit movement of spawning gravels. However, to conserve water for hydroelectric generation and recreational interests, minimum streamflows that follow the shape of the unimpaired hydrograph and are higher than the current minimum streamflows were included in the settlement instead, in hopes that they will address these undesirable ecological conditions. In their rationale for the Settlement Agreement, both the Forest Service and CDFG indicate that they expect the higher minimum streamflows to suppress unknown algae species in the reach. The Settlement Agreement includes an adaptive management approach to address this issue, which we discuss in section 3.3.2.2, *Algae Monitoring and Adaptive Management.*

Camino Dam and SFAR Reaches

Streamflow releases from Camino dam have the potential to affect water temperatures in Silver Creek from Camino dam to the SFAR confluence (Camino dam reach) and in the SFAR from this confluence to Slab Creek reservoir (SFAR reach). Monitoring results indicate that mean daily temperatures exceed 20°C in the lower end of the Camino dam reach and in the SFAR reach (see table 3-16). Mean daily temperatures of streamflow releases from Camino reservoir, which does not thermally stratify, are about 7-10°C in early May, increase to about 8 to 11°C throughout most of June through September, but generally remain below 12°C. Between Camino dam and the SFAR confluence, mean daily temperatures increase about 6°C in May and September and about 8.5 to 10°C in June through August. Evaluation of mean daily temperatures for the 2000 through 2004 monitoring period show that exceedances of 20°C occurred at the lower end of the Camino dam reach on nearly 70 percent of the days in July, about 20 percent of the days in June and August, and occasionally (<5 percent of the days) in May.

At the confluence of the lower end of the Camino dam reach and the SFAR, the SFAR contributes very warm water, as documented by mean daily temperatures exceeding 20°C on nearly 90 percent of days in July and 60 percent of days in August. The SFAR temperatures are increased by higher temperature inflow from the Camino dam reach in May and June, and slightly reduced by cooler conditions in the Camino dam reach in July and August. In September, Camino dam temperatures have negligible effects on SFAR temperatures. Overall, this results in mean daily temperatures immediately downstream of the confluence of Silver Creek with the SFAR that exceed 20°C frequently in July and August, occasionally in June, and rarely in September. A short distance upstream of Slab Creek reservoir, Camino powerhouse discharges much cooler water into the SFAR, resulting in mean daily temperatures that are generally 10 to 15°C during late spring through early fall, with rare exceedances of 20°C in July and August.

Under the Settlement Agreement, the objectives for the Camino dam reach include providing temperatures that allow for management of native fish and improve conditions for foothill yellow-legged frog breeding, and providing good water quality to improve bioassessment composite metric scores, particularly in the lower portion of the reach. SMUD and the parties involved in the settlement do not provide their objectives for the SFAR reach, which also is affected by Camino dam releases.

Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Camino dam during May through July of all water year types, in August of Dry and CD water years, and September of CD water years (table 3-46, see section 3.3.3, *Aquatic Resources*, below). In addition, this proposed article would somewhat reduce minimum streamflow releases from Camino dam in August and September of AN and Wet water years.

Simulated temperatures for the BN year of 2002 suggest that the proposed minimum flows would reduce mean daily temperatures in Silver Creek upstream of the confluence with the SFAR about 5°C in May and June, and about 3°C in July, but still remain above 12°C from mid-May through September. It appears that mean daily temperatures at the lower end of the Camino dam reach would seldom exceed 20°C in May though July of BN water years. Proposed operations would remain virtually the same for August and September of BN water years, and thus the thermal regime would remain the same. Mean daily temperatures would occasionally exceed 20°C in August. In 2001, a Dry water year, mean daily temperatures for the lower end of the Camino dam reach exceeded 22°C in June, July, and August. The proposed increased minimum streamflow releases would reduce these temperatures, although it is not evident whether these reductions would lower temperatures to less than 20°C, since water temperatures were not simulated for a Dry year. Temperature monitoring would need to be conducted at this site to determine if the new flow regime reduced mean daily temperatures to less than 20°C. If mean daily temperatures continue to exceed 20°C, the licensee could determine whether further increasing minimum flows could reduce temperatures to acceptable conditions. We discuss the effects of warmer temperatures on life stages of trout in section 3.3.3.2, *Environmental Effects*, in Aquatic Resources.

SMUD addressed the possibility that the proposed minimum flows would not reduce mean daily temperatures to acceptable levels by including a provision to use a block of water to further reduce Camino dam reach temperatures in Wet years. Proposed Article 1-1, *Minimum Streamflows*, includes a provision to adaptively use up to 1,044 acre-feet for July; 491 acre-feet for August; or 475 acre-feet for September. If water temperature measured in Silver Creek immediately upstream of the SFAR confluence (USGS gage no. 11442000, SMUD station SC-1) exceeds a mean daily temperature of 20ºC in July, August, or September of a Wet water year, SMUD would be required to release additional water into Silver Creek below Camino dam as directed by the Agencies. Within 1 year of license issuance, SMUD would, in consultation with the Agencies, develop a plan for the block of water that addresses, at a minimum:

notification protocols for temperature exceedances, emergency temperature operation contingencies, and ecological monitoring needs associated with use of the block of water.

Reserving the block of water, monitoring water temperatures at the lower end of the Camino dam reach, and developing a plan to address notification protocols and ecological monitoring needs associated with the block of water would facilitate making informed decisions of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary. However, we note that our analysis indicates that mean daily temperatures could potentially exceed 20°C at the lower end of the Camino dam reach under the proposed minimum streamflow release schedule in water year types other than just Wet water years, for which this adaptive process is reserved.

Although the proposed minimum streamflow releases would increase the quantity of water contributed by the Camino dam reach and reduce the temperature of those contributions, their effect on water temperatures in the SFAR reach would likely be negligible due to the much greater contributions of flow from the SFAR.

Brush Creek Dam Reach

Mean daily temperatures typically remain below 20°C in Brush Creek between the diversion dam and Slab Creek reservoir, the Brush Creek dam reach. Dam releases from the low-level outlet, which is at a depth of 140 feet below the reservoir's normal maximum level, result in mean daily release temperatures of about 7-10°C in early May, increasing to about 12 to 14°C by mid-June, and reaching their peak of about 13 to 15°C in August. Mean daily temperatures for the lower end of the bypassed reach were very similar to those measured in the creek just upstream of Brush Creek reservoir, suggesting that they were near their equilibrium with ambient conditions. This is likely due to the reach's steep gradient with frequent small waterfalls, along with minimal accretion during the summer. Annual maximums of mean daily temperatures for the lower end of the reach ranged from about 16 to 20°C.

The existing license requires June through September minimum streamflow releases from Brush Creek dam ranging from 2 to 3 cfs or the natural flow, whichever is less. Under Proposed Article 1-1, *Minimum Streamflows*, corresponding minimum streamflow releases would be increased to a range of 3 to 9 cfs or natural flow, or 1 cfs if natural inflow is less than 1 cfs (table 3-47, see section 3.3.3, *Aquatic Resources*, below). This flow regime was developed with an emphasis on managing for native aquatic species. The mean trout biomass present in Brush Creek is well below the recommended objective, so the objective of minimum streamflows is to increase biomass by increasing the available stream habitat via streamflow regime manipulation. Increasing the summer minimum streamflow releases would provide more cool water at the upper end of the bypassed reach, and is therefore expected to result in somewhat cooler temperatures throughout the reach. Providing minimum streamflow releases of

1 cfs when the natural flow is less than 1 cfs is expected to somewhat reduce temperatures, at least in the upper end of the bypassed reach.

Slab Creek Dam Reach

Mean daily temperatures frequently exceed 20°C in the lower portion of the SFAR between Slab Creek dam and Chili Bar reservoir (the Slab Creek dam reach). Slab Creek dam releases are made from the low-level outlet, which is at a depth of 170 feet below Slab Creek reservoir's normal maximum level. This results in mean daily release temperatures of about 7 to 11°C in early May, increasing to about 12°C by late May to early June. Temperatures reach their peak of 14 to 16°C in June, and generally remain at 10 to 15°C through September. Mean daily temperatures at Mosquito Bridge, located near the middle of the reach length, average about 3.5 to 4.5°C higher than at the release point in May through August and are about 2°C higher in September. In the lower end of the reach, Rock Creek contributes its flow, which is typically warmer than Mosquito Bridge site flows. Just upstream of the White Rock powerhouse (located at the lower end of the Slab Creek dam reach) mean daily temperatures are generally 18 to 24°C in June through August. Mean daily temperatures exceeding 20°C are common at this site in June, July, and August.

Under the Settlement Agreement, the objectives for the Slab Creek dam reach include providing temperatures that allow for management of native fish and improve habitat conditions for foothill yellow-legged frogs and hardhead, and providing good water quality to improve bioassessment composite metric scores, particularly in the lower portion of the reach. Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Slab Creek dam during May through September of all water year types (tables 3-48 and 3-49, see section 3.3.3, *Aquatic Resources*, below).

Simulated mean daily temperatures suggest that the proposed minimum streamflows would substantially reduce temperatures at the lower end of the Slab Creek dam reach. SMUD also provided longitudinal plots of the range of mean daily temperatures simulated for flow releases of 30 to 270 cfs. These plots suggest that mean daily temperatures at the lower end of the reach would generally be about 10 to 15°C in May, 14 to 21°C in June, 19 to 22°C in July, 17 to 21°C in August, and 13 to 19°C in September. These simulations suggest that mean daily temperatures could exceed 20°C, which we use as an indicator of providing the designated coldwater habitat, in the lowermost one-third of the reach in June and July and the lowermost mile in August. Because water temperature modeling was only done for a BN water year type, it is not possible to use model simulations to assess conditions for other water year types. However, the proposed minimum streamflow releases are substantially higher than the existing required minimum flow releases, so we anticipate that a substantial reduction in warming would also occur in other water year types.

Iowa Hill Development

SMUD's Proposed Action includes construction and operation of the Iowa Hill development, which would use the existing Slab Creek reservoir as a lower reservoir and a new 6,400 acre-foot upper reservoir on top of Iowa Hill (section 2.4.1, *Proposed Project Facilities*). Operation of the proposed Iowa Hill development has the potential to affect the thermal regime of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam. In order to evaluate this potential effect, SMUD used version 3.2 of CE-QUAL-W2, a 2-dimensional (vertical and longitudinal) hydrodynamic water quality model developed by the U.S. Army Corps of Engineers, Waterway Experiment Station and Scott Wells (Cole and Buchak, 1995; Wells, 2000), to simulate water temperatures for the period of April 1 through October 1 of 2003, a BN water year.

A pumping/generation cycle was developed for a heavy use scenario using output from the CHEOPS UARP operations model. Under this scenario, the general pattern of operation is to pump water up to Iowa Hill reservoir at night (approximately midnight to 5 am), and release generation flows from Iowa Hill reservoir during the daytime (approximately 7 am to 8 pm). The temperature analysis repeated this daily pattern of pumping and generation from April 2 through September 29. Simulated mean water column temperatures for Slab Creek reservoir near the dam were a little cooler (as much as 0.87°C cooler and averaged 0.39°C cooler) for the heavy use scenario than the without Iowa Hill development scenario. The range of these differences was very close to the absolute mean errors computed for the calibrated vertical profiles from the nearest site to the Slab Creek dam (0.28 to 0.55°C). The combination of these factors suggests that pumping/generation cycling of the proposed Iowa Hill development would result in cooler water being discharged from the proposed Iowa Hill reservoir during the daytime that would cause minimal cooling within Slab Creek reservoir and the streamflow releases from Slab Creek dam.

Operation of the Iowa Hill development has the potential to affect mercury bioaccumulation by enhancing the mobilization of inorganic or methylmercury from riparian sources or from reservoir sediments. Like many area streams affected by historic gold mining operations, some fish tissue samples collected from Slab Creek reservoir show elevated mercury levels (table 19). Based on these tissue samples, it is likely that some mercury exists in sediments that settle in Slab Creek reservoir and in the delta at the head of the reservoir. According to SMUD's modeling studies, remobilization of the sediment on the bottom of Slab Creek reservoir would be unlikely because the proposed Iowa Hill intake/outlet structure at Slab Creek reservoir would be located 90 feet above the reservoir bottom. Furthermore, geomorphic studies conducted by SMUD indicate that the alluvium delta at the upstream area of Slab Creek reservoir will not advance to a position that could be disturbed by the proposed Iowa Hill intake/outlet for at least 100 years. As a result, we conclude that the effects of operating the proposed Iowa Hill development on methylation and bioaccumulation of mercury likely would be negligible.

Chili Bar Dam Reach

Mean daily temperatures occasionally exceed 20°C in the lower portion of the SFAR reach between Chili Bar dam and Folsom Lake, the Chili Bar dam reach. Chili Bar reservoir water is released to the powerhouse from the penstock intake which is at a depth of about 46 feet below Chili Bar reservoir's normal maximum level. This results in mean daily release temperatures of about 8 to 12°C in early May, increasing to their peak of about 16 to 17°C in late June to early July, and generally remaining above 12°C through September. Water temperatures increase at a similar rate throughout the reach's length. Between the Chili Bar dam and the lower end of the reach mean daily temperatures increase about 2 to 2.5°C in May, June, and September and about 3 to 3.5°C in July and August. It appears that the thermal characteristics in this reach are primarily controlled by the quantity and temperature of releases from Chili Bar dam and ambient conditions.

Under the Settlement Agreement, the primary objectives for the Chili Bar dam reach include providing habitat for healthy foothill yellow-legged frog populations, and reducing or eliminating water quality conditions that encourage algae growth in the Chili Bar dam reach. Proposed Article 2-1, *Minimum Streamflows,* would substantially increase the current minimum streamflow releases of 100 cfs from Chili Bar dam during May through September of all water year types (table 3-51, see section 3.3.3, *Aquatic Resources*, below). We base our analysis of the effects of the proposed minimum streamflow schedule on the assumption that the heat load downstream of the dam would remain virtually the same as it is under existing conditions. This leads us to conclude that the proposed minimum streamflow releases would slightly lower May through September water temperatures, probably to mean temperatures of less than 20°C.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Project operations at all reaches and reservoirs, with the exception of Slab Creek reservoir, would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on water temperature and algae would be the same as those described under the Proposed Action, without the effects discussed for the Iowa Hill development.

Effects of Project Construction and Maintenance on Water Quality

Construction of Project facilities and maintenance of existing facilities have the potential to adversely affect water quality.

Under Proposed Article 1-11, *Canal and Penstock Emergency and Maintenance Release Points*, SMUD would, within 1 year after license issuance, file with the Commission a plan approved by the Forest Service and the Water Board, to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality effects when the release points are used. SMUD also would consult with CDFG and FWS in the development of the plan. Upon Commission approval of the plan, SMUD would implement the recommendations contained in it.

Iowa Hill Development

Under Proposed Article 1-42, *Water Quality and Water Pollution*, SMUD would consult with the Agencies, Central Valley Water Board, U.S. Army Corps of Engineers, and other resource agencies with authority over public trust resources within the area of potential effects (APE) from construction and operation of the proposed Iowa Hill development. Prior to initiating any construction activities, SMUD would provide detailed design plans and a proposed timeline for construction to appropriate state and federal regulatory agencies, and obtain all necessary permits. These permits would include but not be limited to a National Pollutant Discharge Elimination System Permit, Waste Discharge Requirements, a section 404 Permit, a section 401 Certification, a Streambed Alteration Permit, and/or other authorizations or certifications as determined necessary under state or federal law.

Prior to undertaking activities on National Forest System lands, SMUD would file with the Commission a storm water pollution prevention plan that is approved by the Forest Service, the Water Board, and CDFG. During construction, operation and maintenance of the UARP, SMUD would prevent water pollution by implementing management practices identified in the Storm Water Pollution Prevention Plan and other requirements identified by the Forest Service, the Water Board, and Central California Water Board. All equipment for construction of the tunnel would be staged at least 100 feet from the SFAR. After construction activities are completed, all material used within the river bed would be removed, including siltation fabric.

Our Analysis

In order to conduct some necessary Project maintenance activities, SMUD needs to drain the associated Project canals/penstocks. Some of the agencies including the Forest Service and CDFG expressed concern as to potential adverse water quality effects that could result from using some release points to drain Gerle canal and the Project's penstocks. SMUD would evaluate ways to minimize the potential for adverse water quality effects to result from emergency and/or planned use of the release points along Gerle canal and Project penstocks. We anticipate that this evaluation would focus on the potential for erosion and sideslope failure, which could result in substantial increases in turbidity and degradation of stream habitat in the vicinity of the release points. We conclude that developing a plan that designates preferred canal/penstock drainage structures and release points to be used for draining Project canals/spillways during maintenance would minimize adverse effects to water quality, particularly turbidity, and aquatic biota.

Construction of the proposed Iowa Hill development could potentially result in substantial adverse effects on water quality and related resources. Pathways by which this could occur include, but are not limited to, increasing erosion along and into surface waters, suspending sediments during construction of the new intake in Slab Creek reservoir, and introducing substances used during construction such as fuel, oil, and concrete. The risk of these events could be limited through implementation of best management practices including scheduling, minimizing in-water work, implementing erosion control practices, managing stormwater runoff, and restricting areas where equipment is allowed and where it is maintained. SMUD would develop detailed plans and a proposed schedule for its construction of the proposed Iowa Hill facilities before initiating construction activities. It would develop the plan in consultation with the appropriate federal and state agencies, and obtain all necessary permits and authorizations. We anticipate that conditions in these permits and authorizations along with the proposed storm water pollution prevention plan would provide reasonable assurance that water quality and aquatic habitat are not directly or indirectly adversely affected by SMUD's construction activities. We conclude that implementing Proposed Article 1-42, *Water Quality and Water Pollution*, would provide reasonable assurance that water quality and aquatic resources would not be adversely affected by construction of the proposed Iowa Hill facilities.

Effects of Recreational Activities on Water Quality

Recreational use concentrated around UARP and Chili Bar Project reservoirs and stream reaches has the potential to act as a source of human pathogens to surface waters in the area, which could lead to increased risk of adversely affecting human health. As recreational use of the area increases and additional recreational facilities are developed and used there could be increased contamination of surface waters.

Our Analysis

A recent study of fecal coliform bacteria concentrations in six UARP reservoirs indicates that fecal coliform concentrations have recently exceeded the upper allowable limit at three sites in Union Valley reservoir (see table 3-20). SMUD states that the most plausible source of this contamination is recreation at the Forest Service's Camino Cove, Fashoda Beach, and Jones Fork campgrounds, which are near the sampling locations.

Under the Proposed Action, SMUD would increase the potential for recreational access throughout the UARP area, particularly near the reservoirs and Slab Creek dam reach. Increased recreational use would add to the potential for contamination from human waste in these areas. SMUD proposes to address sanitation along with other recreation-related issues by annually paying the Forest Service to provide operation, maintenance, and administration of developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities (see section 3.3.6.2, *Specific Recreation Site Improvements*). SMUD also would prepare a recreation management plan that addresses whitewater recreational needs, including sanitation, in the Slab Creek dam reach, as discussed in section 3.3.6.2, *Recreation Streamflows*. Providing an appropriate level of operation and maintenance for recreational facilities, as proposed, would limit the potential for contamination from human waste, although there still would be a risk of creating conditions that could be hazardous to human health. We discuss the need to monitor this risk in section 3.3.2.2, *Water Quality Monitoring*.

A recent study indicates that fecal coliform bacteria concentrations have substantially exceeded their upper allowable limits at four sites in the Chili Bar dam reach (see table 3-20). Under the Proposed Action, PG&E would not add substantial new boating opportunities to the reach downstream of Chili Bar dam. Therefore, we expect negligible changes in coliform concentrations to result from implementation of the proposal. We discuss the need to monitor bacteria as an indicator of this risk in section 3.3.2.2, *Water Quality Monitoring*.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Development and maintenance of recreational facilities in the UARP vicinity would be virtually the same as those described in the Proposed Action. As a result, effects of the UARP-only Alternative on human pathogens would be the same as those described under the Proposed Action.

Water Temperature Monitoring

To document the effects of altered Project operations on water temperatures in the UARP and Chili Bar reaches, SMUD and PG&E would need to monitor water temperatures at numerous locations.

Primary Stream Flow and Reservoirs

Under Proposed Articles 1-5(9) and 2-4(5), *Monitoring Program*, both SMUD and PG&E would develop a water temperature monitoring plan. The applicants would: (1) consult with the agencies and BLM on development of the plan within 3 months of license issuance; (2) provide a draft plan to these agencies for a minimum 90-day review period; and (3) file a Water Board-approved plan with the Commission within 1 year of license issuance. For the UARP, the plan would include using continuous recording devices to monitor water temperatures at a minimum of 17 stream stations associated with the Project (table 3-27) from March 15 through September 30 in each year of the new license. Based on a review of the annual data and consultation with the Agencies, monitoring could be required at up to five additional water temperature monitoring stations. If SMUD demonstrates that the resulting thermal regime(s) reasonably protect the designated cold freshwater beneficial use, they may be able to cease temperature monitoring at some stations. Proposed Article 1-5(9) would also reserve the potential to recommend monitoring of water temperature profiles in reservoirs if the Agencies determine that reservoir temperatures are a controllable factor that may resolve stream temperature issues. If this should occur, vertical profiles would be monitored seasonally in the applicable reservoir(s) during multiple water year types to provide data necessary for decision making. Water temperature data would be used to determine the need for adaptively managing Project operations as described in section 3.3.2.2, *Effects of Project Operations on Water Quality*.

Table 3-27. Recommended continuous stream temperature monitoring stations under the Settlement Agreement.[a] (Source: SMUD and PG&E, 2007)

Reach	**Recommended Monitoring Stations**
Rubicon dam	Immediately downstream of Rubicon dam, Downstream of Little Rubicon River confluence (at the Project boundary)
Buck Island dam	Immediately downstream of Buck Island dam
Loon Lake dam	Immediately downstream of Loon Lake dam
Gerle Creek dam	Immediately downstream of Gerle Creek dam
Robbs Peak dam	Immediately downstream of Robbs Peak dam, Downstream of confluence with Gerle Creek (at Project boundary)
Ice House dam	Immediately downstream of Ice House dam, Immediately upstream of Junction reservoir
Junction dam	Immediately downstream of Junction dam, Immediately upstream of Camino reservoir[b]
Camino dam	Immediately downstream of Camino dam, Immediately upstream of confluence with SFAR
SFAR	None
Brush Creek dam	Immediately downstream of Brush Creek dam
Slab Creek dam	Immediately downstream of Slab Creek dam, Approximately 0.5 mile upstream of White Rock powerhouse, Downstream of White Rock powerhouse to measure powerhouse outflow temperatures
Chili Bar dam	Immediately downstream of Chili Bar dam, Upstream of the confluence with Dutch Creek, Immediately upstream of Camp Lotus, Immediately upstream of the confluence with Greenwood Creek

[a] All of the monitoring stations associated with the Chili Bar dam reach are included in Proposed Article 2-4(5), *Monitoring Program*; whereas, all of the other designated monitoring stations are recommended for the UARP under Proposed Article 1-5(9), *Monitoring Program*.

[b] In its comments on the draft EIS, SMUD indicates that Proposed Article 1-5 in the Settlement Agreement incorrectly described this location as “Immediately upstream of Camino reservoir dam” and requests that we delete “dam” in the final EIS. The monitoring station would be immediately upstream of Camino reservoir.

For the Chili Bar Project, the plan would include using continuous recording devices to monitor water temperatures at a minimum of four stream stations associated with the Project from March 15 through October 15 in each year of the new license. Up to two additional stream temperature monitoring stations may be added based on need determined through review of the annual data and consultation with the Water Board, CDFG, FWS, and BLM. Requirements for monitoring temperature could be altered based on demonstration of the need for additional monitoring. Under Proposed Article 2-4(5), *Monitoring Program*, PG&E would seasonally monitor vertical temperature profiles in Chili Bar reservoir during multiple water year types if the Water Board, CDFG, FWS, and BLM determine that reservoir temperatures are a controllable factor that may resolve temperature issues in the reach downstream of Chili Bar dam or if impoundment chemistry dictates a need for additional temperature considerations. We conclude that if PG&E demonstrates that the thermal regime under the new license reasonably protects the cold freshwater beneficial uses there would be little value in continuing to monitor temperature at these stations.

Edgewater of Streams and Reservoirs

As a component of the evaluation of habitat for amphibians and aquatic reptiles, Proposed Article 1-5(3), *Monitoring Program*, SMUD would use a minimum of six micro-thermographs to monitor water temperatures in stream margin habitats associated with known or suitable foothill yellow-legged frog breeding sites in the reaches downstream of the Camino and Slab Creek dams. Under Proposed Article 1-6(9), *Adaptive Management Program*, the Agencies would have the opportunity to use the results of this temperature monitoring effort along with the results of the associated monitoring of the foothill yellow-legged frog to determine whether the water temperature used is an indicator of breeding initiation, which is currently set at 12°C as a 7-day running average of mean daily temperatures in the proposed license article, should be increased or decreased. Proposed Articles 1-6(1) and 1-6(2) would use the selected temperature indicator of breeding initiation, results of monitoring water temperatures in the SFSC immediately upstream of Junction reservoir and the SFAR immediately downstream of Slab Creek dam, and documentation of the foothill yellow-legged frog to adaptively manage scheduled high flow releases to the Ice House dam reach and Slab Creek dam reach.

As a component of Proposed Article 1-40, *Aquatic Resources,* for the proposed Iowa Hill development, SMUD would monitor temperatures between May and September in edgewater of Slab Creek reservoir at locations approved by the Forest Service, CDFG, and the Water Board. These data in combination with monitored locations of hardhead would be used to confirm that the effects of proposed Iowa Hill development pump-discharge operations on the distribution of hardhead.

Our Analysis

SMUD and PG&E conducted substantial monitoring of water temperature for relicensing of the Projects. SMUD also conducted water temperature modeling as far downstream as Slab Creek dam reach for relicensing the UARP. This information provides the basis for our evaluation, in which we conclude that the proposed operations would generally reduce spring through summer stream temperatures in most of the reaches affected by the UARP and Chili Bar Project. These effects on temperatures would enhance the quality of habitat for desired aquatic-dependent communities.

Monitoring water temperature immediately downstream of the UARP dams, as proposed, would document thermal conditions at the upper end of the UARP bypassed reaches under any new Project operations. Monitoring at the other sites listed in table 3-27 along with up to five additional sites would document thermal conditions downstream of confluences, and in critical locations within the Ice House dam, Camino dam, and Slab Creek dam reaches. Monitoring temperature in the Ice House dam reach just upstream of Junction reservoir and in the SFAR immediately downstream of Slab Creek dam would provide the temperature data necessary to determine whether scheduled geomorphic pulse flow or recreational flow releases to these reaches may need to be adaptively managed to protect foothill yellow-legged frogs and other biological resources. See section 3.3.4.2, *Environmental Effects, Special Status Amphibians and Reptiles*, for our evaluation of these proposed measures.

Including the option to monitor temperature profiles in UARP reservoirs is expected to provide limited benefit in terms of the ability to use any cold water available in the reservoirs to further improve thermal conditions in UARP stream reaches. The results of SMUD's 2002 to 2004 monitoring of reservoir temperatures provides evidence that there is virtually no cold water available in the Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino reservoirs (table 3-15). Because substantial temperature data were collected within the past 10 years (DTA, 2005a), sufficient data likely already exist to answer most questions about coldwater availability in the other UARP reservoirs. Therefore, the existing temperature data could be used, as appropriate, to evaluate coldwater availability prior to collecting any additional reservoir temperature data. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 1-5(9), *Monitoring Program*, would document spring through summer water temperatures in UARP bypassed reaches under any new Project operations, and help confirm that desired fish and amphibian communities are supported, although there would be little benefit in monitoring temperatures in UARP reservoirs.

Monitoring the timing of amphibian breeding and larval periods along with water temperature in areas used by foothill yellow-legged frogs for breeding could provide data that would lead to a better indicator of the onset of foothill yellow-legged frog breeding. We discuss this further in section 3.3.4.2, *Environmental Effects, Special Status Amphibians and Reptiles*.

Monitoring water temperature immediately downstream of the Chili Bar dam, as proposed in Proposed Article 2-4(5), *Monitoring Program*, would document thermal conditions at the upper end of the Chili Bar reach under any new Project operations. Monitoring at the other three designated sites downstream of the Chili Bar dam with up to two additional sites would document thermal conditions in critical locations within the Chili Bar dam reach. Because this reach is not managed for coldwater fishes and results of PG&E's 2002 to 2004 temperature monitoring study show that little cold water is available in Chili Bar reservoir (table 3-15), we conclude that requiring PG&E to conduct additional monitoring of Chili Bar temperatures would not be warranted. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 2-4(5), *Monitoring Program*, would confirm that the temperature range would be suitable for the desired fish communities and amphibians under any new Project operations.

Iowa Hill Development

Simulations of the operation of the proposed Iowa Hill development suggest that operation of the development could lead to water temperatures in Slab Creek reservoir that are generally slightly cooler than occur currently. Because the model simulates conditions for a complete cross-sectional area of the reservoir, it is possible that water temperatures could be influenced even more along the edge of the reservoir. Monitoring water temperatures along the edge of the Slab Creek reservoir, per Proposed Article 1-40(2), *Aquatic Resources*, would provide data that could be used along with information about the distribution of hardhead to confirm that Iowa Hill development operations do not adversely affect hardhead by causing them to relocate to less desirable areas in the reservoir, including in front of the new intake structure for the Iowa Hill development where they could become entrained.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Therefore there would not be a need for monitoring water temperature in edgewater of Slab Creek reservoir.

Water Quality Monitoring

Water quality data indicate occasional seasonal exceedances of several water quality criteria. In addition, arsenic and mercury concentrations in fish exceed screening values set to protect anglers. Changing Project operations has the potential to alter water quality conditions. Increasing the carrying capacity for recreational access could potentially elevate fecal coliform concentrations. In order to document that water quality standards are met under any new license, and concentrations of metals are at safe levels for humans who consume fish from the Project area, it would be necessary to monitor water quality and body burdens of metals in fish.

Under Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program,* both SMUD and PG&E would develop a draft water quality monitoring program plan. Within 3 months of license issuance, the applicants would consult on the development of the plan with the Agencies, Central Valley Water Board, and BLM for the UARP. This plan would address monitoring water chemistry, physical properties, and bacteria. The plan would provide detail on field sampling (locations, sampling frequency, handling methods, and QA/QC); and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored. Following consultation, and within 6 months of license issuance, the applicants would submit the draft plan for review and approval by the Chief, Division of Water Rights, Water Board and then file the final plan with the Commission. The plan(s) could be modified pursuant to adaptive management program needs as recommended by Central Valley Water Board, CDFG, FWS, BLM, (and the Forest Service for the UARP plan), and approved by the Water Board and the Commission.

SMUD and PG&E would sample water chemistry to demonstrate seasonal conditions at all reservoir and stream locations described in the January 8, 2003 version of the Water Quality Study Plan that was approved by the plenary group for UARP and Chili Bar Project relicensing efforts. Laboratory analyses would use methods approved by EPA that are adequately sensitive to detect constituent levels for determination of compliance with recognized state and federal criteria. Table 3-28 describes the strategy and schedule for various water chemistry and physical properties of this recommended seasonal plan. Conditions at representative locations would be monitored by making *in situ* measurements of water temperature, DO, pH, specific conductance, and turbidity; collecting and analyzing water samples for minerals, nutrients, metals, hardness, and petroleum products; and measuring Secchi depths (reservoirs only).

SMUD and PG&E would also seasonally monitor bacteria in a manner consistent with the Basin Plan objectives for protection of the REC-1 (water contact recreation) beneficial uses at a minimum of 15 shoreline recreational locations within the UARP boundary and 8 shoreline recreational locations in the Chili Bar Project-affected reach. By May 31 of each designated sampling year, the licensees would select sampling locations for the upcoming season based on criteria that include known swimming and other water contact recreational areas, and potential sources of pathogen introduction to the water column in the immediate vicinity. Sampling would be conducted at each of the selected sites by collecting five near-shore samples during a 30-day period that spans either the Independence Day holiday or the Labor Day holiday, using the five samples in 30 days methodology or other protocol as amended in the Basin Plan. Bacterial monitoring would be conducted annually for the first 5 years after license issuance. Then, monitoring could be decreased in frequency to every other year at UARP reservoirs and Chili Bar Project sites where no exceedances of Basin Plan objectives for protection of REC-1 designated waters are identified during years 1–5, but would continue annually through the life of the license at reservoirs where data demonstrate bacterial concentrations that present risks to human health.

Table 3-28. Recommended strategy for monitoring water chemistry and physical properties under the Settlement Agreement.[a] (Source: Settlement)

Monitoring Type	Parameters	Monitoring Sites	Frequency/Duration
In situ at representative locations	Water temperature, DO, pH, specific conductance, and turbidity	UARP bypassed reaches and the SFAR downstream of Chili Bar dam	Seasonally in spring (April–May), summer (August), fall (November), and winter (January–February, as accessible) each year after license issuance
In situ at 1-meter intervals vertically	Water temperature, DO, pH, specific conductance, and turbidity	Loon Lake, Gerle Creek reservoir, Ice House reservoir, Union Valley reservoir, Junction reservoir, Camino reservoir, Slab Creek reservoir, and Chili Bar reservoir	Seasonally in spring (April–May) and fall (October–November) each year after license issuance
General chemistry at representative locations[b]	Minerals, nutrients, metals (total and dissolved fractions), hardness, and petroleum products	UARP dam release points from reservoirs, representative sites along all UARP bypassed reaches greater than 1 mile long, and at least three representative sites along the SFAR between Chili Bar dam and the confluence with Greenwood Creek.	Seasonally in spring, summer, fall, and immediately following the second or third measurable rain event of the fall–winter period, once every 5 years beginning in year 3 after license issuance
General chemistry at the surface and near bottom at multiple representative locations[b]	Nutrients, minerals, hardness, metals (total and dissolved fractions), and petroleum products	At the surface and near the bottom at multiple representative locations in each UARP impoundment and Chili Bar reservoir	Seasonally in spring, summer, fall, and immediately following the second or third measurable rain event of the fall–winter period, once every 5 years beginning in year 3 after license issuance
Water clarity[b]	Secchi depth	Loon Lake, Ice House reservoir, Union Valley reservoir, and Slab Creek reservoir	Seasonally in summer and fall once every 5 years after license issuance

[a] All of the monitoring sites associated with the Chili Bar dam reach are recommended for the Chili Bar Project; whereas, all of the other designated monitoring sites are recommended for the UARP.

[b] After a minimum of three data sets have been collected, if the data demonstrate that exceedances are not occurring at specific locations, the frequency may be reviewed to determine if it can be modified.

SMUD proposes to consult with the Central Valley Water Board, and the Agencies for selection of UARP sampling locations. Candidate monitoring sites would include developed recreational sites and frequently used dispersed sites at reservoir and riverine locations. The UARP bacterial monitoring sites would include a minimum of four annually rotating stations at Union Valley reservoir swim areas; and a minimum of two beach locations each at Buck Island reservoir, Loon Lake, Ice House reservoir, and Gerle Creek reservoir, along with three other selected stations.

For the Chili Bar Project, PG&E would consult with the Water Board, the Central Valley Water Board, CDFG, FWS, and BLM for selection of sampling locations. Candidate monitoring sites would include developed recreational sites and frequently used whitewater boating take-out sites along the Chili Bar dam reach. Chili Bar bacterial monitoring sites would include a minimum of four swim beach sites including the Coloma and Camp Lotus areas, along with four other selected sites.

Under Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, SMUD and PG&E also propose to monitor potential uptake of mercury, copper, lead, and silver through the aquatic food chain resident in impoundments affected by the UARP and Chili Bar Project. They would determine the target species and number of individuals, sampling strategy, and analytical methods through consultation so that they are consistent with the Water Board's Surface Water Ambient Monitoring Program needs. They would collect and analyze fish tissue samples for bioaccumulation once every five years. Collection of these samples would begin in the second year after license issuance and continue through the term of any new license.

For the UARP, SMUD would consult with the Agencies, the Central Valley Water Board, and the state Office of Environmental Health Hazard Assessment. Resident fish species would be collected from Loon Lake, Gerle Creek reservoir, Ice House reservoir, Union Valley reservoir, Camino reservoir, and Slab Creek reservoir and samples would be prepared and analyzed for concentrations of mercury, copper, lead, and silver. Under Proposed Article 1-6(8), *Adaptive Management Program*, the Agencies may request that SMUD conduct additional studies of metals bioaccumulation if comparing the results of metal testing to published scientific information leads to suspicion that the health of aquatic species are adversely affected.

For the Chili Bar Project, PG&E would consult with the BLM, FWS, CDFG, the Water Board and the Central Valley Water Board, and the state Office of Environmental Health Hazard Assessment. Resident fish species from Chili Bar reservoir would be collected and samples would be prepared and analyzed for concentrations of mercury, copper, lead, and silver. Proposed Article 2-4(6), *Monitoring Program*, also includes monitoring of an invasive algae species in the Chili Bar dam reach. We discuss the algae component of this proposed article along with proposed monitoring of algae at UARP sites in section 3.3.2.2, *Algae Monitoring and Adaptive Management*.

Our Analysis

Our review of available water quality information (section 3.3.2.1, *Water Quality*) indicates that UARP- and Chili Bar-affected waters typically comply with the applicable federal and state standards for most water quality parameters. However, available information indicates that waters affected by the Projects sometimes do not satisfy the applicable criteria for DO, pH, fecal coliform bacteria, and several metals. Sampling results from a study of bioaccumulation of several metals in fish residing in Project reservoirs indicate that arsenic and mercury exceed screening values set to protect anglers who consume their catch. One of the objectives used while developing proposed operations and environmental measures was to maintain water quality adequate to protect beneficial uses and meet state water quality standards. Monitoring water quality and body burdens of metals in resident fish under any new Project operations could confirm that the aforementioned objectives are met.

SMUD and PG&E's proposed approach for monitoring water chemistry and physical properties would document compliance with water quality standards, including support for the targeted aquatic ecosystem. Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, designate the general parameters that would be sampled and provides the schedule and general locations for each sampling effort. Specific parameters and sampling locations would be presented in the proposed monitoring plan, which would be developed in consultation with appropriate agencies.

Implementation of this plan would provide data to annually document seasonal variation in DO concentrations, pH, specific conductance, and turbidity in UARP-affected stream reaches and impoundments. SMUD and PG&E's proposal also would document concentrations of nutrients, minerals, hardness, metals, and petroleum products at 5-year intervals, which could be used to evaluate long-term trends. We note that concentrations of minerals are primarily controlled by geologic and hydrologic characteristics and many of the waters affected by the UARP and Chili Bar Project have little potential for contamination from petroleum products. Therefore, monitoring of each of these parameters at each monitoring location would likely provide little incremental benefit.

SMUD and PG&E's proposed approach to select specific metals and monitor bioaccumulation of the specified metals in aquatic organisms at 5-year intervals would ensure that results of this sampling effort are consistent with the Water Board's approach and would facilitate evaluation of changes in fish body burdens of these metals. However, we note that biomagnification of silver is unlikely (Howe and Dobson, 2002).

SMUD and PG&E's proposed approach to select and monitor 15 shoreline recreational locations within the Project boundary would document near worst-case bacteria concentrations at locations of greatest concern.

We conclude that Proposed Articles 1-5(10) and 2-4(6) would provide water quality regulators with sufficient data to document compliance with water quality standards under any new Project operations and identify any trends in risks to the health of humans and wildlife.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. However, the need for monitoring water quality and bioaccumulation of metals for the UARP-only Alternative would be the same as those described under the Proposed Action.

Algae Monitoring and Adaptive Management

Relicensing studies indicate that under existing conditions algae are abundant in some reaches of the Projects, particularly in the lower end of the Junction dam reach and the Chili Bar dam reach. In addition, there are anecdotal accounts of an exotic invasive species of diatom, *Didymosphenia geminata*, in the Chili Bar dam reach. Specific objectives of the Settlement Agreement include reducing or eliminating conditions that encourage algae growth in the Junction and Chili Bar dam reaches. We evaluate the effects of Project operations on algae and water quality above in section 3.3.2.2, *Effects of Project Operations on Water Quality*. In this section, we discuss monitoring algae and adaptive management associated with algae.

Under the Settlement Agreement, SMUD and PG&E would monitor algae. For the UARP (Proposed Article 1-5(6), *Monitoring Program*), SMUD would develop an algae species identification and monitoring plan in consultation with the Agencies. SMUD would provide a draft plan to these agencies for a minimum 90-day review and approval period, and implement the plan upon its approval. Under the plan, SMUD would collect, identify, and archive samples of the species of algae inhabiting the stream channel of the Junction dam reach using a lab selected in consultation with the Agencies. SMUD would collect additional baseline samples from the SFRR downstream of Robbs Peak dam, Camino dam reach, and Slab Creek dam reach. Additional sites or reaches may be added should algal species be deemed to have negative effects upon the aquatic ecosystem. The Settlement Agreement does not specify the proposed monitoring period for the UARP. However, because SMUD did not provide costs for this measure we assume that SMUD plans to monitor algae under Proposed Article 1-5(6), *Monitoring Program*, only within 1 or 2 years of license issuance.

Under Proposed Article 1-6(7), *Adaptive Management Program*, SMUD would adaptively manage algae based on results of monitoring algae in the Junction dam reach, SFRR downstream of Robbs Peak dam. If the new streamflow regime does not reduce algae growth in the Junction dam reach or SFRR downstream of Robbs Peak dam within 2 years of license issuance, SMUD would reduce or eliminate the excessive algae growth using a method approved by the Agencies. If any future pervasive algal growths are identified in any UARP-affected stream reaches, and the Agencies determine the algae needs to be reduced or eliminated, SMUD should reduce or eliminate the algae growth using a method approved by these agencies.

As a component of Proposed Article 2-4(6), *Monitoring Program*, PG&E would annually monitor for the presence/absence of the diatom *Didymosphenia geminata*, an invasive algae in the Chili Bar dam reach. This monitoring would be done in conjunction with the other water quality monitoring.

Our Analysis

SMUD has documented dense growth of green-colored algae in the Junction dam reach of Silver Creek that is abnormal. Excessive algae growth can substantially alter hydraulics and sediment transport and thereby adversely affect other aquatic plants, macroinvertebrates, and amphibian communities. In addition to these issues, CDFG indicates that it has observed *Didymosphenia geminata* nearby in the Middle Fork American River. In the past two decades, *D. geminata* has substantially expanded its geographical range in the United States and across much of the world, and has increasingly been found to form excessive growths in streams (EPA, 2006; IUCN, 2007; Kilroy, 2004). In some streams, *D. geminata* covers more than 90 percent of available substrates, and the dense mats can cover miles of stream length. These dense mats trap sediments and may suppress the native algae and invertebrate communities. In Rapid Creek, located in the Black Hills of South Dakota, brown trout populations have experienced severe declines that have been correlated to dense growths of *D. geminata* (SDGFP, 2006).

Given the extent of algae growth in the Junction dam reach and the potential for *D. geminata* to adversely affect the aquatic ecosystem, we conclude that it is important to determine the algae species present and their general level of abundance in this reach under the new flow regime. This information could be used to determine whether the new streamflow releases effectively reduce the extent of algae in the Junction dam reach. We conclude that the combination of Proposed Articles 1-5(6), *Monitoring Program*, and 1-6(7), *Adaptive Management Program*, would provide information to determine whether any new flow regime substantially reduces algae growth in the Junction dam reach and determine if *D. geminata* is present in the reach. Although algae does not appear to be a problem in the other UARP-affected stream reaches, Proposed Articles 1-5(6), *Monitoring Program*, and 1-6(7), *Adaptive Management Program*, would provide information to confirm that there are no algae-related problems in selected UARP-affected stream reaches. SMUD's proposal to monitor algae could also determine whether *D. geminata* is present in the other monitored UARP-affected stream reaches.

Given the extent of algae growth in the Chili Bar dam reach, and the potential for *D. geminata* to adversely affect water quality and the aquatic community, we conclude that it is important to periodically evaluate whether *D. geminata* has become established in this reach. We conclude that this could be accomplished by developing and implementing the plan in Proposed Article 2-4(6), *Monitoring Program*.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Monitoring and adaptive management requirements for algae would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on algae would be the same as those described under the Proposed Action.

3.3.2.3 Cumulative Effects

Water temperatures have been affected by natural events and by water and land management practices in the Rubicon River Basin to the SFAR Basin. Impoundment of water by the Project dams generally results in higher spring through fall temperatures near the surface of the reservoirs than would occur in the same reach if the stream was still free-flowing. Using low-level outlets for streamflow releases has substantially reduced water temperatures immediately downstream of some dams (e.g., Ice House and Loon Lake developments). However, diverting water around stream reaches tends to increase spring through summer temperatures in the bypassed reaches. Similarly, UARP's diversion of water from the Rubicon River Basin to the SFAR Basin has reduced flows in the Rubicon River Basin and thereby increased the potential for streamflow warming in the basin.

Fires have cleared much of the upland and riparian vegetation in portions of the UARP area, resulting in reduced shading of the streams and reservoirs. In the lower portion of the Ice House dam reach, the 1992 Cleveland Fire substantially reduced stream shading and thereby substantially increased stream temperatures. Riparian vegetation has recovered well along the stream banks, which has somewhat increased shading and reduced stream temperatures. Recovery of upland vegetation is expected to occur through any new license term and thereby increase stream shading and further reduce stream temperatures.

EID operates the El Dorado Project, which diverts up to about 165 cfs of water around a 22-mile-long section of the SFAR to its domestic water supply system and the El Dorado powerhouse, located a short distance further downstream than the river's confluence with Silver Creek. This has resulted in an incremental increase in spring through summer temperatures in the river between the confluence and the El Dorado powerhouse. Under a new FERC license issued for the El Dorado Project in 2006 (FERC, 2006), minimum flow releases from EID's dam to the SFAR were substantially increased, resulting in a reduction in the aforementioned incremental increase in spring through summer temperatures. The UARP and Chili Bar Project proposed increased minimum streamflows would tend to reduce spring through summer temperatures in most of the UARP- and Chili Bar Project-affected stream reaches. Operation of the proposed Iowa Hill development would reduce water temperatures emanating from Slab Creek reservoir by less than 0.5°C. This change would have no observable effect on water temperatures in Chili Bar reservoir or the Chili Bar dam reach. Under the Proposed Action, these cumulative effects are expected to provide a thermal regime that would support the designated beneficial uses including a coldwater habitat for resident fish and amphibians.

Water quality in the UARP and Chili Bar Project-affected reaches is generally good, although it currently does not always satisfy the Basin Plan water quality objectives for bacteria and some chemical parameters. Numerous factors, including mining, land management, water-resource projects, development, and water-oriented recreation, have all incrementally adversely affected water quality, particularly fecal coliform concentrations in heavily-used areas of reservoirs and in the Chili Bar dam reach and metals in several of the UARP and Chili Bar Project reservoirs. Additional increases in development and recreation are expected to further increase the potential for water quality degradation. In contrast, expansion of the Hangtown Creek Wastewater Treatment Plant in Placerville is expected to somewhat reduce bacteria and nutrient loadings from Weber Creek to the SFAR. EID's recent replacement of a damaged and unstable section of the El Dorado Project's canal with a 2-mile-long bypass tunnel is expected to reduce canal failures and resulting erosion and sedimentation that have occurred historically. Under the Proposed Action, SMUD would implement an erosion and sedimentation control plan and a storm water pollution prevention plan during the construction phase of the Iowa Hill development. Implementation of these plans is expected to minimize adverse effects on water quality during construction. The cumulative effects of these actions would be an overall improvement in water quality.

3.3.2.4 Unavoidable Adverse Effects

None.

3.3.3 Aquatic Resources

3.3.3.1 Affected Environment

Fisheries Resources

Table 3-29 lists fishes known to occur in the Sacramento-San Joaquin drainage basin in the vicinity of the UARP and/or Chili Bar Project.

Table 3-29. Fishes in the UARP and Chili Bar Project study area. (Sources: DTA and Stillwater Sciences, 2005c,d,e)

Common Name	Scientific Name	Status[a]	Sacramento-San Joaquin Drainage[b]
Fall-run Chinook salmon[c]	*Oncorhynchus tshawytscha*	--	Native
Rainbow trout	*Oncorhynchus mykiss*	MIS	Native
Kokanee salmon	*Oncorhynchus nerka*	--	Introduced
Brown trout	*Salmo trutta*	MIS	Introduced
Brook trout	*Salvelinus fontinalis*	MIS	Introduced
Lake trout (mackinaw)	*Salvelinus namaycush*	--	Introduced
Lahontan cutthroat trout[d]	*Oncorhynchus clarki henshawi*	FT	Introduced
Pacific lamprey[e]	*Lampetra tridentata*	--	Native
Sacramento hitch	*Lavinia exilicauda exilicauda*	--	Native
California roach[f]	*Lavinia symmetricus symmetricus*	CSC	Native
Hardhead	*Mylopharodon conocephalus*	CSC	Native
Sacramento pikeminnow	*Ptychocheilus grandis*	--	Native
Sacramento speckled dace	*Rhinichthys osculus* ssp.	--	Native
Carp	*Cyprinus carpio*	--	Introduced
Golden shiner	*Notemigonus crysoleucas*	--	Introduced
Sacramento sucker	*Catostomus occidentalis*	--	Native
Sacramento tule perch	*Hysterocarpus traski traski*	--	Native
Prickly sculpin	*Cottus asper*	--	Native
Riffle sculpin	*Cottus gulosus*	--	Native
Mosquitofish	*Gambusia affinis*	--	Introduced
Green sunfish	*Lepomis cyanellus*	--	Introduced
Bluegill	*Lepomis macrochirus*	--	Introduced
Smallmouth bass	*Micropterus dolomieui*	--	Introduced

[a] Status: FT – Federally Threatened; CSC - CDFG species of concern; MIS - listed by the Eldorado National Forest as a management indicator species.

[b] Native or introduced into the Sacramento-San Joaquin Drainage Basin. Prior to the California Gold Rush in 1848, all of the steams and natural lakes in the UARP area were fishless, with the exception of the lower 0.83 mile of Brush Creek, the lower 3.30 miles of Silver Creek, and the SFAR. Therefore, while considered native to the Drainage, any fish currently present in these formerly fishless areas should be considered 'introduced' in these areas.

[c] Excess hatchery stock planted in Folsom may migrate into reach downstream of Chili Bar dam.

[d] Stocked upstream of the Project area.

[e] Pacific lamprey no longer occur upstream of Nimbus dam, which is below Folsom dam.

[f] Some reports prepared by the licensees refer to the Sacramento roach, which is a subspecies of California roach. To minimize confusion, we will refer to Sacramento roach as California roach throughout this document.

Reservoirs

To determine fish species composition in the Project reservoirs, sampling was conducted at multiple sites in five Project reservoirs (Loon Lake, Ice House, Union Valley, Junction, and Slab Creek). Camino reservoir was not sampled due to safety and access constraints. Gerle Creek reservoir was surveyed to provide the Forest Service with information for trout management, and Chili Bar reservoir was surveyed since there was no historical fish survey information available. Rubicon, Buck Island, Robbs Peak and Brush Creek reservoirs and Rockbound Lake were not surveyed because there was no historical data, or there was no indication these areas supported fish that could be significantly affected by reservoir operations. Table 3-30 presents results from historical reports and reservoir surveys in 2002/2003.

Trout (brown and rainbow) dominated the fish collected from Gerle Creek, Ice House, and Loon Lake reservoirs (table 3-31). Trout were less dominant in lower elevation reservoirs, although kokanee salmon comprised 20 percent of the fish collected from Union Valley reservoir. Trout only accounted for 18 percent of the fish collected from Junction reservoir and less than 10 percent of the fish collected from Union Valley, Slab Creek, and Chili Bar reservoirs. The fish community was most diverse in Union Valley reservoir, which was dominated by smallmouth bass. Sacramento sucker were dominant in the Junction, Slab Creek, and Chili Bar reservoirs.

SMUD conducted intensive gill net, snorkel, and trawl surveys of Slab Creek reservoir to characterize the locations of greatest fish abundance in late fall (November 2003), spring (May 2004), and summer (July and August 2004). Results of this study indicate that hardhead, Sacramento sucker, and Sacramento pikeminnow use both the upper and lower reaches of the reservoir. Brown trout and rainbow trout also use the upper reservoir, but were not observed in the lower reservoir. The fish captured in the lower reservoir consisted primarily of Sacramento suckers and hardhead with a single Sacramento pikeminnow. More fish were captured at the 10- to 25-foot and 50-foot depths than at 100-foot sampling depths, although all three species were captured at each of the three sampling depths. Most of the juvenile fish captured in September 2004 were captured in the lower reservoir near the location of proposed Iowa Hill intake, and consisted of 79 percent hardhead and 21 percent Sacramento pikeminnow.

CDFG stocks fish into several of the UARP reservoirs, and in Wrights Lake located on SFSC upstream of Ice House reservoir. Between 1995 and 2004, CDFG stocked nearly 1.5 million fish, about 0.5 million of which were catchable size. The

Table 3-30. Fish species present in UARP and Chili Bar Project reservoirs reported during historical and relicensing studies. (Sources: DTA and Stillwater, 2005c,e)

Common Name	**Rubicon**	**Buck Island**	**Loon Lake**	**Gerle Creek**	**Robbs Peak**	**Union Valley**	**Ice House**	**Junction**	**Camino**	**Brush Creek**	**Slab Creek**	**Chili Bar**[a]
Rainbow trout	●	●	⦿	●	●	⦿	⦿	●	●	●	⦿	
Brown trout	●	●	⦿	⦿	●	●	⦿	⦿	●	●	⦿	○
Brook trout	●	●	●	●			●	●	●		●	
California golden trout	●											
Kokanee salmon						⦿	●	●			●	
Lake trout (mackinaw)						⦿						
Lahontan cutthroat trout						●						
Hardhead											⦿	○
California roach			⦿	○			○		●		●	
Sacramento pikeminnow											○	○
Sacramento speckled dace											●	
Golden shiner						●						
Sacramento sucker			⦿			⦿		⦿	●		⦿	○
Sacramento tule perch			●									
Riffle sculpin									●			
Mosquitofish						●						
Green sunfish			●			●	●					
Smallmouth bass						⦿					●	○

Note: ● indicates historical, ○ indicates relicensing studies, and ⦿ indicates historical and relicensing studies.

[a] In 2003, CDFG collected several Sacramento pikeminnow and a smallmouth bass from Chili Bar reservoir. However, PG&E did not collect either of these fish from Chili Bar reservoir during their sampling in 2002/2003.

Table 3-31. Number and composition of fish captured in reservoirs of the Projects using gill netting and beach seining, October to November 2002 and October 2003. (Source: DTA and Stillwater, 2005c)

Species	Loon Lake	Ice House	Gerle Creek	Union Valley	Junction	Slab Creek	Chili Bar
Total (number captured)	85	55	64	110	57	74	44
Rainbow trout (%)	8	20	0	6	0	0	0
Brown trout (%)	46	69	92	0	18	7	7
Lake trout (%)	0	0	0	1	0	0	0
Kokanee salmon (%)	0	0	0	20	0	0	0
Hardhead (%)	0	0	0	0	0	39	23
Sacramento pikeminnow (%)	0	0		0	0	1	0
Sacramento sucker (%)	2	0	0	15	82	53	70
Smallmouth bass (%)		0	0	58	0	0	0
California roach (%)	44	11	8	0	0	0	0

species and size of fish stocked into each of the reservoirs varies depending on management goals for the reservoir and availability of fish. CDFG typically stocks rainbow trout in Rubicon reservoir, Rockbound Lake, Loon Lake, Union Valley and Ice House reservoirs. Brown trout are stocked in Ice House reservoir and Wrights Lake, and kokanee salmon in Union Valley reservoir.

Streams

SMUD and PG&E used a variety of historical information to determine which fish species were known to exist in the stream reaches in the Project area (table 3-32). These data show that rainbow, brown, and brook trout have historically (post-Gold Rush) been present in most of the stream reaches evaluated, and Sacramento sucker and riffle sculpin have occurred in several of the lower elevation reaches. SMUD and PG&E conducted fish population surveys in October of 2002, 2003, and 2004 using electrofishing or snorkel surveys in reaches that depth or flow made electroshocking impractical. Figures 3-17 through 3-20 display the location of each of the stream segments where these fish population surveys were conducted, and table 3-33 displays results of these surveys. Sacramento suckers were observed in six of the 13 reaches surveyed, all six were lower elevation reaches. These results indicate that the reach downstream of Chili Bar dam has the most diverse fish community, followed closely by the Slab Creek reach and then the SFAR reach.

Table 3-32. Fish presence in Project stream reaches[a] observed during historical and relicensing studies. (Source: DTA and Stillwater Sciences, 2005d)

Common Name	Rubicon dam reach	Buck Island dam reach	Loon Lake dam reach	Gerle Creek dam reach	SFRR upstream of Robbs Peak	Robbs Peak dam reach	Ice House dam reach	Junction dam reach	Camino dam reach	SFAR reach	Brush Creek dam reach	Slab Creek dam reach	Chili Bar reach
Chinook salmon[b]													○
Rainbow trout	⦿	○	⦿	⦿	⦿	○	⦿	⦿	⦿	⦿	⦿	⦿	○
Brown trout	○		⦿	⦿		○	⦿	⦿	⦿		⦿	⦿	○
Brook trout	●		●	●									
California roach	○	○	●	●						⦿		○	
Hardhead										⦿		⦿	○
Sacramento pikeminnow										⦿		⦿	○
Sacramento speckled dace	○									⦿		⦿	○
Golden shiner		○											
Sacramento sucker							⦿	⦿	⦿	⦿		⦿	○
Prickly sculpin												○	○
Riffle sculpin								●	●	●		⦿	○
Green sunfish												●	○
Bluegill													○
Smallmouth bass												⦿	○

Note: ● indicates historical, ○ indicates relicensing studies, and ⦿ indicates historical and relicensing studies.

[a] No fish population information (either historical or 2002–2004) is known to exist for Rubicon tunnel outlet reach or Rockbound dam reach.

[b] Likely fall-run Chinook stocked into Folsom Reservoir.

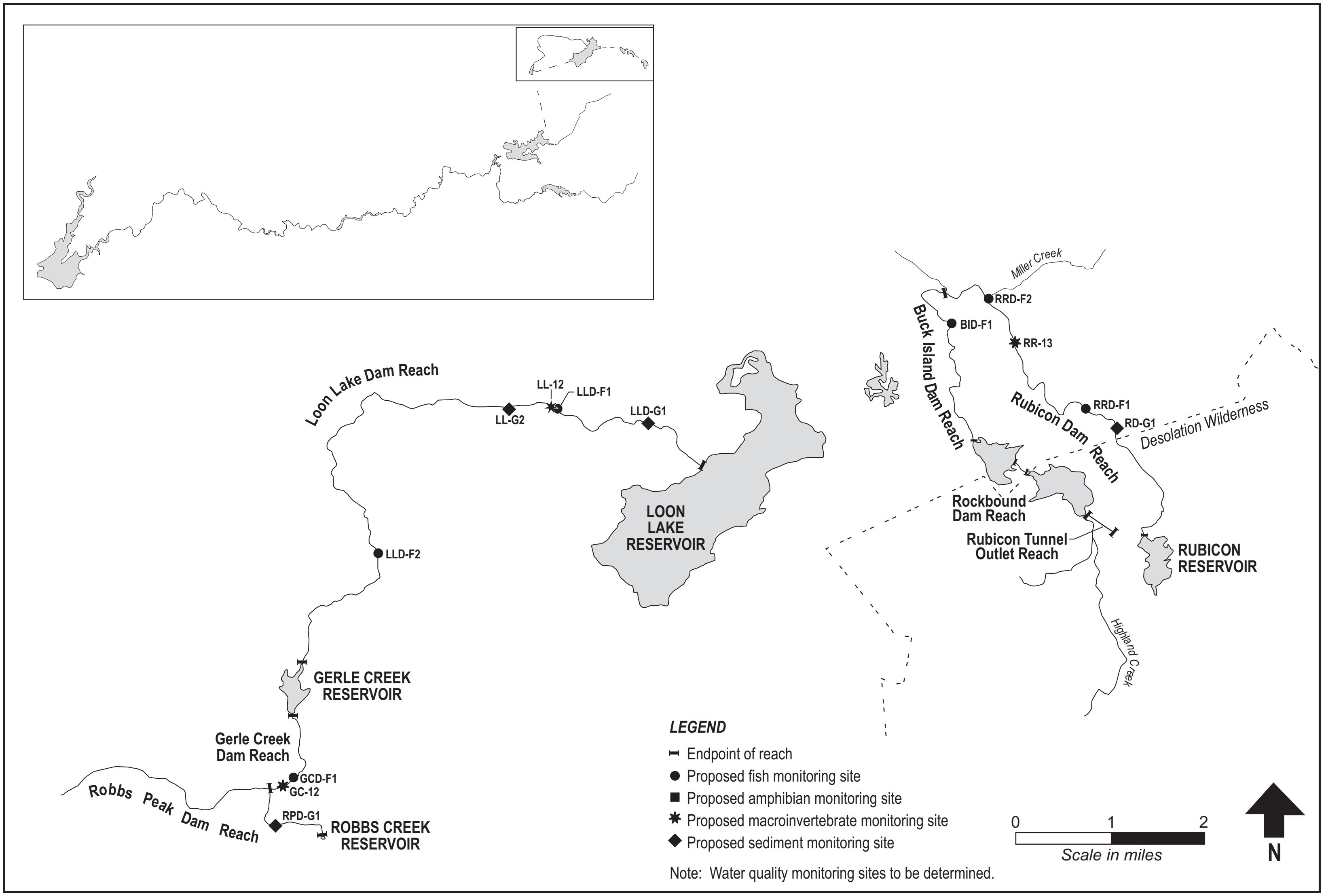

Figure 3-17. Stream segment sampling reaches—UARP northeast area. (Source: SMUD, 2005, as modified by the staff)

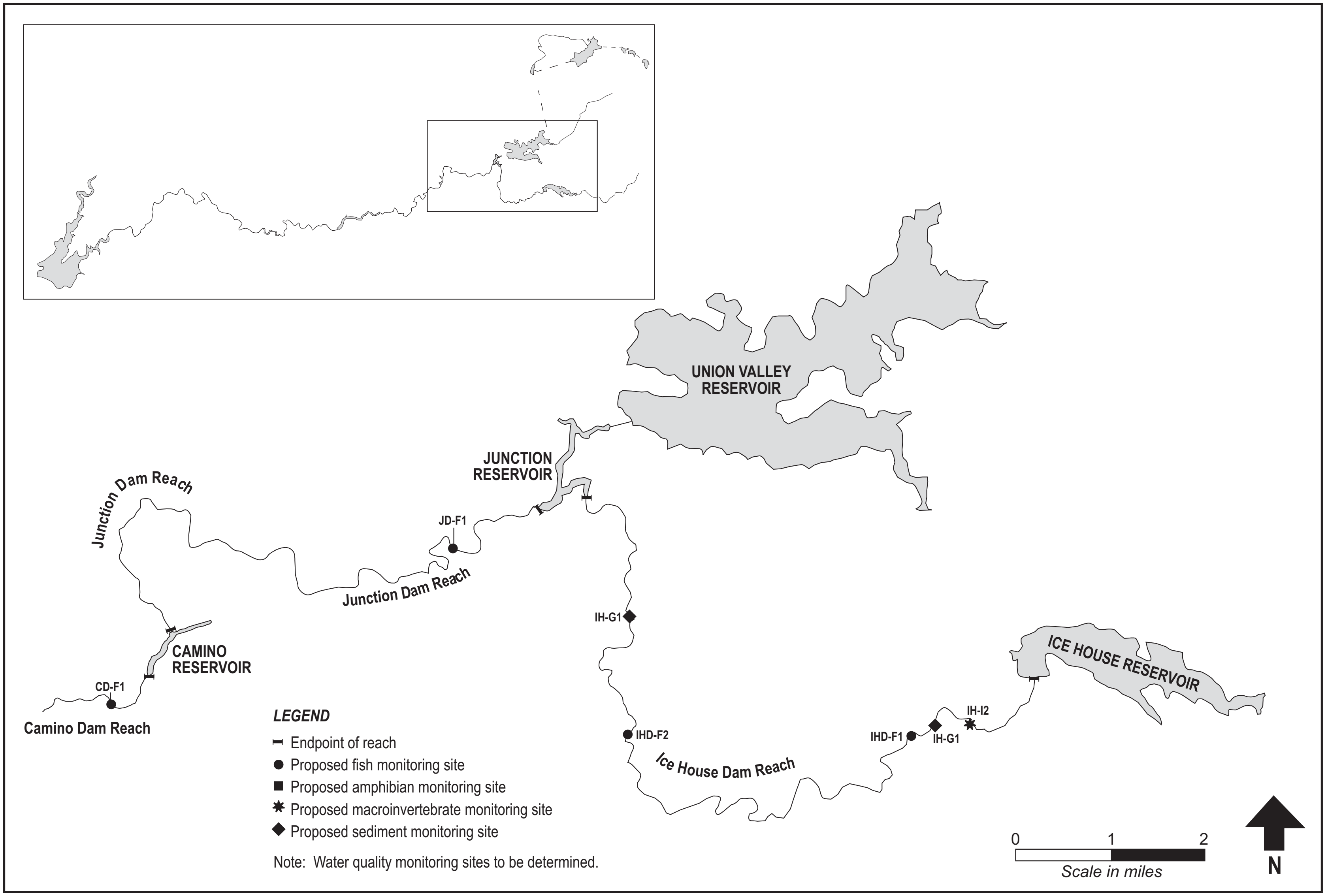

Figure 3-18. Stream segment sampling reaches—UARP southeast area. (Source: SMUD, 2005, as modified by the staff)

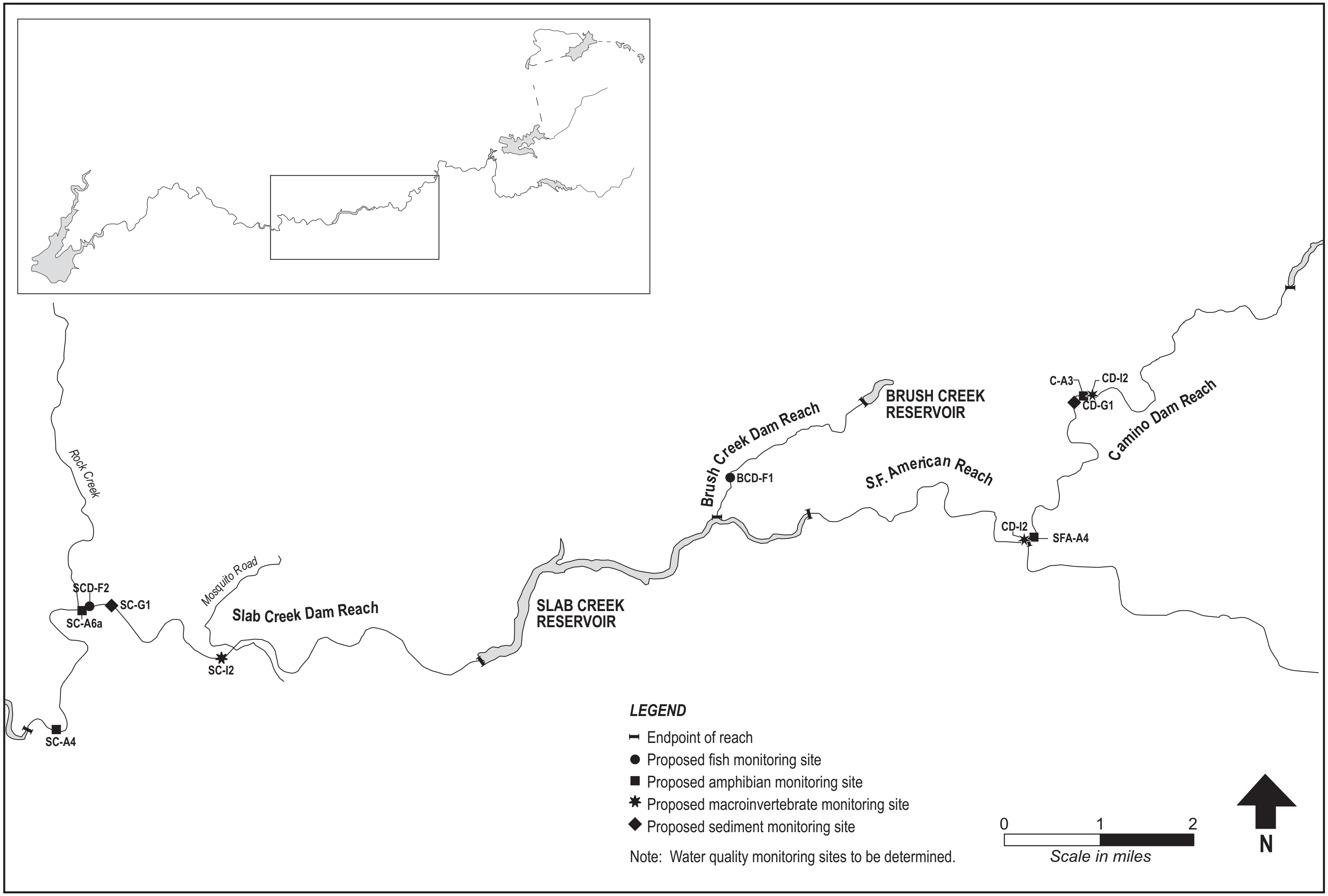

Figure 3-19. Stream segment sampling reaches—UARP southwest area. (Source: SMUD, 2005, as modified by staff)

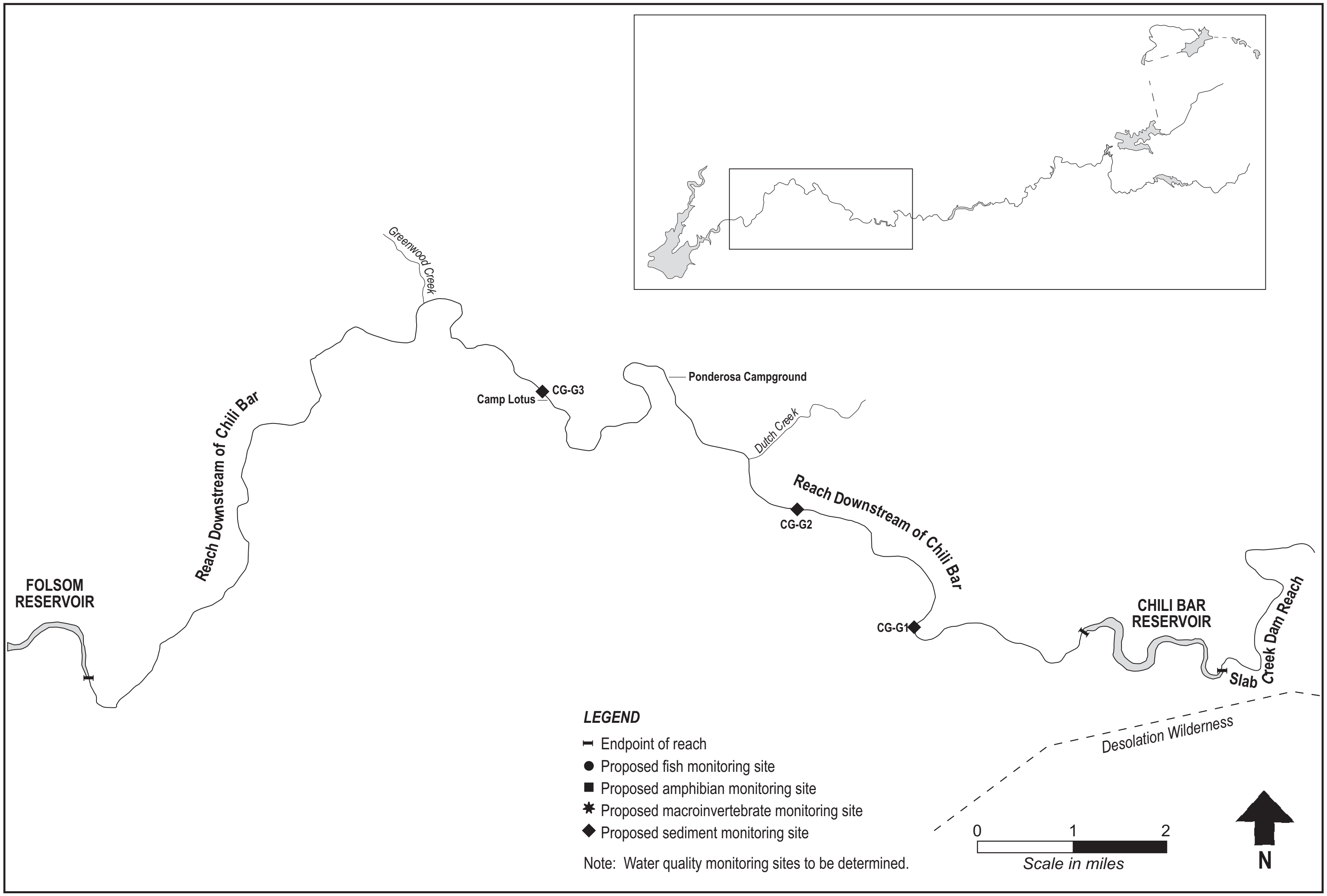

Figure 3-20. Stream segment sampling reaches—UARP western area. (Source: SMUD, 2005, as modified by the staff)

Table 3-33. Summary information from 2002 to 2004 stream fisheries studies. (Source: DTA and Stillwater Sciences, 2005d, CDFG, 2007)

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
Rubicon dam reach upstream of Rubicon Springs (RRD-F1)	Rainbow trout	Rainbow	11.3	YOY to 2+	YOY to 3+, but low recruitment of YOY in 2002 and 2003
Rubicon dam reach at Miller Cr. Confluence (RRD-F2)	Speckled dace and California roach	Brown	0.9	YOY to 1+	YOY to 3+ in 2002, up to 1+ in 2003
Little Rubicon River Buck Island dam reach (BID-F1)	Golden shiner	Rainbow	0	YOY to 2+	NA
Gerle Creek Loon Lake dam reach at Wentworth Springs (LLD-F1)	Brown trout	Brown	19.5	YOY to 2+	YOY to 3+
Gerle Creek Loon Lake dam reach at Rocky Basin Cr. Confluence (LLD-F2)	Brown trout	Brown	40	No YOY or 2+ in 2002 and 2003, only 2 YOY in 2004	YOY to 3+
Gerle Creek below Gerle dam reach (GCD-F1)	Rainbow trout	Rainbow	11.5	YOY to 2+ (most YOY)	Up to 3+
SFRR upstream of Robbs Peak reservoir (--)	Rainbow trout	Rainbow	7	YOY to 1+ (most 1+)	NA
SFRR Robbs Peak dam reach (RPD-F1)	Rainbow trout	Rainbow	23	YOY to at least 2+	YOY to 2+ with good distribution of older age classes

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
SFSC Ice House dam reach downstream of Silver Cr. Campground (IHD-F1)	Rainbow trout	Rainbow	10.6	Good distribution of YOY and 1+	YOY to 4+ (most 1+)
SFSC Ice House dam reach at Bryant Springs (IHD-F2)	Sacramento sucker	Rainbow /Brown	3	YOY to 2+	YOY to 3+
Silver Cr. Junction dam reach, 2 miles downstream of dam (JD-F1)	Rainbow trout	Rainbow	7.5	Most YOY	Older age classes evenly distributed
Junction dam reach upstream of Sugar Pine Cr. (JD-F2)	Rainbow trout	Rainbow	NC	YOY to 3+ (moderate recruitment of YOY and good distribution1+ to 3+)	NA
Silver Cr, Camino dam reach downstream of Tent Canyon (CD-F1)	Rainbow trout	Rainbow	NC	YOY to 3+	One 100 mm and one 150 mm
Silver Cr. Camino dam reach at Camino tunnel adit access (CD-F2)	Rainbow trout	Rainbow	NC	YOY to 4+ with peak in 2+	NA
Brush Creek dam reach (BCD-F1)	Rainbow trout	Rainbow	14.7	YOY to 3+ with strong recruitment of YOY	YOY to 3+ with strong recruitment of YOY

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
Slab Creek dam reach upstream of Rock Cr. powerhouse (SCD-F2)	Speckled dace/hardhead in 2002; riffle sculpin in 2003	Rainbow	4.65	Peak at YOY	Three fish older than YOY
Downstream of Chili Bar reach at Old Flume Memorial (CB-F1)	Rainbow trout, sculpin along margins	Rainbow	NC-	Low percentage of YOY	Only 5 fish [a]
Downstream of Chili Bar reach at Coloma State Park (CB-F2)	Sacramento sucker, sculpin along margins	Rainbow	NC	Peak at 125 mm (ages not discussed)	Only 4 fish [a]
Downstream of Chili Bar reach downstream of Camp Lotus (CB-F3)	Rainbow trout, sculpin along the margins	Rainbow	NC	Peak at 200 mm (ages not discussed)	Only 6 fish [a]
Downstream of Chili Bar reach at Weber Cr. Confluence (CB-F4)	Rainbow trout, sculpin along margins	Rainbow	NC	Peak at 175 mm (ages not discussed)	Only 1 fish [a]

Notes: -- – no data

mm – millimeter

NA – not applicable

NC – not calculated

YOY – young-of-the-year

[a] Size not given.

Table 3-33 summarizes the results of the applicant's 2002 through 2004 fish population studies and estimates of trout density and biomass in Project streams. All study segments contained rainbow trout and most contained brown trout; these were the dominant species in most of the stream segments sampled. Stream segments where trout were not dominant include sites in the lower Rubicon dam reach (RRD-F2), Buck Island dam reach (BID-F1), lower Ice House dam reach (IHD-F2), SFAR reach (SFAR-F1), lower Slab Creek dam reach (SCD-F2), and at a study site in the reach downstream of Chili Bar dam (CB-F2). SMUD's studies reported that average condition factors[35] for both rainbow and brown trout were close to 1.0 for all 3 years (i.e., 2002–2004), indicating that trout are generally in good condition in the reaches sampled.

SMUD evaluated the longitudinal distribution of fish in the Slab Creek dam reach by snorkeling 14 sites located between 3.65 and 7.64 miles downstream of Slab Creek dam (i.e., between 0.21 and 4.2 miles upstream of Chili Bar reservoir) in October 2004. SMUD did not evaluate the fish community within the first 2.5 miles downstream of the dam due to accessibility and safety concerns. Figure 3-21 displays the location where each fish species was observed. In total, nine species were observed in the reach, seven of which were observed during the 2004 longitudinal study. The distribution of fish species was consistent with longitudinal trends expected with increasing temperature downstream of Slab Creek dam. At the uppermost sample site, rainbow trout were dominant, and subdominant species included brown trout, Sacramento sucker and sculpin. Diversity of fish species was higher at downstream sample sites with the addition of transition zone species including hardhead, Sacramento pikeminnow, and California roach. The most abundant species was California roach followed by hardhead. Only one smallmouth bass (250 to 275 mm) was observed in the reach. SMUD reported that the cryptic marking and benthic nature of sculpins may have caused them to be under represented due to the difficulty in observing them while snorkeling.

Aquatic Habitat

Reservoirs

SMUD and PG&E conducted a study to evaluate reservoir habitat that could affect warmwater or reservoir spawning fishes in Project reservoirs. Based on the historical or suspected fish species present, Loon Lake, Ice House, Union Valley, Junction, Slab Creek, and Chili Bar were studied. Camino was excluded due to access and safety constraints. Primary characteristics, including water-level fluctuations,

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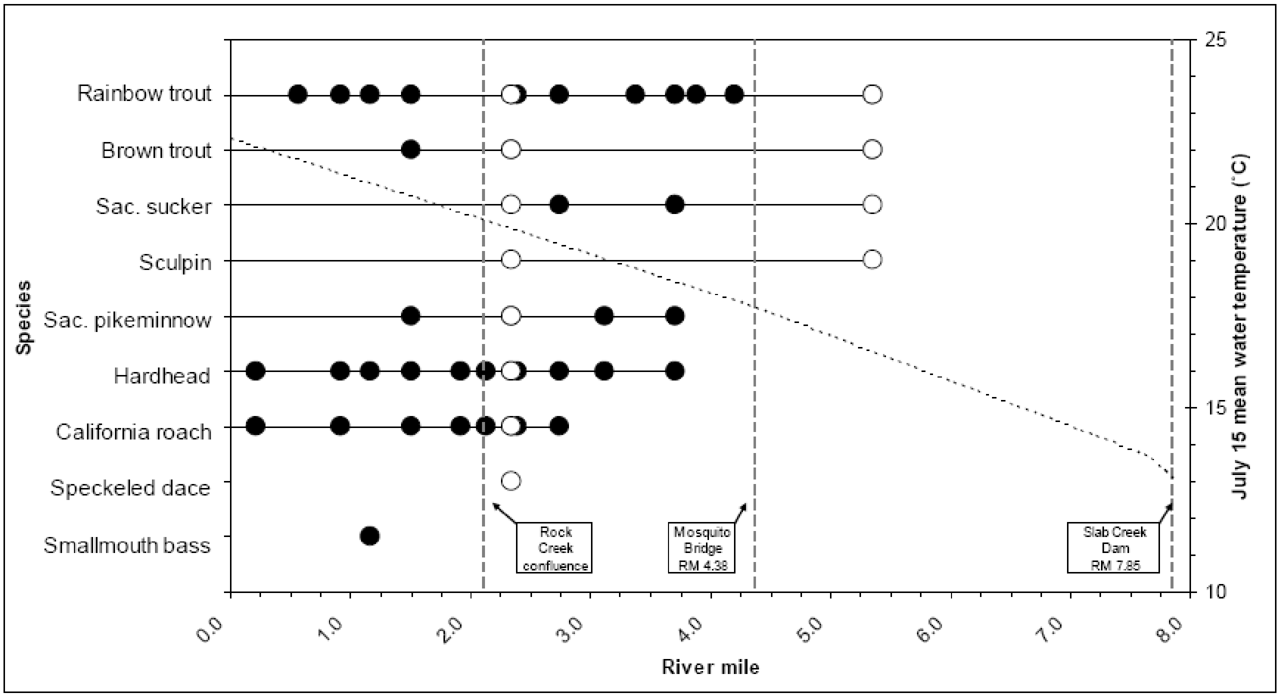
[35]Condition factor, or K, is a calculation used as an indicator of overall health of a fish, where $K = 10^5 \text{weight}/\text{length}^3$.



Note: Solid black circles indicate species observed in 2004, and open circles indicate species observed in 2002 and 2003 surveys. Dashed line is the water temperature relationship.

Figure 3-21. Species presence by river mile in Slab Creek dam reach. (Source: DTA and Stillwater Sciences, 2005d, figure 4.14-6)

physical shoreline habitat, number of tributaries and potential barriers to upstream fish migration, and shoreline fish spawning habitat were evaluated for each of these reservoirs. Note that we describe existing water level fluctuations in greater detail in section 3.3.2.1, *Water Quantity* (and erosion discussed in section 3.3.3.1, *Geology and Soils*).

Most of the shoreline of Junction, Slab Creek, and Chili Bar reservoirs is steep, but little erosion occurs along these shorelines due to bedrock and large-sized substrate along with dense vegetation along Chili Bar reservoir. Most of Loon Lake's shoreline, which is predominantly flat to moderately sloped, is also stable. In contrast, Ice House and Union Valley reservoirs have substantial mild erosion along their shorelines. Emergent vegetation is sparse along the shoreline of Ice House, Junction, and Union Valley reservoirs. Considerable emergent vegetation occurs in Chili Bar reservoir, and moderate levels of emergent vegetation occur in Loon Lake and Slab Creek reservoir.

No potential upstream fish migration barriers were identified for Loon Lake, Ice House, or Junction reservoirs. Potential barriers were identified for the other three reservoirs, although most of these barriers are not expected to preclude all fish species from entering the tributaries.

Streams

SMUD and PG&E evaluated stream habitat in numerous reaches affected by the Projects by conducting on-the-ground and aerial surveys during 2002 and 2003. This included on-the-ground mapping of seven reaches and aerial mapping of six reaches that were not safely accessible by foot or where ground surveys were not feasible. For both on-the-ground and aerial surveys, habitat units were delineated and categorized by habitat type, and then the percent of each habitat type was determined. The ground surveys recorded the type of substrate and cover, quantity of trout spawning gravel, large woody debris, potential upstream migration barriers for trout, and tributaries. The potential migration barriers were further evaluated to determine if they are absolute barriers to upstream trout migration or likely passable at anticipated high flows during spring runoff and/or winter storms. The results of these stream mapping and barrier evaluations are summarized in table 3-34.

Table 3-34. Summary characteristics for UARP and Chili Bar Project stream reaches. (Sources: DTA and Stillwater Sciences, 2005f, 2004a)

Reach (miles)	Cascade/High Gradient Riffle[a]/Low Gradient Riffle[a]/ Run/ Pool/ Pocket water %	Spawning Gravel (sq ft/ mile)	Large Woody Debris[b] (#/ mile)	# Trout Migration Barriers[c]	# of Tribu-taries
Rubicon River Rubicon dam[d] (5.8)	9.1/1.3/6.6/39.2/41.6/0.8	1,908	136	9/6	9
Rockbound dam (0.3)	13.5/11.7/28.9/8.8/37.2/0.0	0	329	4/2	0
Little RR Buck Island dam (2.5)	9.3/2.0/12.9/14.8/61.0/0.0	2	96	5/3	5
Gerle Cr Loon Lake dam (9.3)	10.4/7.8/18.9/25.9/35.9/1.1	3,932	194	7/3	2
Gerle Creek Gerle Creek dam (1.2)	18.1/0.0/4.6/1.1/36.7/39.4	1,606	7	0/0	4
SF Rubicon Robbs Peak dam (5.6)	25.2/11.5/18./15.8/25.2/3.4	--	--	2/1	--
Silver Cr. Ice House dam (12.3)	1.4/3.3/43.6/42.2/9.5/0.0	407	66	0/4	25
Silver Cr. Junction dam (8.3)	23.9/4.0/17.4/27.5/23.9/3.3	--	--	3/1	--
Silver Cr Camino dam (6.0)	16.3/2.8/2.6/14.0/59.0/5.6	--	--	1/0	--
Brush Creek dam (2.3)	17.0/10.6/21.9/19.2/31.3/0.0	134	42	19/8	0
SFAR Slab Creek dam (8.0)	4.9/13.3/18.9/28.8/26.1/8.0	--	--	0/0	--
SFAR Downstream of Chili Bar dam (19.1)	8.1/15.7/21.8/37.0/16.3/1.2	--	--	0/0	--

Note: -- indicates not reported.

[a] High gradient riffle has slope of greater than 4 percent. Low gradient riffle has slope of 4 percent or less.

[b] The minimum requirements used to define large woody debris were 6 inches in diameter and 3 feet in length where the total length was greater than or equal to one-half the channel width.

[c] Number before "/" is the number of migration barriers (other than the dam) to trout throughout the year. Number after "/" is the number of additional seasonal barriers that appear to be passable by trout at typical high flows during spring runoff and/or winter storms. Estimates for reaches where aerial mapping was done were made using aerial videography.

[d] Values for this reach include the Rubicon River from the base of Rubicon dam to the confluence with Miller Creek.

The estimated quantity of trout-spawning gravel for the seven ground-surveyed reaches ranges from zero to 3,932 square feet per mile. SMUD reports that virtually no spawning gravel occurs in the Rockbound dam and Buck Island dam reaches, but this is likely due primarily to geological features at these locations such as the predominance of relatively unweathered exposed bedrock. In contrast, more than 1,500 square feet of spawning gravel per mile occurs in the Loon Lake dam, Rubicon dam, and Gerle Creek dam reaches. Moderate volumes of spawning gravel exist in the Ice House dam and Brush Creek dam reaches.

The density of large woody debris ranged from 7 to 329 pieces per mile (table 3-34). The Gerle Creek dam reach had much less large woody debris than the other six reaches evaluated.

The applicants' trout barrier analysis revealed few year-round and seasonal barriers to upstream trout migration in the lower elevation reaches. The largest number of barriers to upstream passage was reported for the Brush Creek dam reach. Hardhead have relatively poor swimming abilities in cool water in comparison to trout, thus hardhead may have additional velocity barriers that permit the passage of salmonids (Moyle, 2002).

SMUD and PG&E sampled macroinvertebrate communities and assessed water quality by using measures of stream benthic macroinvertebrate community and physical/habitat characteristics to evaluate the biological integrity of stream ecosystems consistent with the California Stream Bioassessment Procedure (CDFG, 2003). They collected data at 30 sites in 13 reaches of the UARP during fall of 2002 and 2003, and at 6 sites in the reach downstream of Chili Bar dam in 2003 and 2004

About half of the distinct taxa identified at most UARP study sites were Ephemeroptera (mayfly), Plecoptera (stonefly), or Trichoptera (caddisfly). The overall number of mayflies, stoneflies, and caddisflies made up more than 40 percent of the organisms for the majority of the UARP study sites. However, mayflies, stoneflies, and caddisflies made up a much smaller percentage of the organisms at most of the sites downstream of the Chili Bar dam. The lowest percentage of organisms that were mayflies, stoneflies, and caddisflies occurred a short distance downstream of the Chili Bar and Junction dams, where they comprised about 6 and 14 percent of the total organisms, respectively.

Composite metric scores, which are indicators of biological integrity, were below average immediately downstream of the three largest UARP storage dams (Loon Lake, Ice House, and Junction) and generally increased with distance downstream of the reservoirs. Similarly, elmid beetles (riffle beetles of the family Elmidae) and perlid stoneflies (*Calineuria californica*), most of which are relatively long-lived taxa that require a full annual cycle or more for their development, are absent just below these reservoirs with increasing numbers further downstream. These factors suggest potential impairment immediately downstream of the Loon Lake, Ice House, and Junction dams, but recovery further down the corresponding reaches. Conversely, benthic macroinvertebrate composite metric scores decrease with distance downstream in the Camino and Slab Creek reaches, suggesting a decline in water quality at the lower ends of these reaches. Composite metric scores for the reach downstream of Chili Bar dam are consistently lower than at reference sites in the North Fork American and Cosumnes rivers, although this is partially due to the larger substrate in the upper end of the reach. Oligochaetes are dominant, and taxonomic richness and diversity are generally low in this reach, particularly at the upper end.

3.3.3.2 Environmental Effects

This section evaluates the environmental effects of the Proposed Actions on the aquatic resources of the Projects. Environmental measures are considered to have a significant effect if they interfere with reproduction, recruitment, or survival of fish to the degree that they adversely affect the species at the population level; cause water quality characteristics to become suboptimal for fish compared to reference conditions; or result in decreases in benthic macroinvertebrate diversity in Project reaches.

While historically the upper reaches of the UARP area were fishless, under the terms of the Settlement Agreement, the resource agencies chose trout (rainbow or brown trout) and hardhead biomass amounts as indicators of favorable ecological conditions in the Project areas. Specific indicators used include components articulated in the “Fish Community Assessment Metrics” (SMUD, 2004a), or biomass numbers. If the Fish Community Assessment Metrics, or existing biomass numbers are less than expected for Northern Sierra trout biomass numbers (according to Gerstung, 1973), the goal for the reach is to improve biomass to meet those numbers.

Table 3-35 compares existing rainbow trout biomass (and brown trout on some reaches) by reach, survey reach number, and measured stream width from 2002–2004 SMUD surveys with the trout biomass goals taken from Gerstung (1973) (CDFG, 2007). Agency objectives for each reach are also included in the table.

Table 3-35. Rainbow trout and brown trout biomass by reach from 2002–2004 SMUD Surveys, with agency objectives for trout biomass in each reach.

Reach Name (site #)	Objective	Existing Mean Biomass for Rainbow Trout (lbs/surface acre)	Rainbow Trout Biomass Goal[a] (lbs/surface acre)
Rubicon River below Rubicon dam (RRD-F1)	Increase RT	11.3	24
Rubicon River below Rubicon dam (RRD-F2)	Increase RT	0.9	33
Little Rubicon River below Buck Island dam (BID-F1 (upper)	Reduce or eliminate golden shiners and increase RT	0	Reduce or eliminate golden shiners and move toward 33 RT
Gerle Creek below Loon Lake dam (LLD-F1)	Increase RT and maintain BN	19.5	Combined biomass of RT and BN–24
Gerle Creek below Loon Lake dam (LLD-F2)	Increase RT and maintain BN	40	Combined biomass of RT and BN–24
Gerle Creek below Gerle dam (GCD-F1)	Increase RT and maintain BN	11.5	Combined biomass of RT and BN–24
SF Rubicon upstream of Robbs Peak dam	Increase RT	7	33
SF Rubicon below Robbs Peak dam (RPD-F1)	Increase RT and maintain BN	23	Combined biomass of RT and BN–24
SF Silver below Ice House dam (IHD-F1)	Increase RT	10.6	RT-24
SF Silver below Ice House dam (IHD-F2)	Increase RT	3	24
Silver Creek below Junction Dam (JD-F1)	Increase RT	7.5	24
Silver Creek below Junction dam (JD-F2)	Increase RT	Use Fish Community Assessment Metrics[b]	
Silver Creek below Camino dam (CD-F1)	Increase RT	Use Fish Community Assessment Metrics[b]	278 catchable trout per mile[a]
Brush Creek (BCD-F1)	Increase RT	14.7	35

Reach Name (site #)	Objective	Existing Mean Biomass for Rainbow Trout (lbs/surface acre)	Rainbow Trout Biomass Goal[a] (lbs/surface acre)
SFAR Below Slab Creek dam (SCD-F2)	Provide healthy age class distribution of transitional fishery (coldwater to warmwater)	4.65 RT; Age class distribution that represents healthy population of hardhead. Use Fish Community Assessment Metrics [b]	13 rainbow trout; use electrofishing and snorkeling for hardhead
SFAR Below Chili Bar dam (CB-1 and F4)	Provide healthy age class distribution of transitional fishery (coldwater to warmwater)	Use Fish Community Assessment Metrics [b] rainbow trout and hardhead	

Note: RT = rainbow trout, BN = brown trout.

[a] Gerstung (1973)

[b] SMUD (2004a)

Minimum Streamflows

The proposed minimum streamflow schedule would apply to the Rubicon River below Rubicon dam, Little Rubicon River below Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle Creek dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, and the SFAR below Slab Creek dam.

The proposed schedules specify minimum streamflows by month and water year type for each of the specified stream reaches, and allow the licensees a 3-year period after the license is issued or 3 years after completion of necessary facility modifications, whichever is later, to adjust operations to meet the required minimum streamflows. During this time period, daily mean streamflows may vary up to 10 percent below the amounts specified in the minimum streamflow schedules, provided that the average monthly streamflow in any given month equals or exceeds the required minimum amount for the month. After the applicable period, the licensees would meet the minimum streamflow requirements specified in the minimum streamflow schedules.

The minimum streamflow schedules are separated into five water year types: Wet, AN, BN, Dry, and CD. For the Proposed Action, SMUD would determine water year type based on the predicted unimpaired inflow to Folsom reservoir and spring forecasting information provided by DWR Bulletin 120 report of water conditions in California each month from February through May. The water year types are defined as follows:

- Wet = greater than or equal to 3.5 MAF.
- AN = greater than or equal to 2.6 MAF but less than 3.5 MAF.
- BN = greater than 1.7 MAF or equal to but less than 2.6 MAF.
- Dry = greater than 0.9 MAF or equal to but less than 1.7 MAF.
- CD = less than 0.9 MAF.
- SD = any CD year that is immediately preceded by a Dry or CD year or any Dry year that is immediately preceded by any combination of two Dry or CD years. Applies to flows below Chili Bar dam only.

In our analysis of the potential effects of the proposed minimum streamflow schedules on aquatic resources, we refer to the results of water temperature monitoring shown in table 3-16, in section 3.3.2.1, *Water Quality*, and the summary characteristics of the stream reaches presented in table 3-34 and Agency objectives for aquatic resources shown in table 3-35.

Rubicon River below Rubicon Dam

Historically, the high-elevation Rubicon River was fishless. Rainbow trout, brown trout, California roach and speckled dace now inhabit the reach. Rainbow trout biomass observed at sample sites in this reach were low, with 11.3 pounds per surface acre in the upper sample site (RRD-F1), and 0.9 pounds per surface acre in the lower site (RRD-F2) (see table 3-33), below the management goal of 24, and 33 pounds per surface acre, respectively. Spawning gravels in the reach are comparatively high, with 1,908 square feet per mile.

Resource agency objectives for this reach are to increase rainbow trout habitat, and “de-emphasize” California roach and speckled dace populations. Settlement Agreement Proposed Article 1-1, Minimum Streamflows, calls for a minimum streamflow schedule that varies by water year and month, in an attempt to more closely mimic a natural hydrograph (table 3-36).

Our Analysis

The presence of warm, slow moving water likely accounts for the fact that California roach and speckled dace are dominant over trout in this reach. Both rainbow and brown trout both appear to be reproducing here, with age classes of rainbow trout up to 2+, and brown trout up to 3+ (see table 3-33). According to PHABSIM analysis conducted by CDFG (CDFG, 2006a), approximately 100 percent of rainbow trout available Weighted Usable Area[36] (WUA) for spawning in this reach of the Rubicon River occurs at 60 cfs (figure 3-22). In the Settlement Agreement, the May flow in a BN water year (beginning of rainbow trout spawning) was set at 35 cfs, which provides 84 percent of available WUA for rainbow trout, and provides 40 to 55 feet of wetted perimeter. After the May minimum streamflow was established, the unimpaired hydrograph was used to shape the streamflow regime for the remainder of the BN water year. For CD water years the minimum May streamflow was set at 48 percent WUA, since during natural conditions, fish would have had less habitat available during these dry years.

Table 3-36. Proposed minimum streamflow schedule (cfs) for the Rubicon River below Rubicon dam. (Source: SMUD and PG&E, 2007)

Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
July–February	6 or NF	6 or NF	6 or NF	6 or NF	6 or NF
March	6 or NF	8	15	15	15
April	8	12	20	20	20
May	10	15	35	35	35
June	6 or NF	8	15	15	15

Note: If Natural Flow (NF) measured in the Rubicon River above Rubicon reservoir is below 1 cfs, the minimum streamflow would be 1 cfs. In CD water year types, if the useable storage in Rubicon reservoir is less than 60 acre-feet and the licensee cannot maintain 1 cfs due to lack of NF into and storage in Rubicon reservoir, SMUD would notify the Agencies at least 30 days prior to not meeting the streamflow. After notification of the Agencies, SMUD may reduce minimum flows below 1 cfs, but at no time would the minimum streamflow be less than the NF into Rubicon reservoir, until sufficient water is available to resume prescribed minimum streamflow releases.

SMUD would maintain an over-wintering minimum pool of 6,527 feet in elevation in Rubicon reservoir once the reservoir begins to freeze for the protection of aquatic species. Below an elevation of 6,527 feet, streamflow releases from Rubicon reservoir would equal the lesser of the applicable flow listed in the table or the NF into Rubicon reservoir.

Proposed increases in minimum stream flows are expected to benefit the rainbow trout population by creating more available spawning habitat during April, May, and June in all water year types. Increasing flows during these months would slightly lower water temperatures in the stream during May and June resulting in temperatures that would benefit the preferred trout species, but that are less favorable for California roach and speckled dace.

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[36]Weighted Usable Area is the amount of usable habitat available for a given fish species.

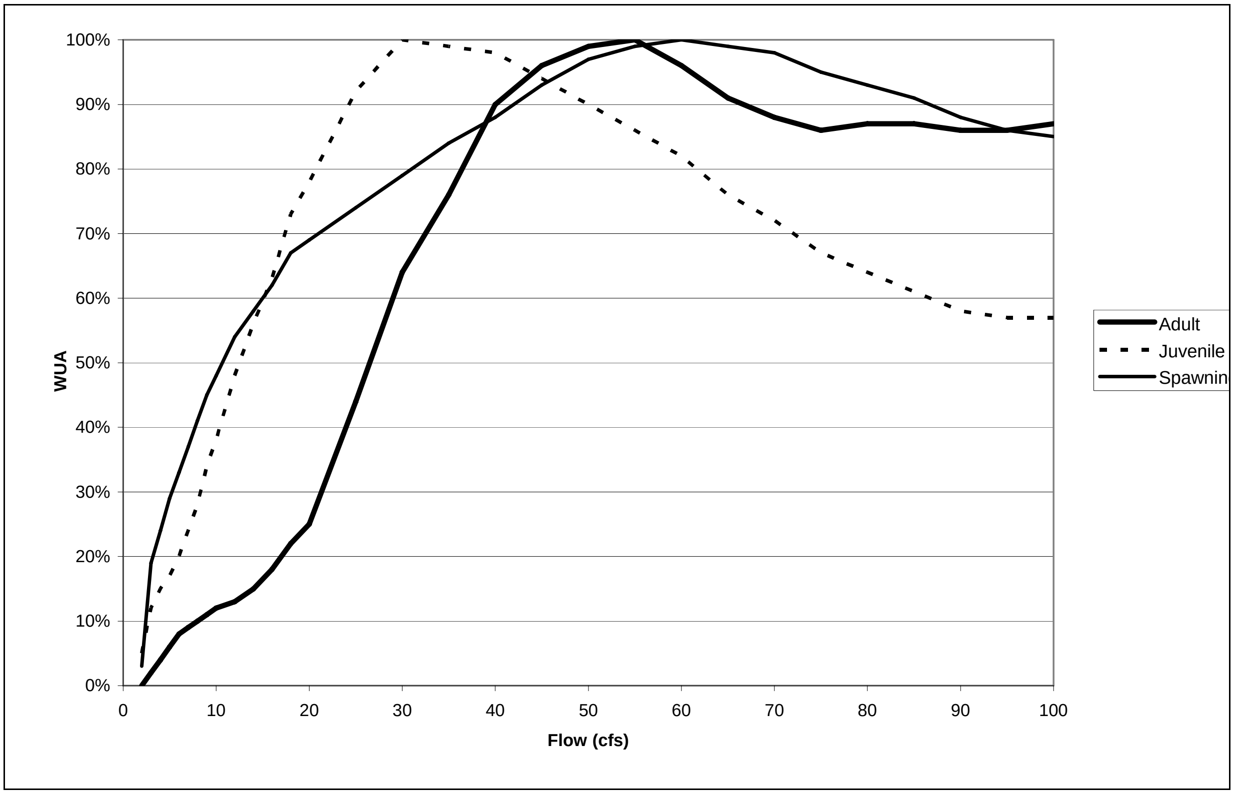

Figure 3-22. Weighted usable area for rainbow trout in the Rubicon River downstream of Rubicon dam. (Source: CDFG, 2006b)

Little Rubicon River below Buck Island Dam

Historically, the Little Rubicon River reach was fishless, and currently rainbow trout and golden shiners are found in the reach. There is a lack of spawning habitat for trout (less than 5 square feet in the entire reach), and there are 9 potential fish migration barriers. Without the current constant 1 cfs flow release, the high-elevation river would likely freeze in the winter, with limited habitat available only in deeper pools, and the river would be intermittently dry in the summer months. Water temperatures during March to April are near 0ºC, and during the summer the lower portions of the reach can reach 26ºC, near lethal temperatures for rainbow trout. These conditions result in low flow, warm water conditions during the summer that are more favorable for golden shiners, an exotic species that were likely introduced into the reach as baitfish.

Agency objectives for fish in this reach are to reduce or eliminate golden shiners, and increase existing populations of rainbow trout. The minimum streamflow schedule was developed by taking the Rubicon River minimum streamflows, and adjusting them by watershed area. There are approximately 26.5 square miles in the Rubicon River watershed, and approximately 6 square miles in the Little Rubicon River watershed, therefore the minimum flow regime was determined by dividing the Rubicon River minimum flows by 4.4. The proposed minimum flows are presented in table 3-37.

Table 3-37. Proposed minimum streamflow schedule (cfs) for the Rubicon River below Buck Island dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
July to February	1	1	1	1	1
March	1	2	3	3	3
April	2	3	5	5	5
May	2	3	8	8	8
June	1	2	3	3	3

Notes: Compliance point, USGS gage 11428400, located at the outlet structure on Buck Island dam. If Natural Flow (NF) measured in Highland/Rockbound Creek above Buck Island reservoir is below 1 cfs, the minimum flow would be 1 cfs. In CD water year types, if the useable storage in Buck Island reservoir is less than 60 acre-feet and the licensee cannot maintain 1 cfs due to lack of NF into and storage in Buck Island reservoir, SMUD would notify the Agencies at least 30 days prior to not meeting the streamflow. After notification of the Agencies, the licensee may reduce minimum flows below 1 cfs, but at no time would the minimum streamflow be less than the NF into the Buck Island reservoir, until sufficient water is available to resume prescribed minimum streamflow releases.

Our Analysis

Few fish inhabit this reach of the Little Rubicon River. Sampling at two sites in 2002 and 2003 yielded only 5 rainbow trout in total. In 2002, 12 golden shiners were captured, and in 2003 over 200 young-of-the-year golden shiner were captured. These young fish may have originated in the Buck Island reservoir. The small amount (less than 5 square feet) of spawning gravels present for trout along with the 9 passage barriers render this reach unproductive for trout at almost any flow. The proposed minimum streamflow schedule provides for increased flows from March through June in all but CD years. In CD years flows would be increased during April and May. The volume of watershed runoff that enters the reach as accretion during these months is significantly greater than the proposed increase in minimum flows, which would likely mask any potential benefit of the increased releases. Increases in minimum flow, particularly during May and June may benefit trout by lowering streamflow temperatures in the reach slightly; however, given the lack of available spawning gravels, this benefit may be limited to preventing pools in the stream from drying and providing rearing habitat.

Gerle Creek below Loon Lake Dam

Brown trout, a non-native but desirable fish species, and rainbow trout are relatively abundant in this reach (see table 3-31) and support an important recreational fishery. Agency objectives for Gerle Creek flows below Loon Lake dam are to emphasize rainbow trout and brown trout fisheries, reintroduce some similarity to the natural hydrograph to restore ecosystem processes that have been altered by Project operations, and to inundate banks to a greater degree than present to move fines and to improve riparian condition.

The Settlement Agreement proposed minimum streamflow schedule is shown in table 3-38. To facilitate fish passage to Gerle Creek below the reservoir, the Settlement Agreement also contains a provision (Proposed Article 1-8, *Fish Passage at Gerle Creek*) that specifies that the reservoir level at Gerle Creek reservoir be maintained at an elevation that provides fish passage into Gerle Creek from August through October.

Table 3-38. Proposed minimum streamflow (cfs) schedule for Gerle Creek below Loon Lake dam. (Source: SMUD and PG&E, 2007)

Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
October–November	7	11	16	20	23
December	8	13	18	22	26
January	12	15	19	23	28
February	14	18	22	27	32
March	19	24	30	37	44
April	23	32	40	49	58
May	25	32	40	49	58
June	10	16	22	27	32
July	5	14	22	27	32
August–September	5	10	14	17	20

Note: Compliance point, USGS gage 11429500, located on Gerle Creek approximately 0.3 mile downstream from Loon Lake dam.

Our Analysis

The proposed minimum streamflow schedule was developed to accomplish several objectives. These include increasing available habitat for brown trout and rainbow trout, particularly during their respective spawning seasons; providing cold freshwater instream habitat; ensuring low terraces and flood-prone areas are inundated during the growing season; and providing flows that will reduce encroachment of riparian vegetation in the channel. Allowing flows to vary among seasons and more closely follow flow patterns of an unimpaired flow regime would help to accomplish these objectives.

Brown trout typically spawn during a natural low-flow period of the year in October and November, and rainbow trout spawn during April through June. Results of CDFG's WUA analysis (CDFG, 2006b) for rainbow trout and brown trout are presented in figures 3-23 and 3-24. The current 8 cfs minimum flow provides 85 percent, 98 percent and 77 percent WUA for rainbow trout adult, juvenile, and spawning, respectively, and 92 percent, and 100 percent, and 77 percent WUA for brown trout adult, juvenile, and spawning, respectively. The Proposed Action would increase flows and available WUA for all life stages of rainbow trout and brown trout spawning in all water years, with the exception of brown trout spawning in CD years, where WUA would decrease slightly in October and November.

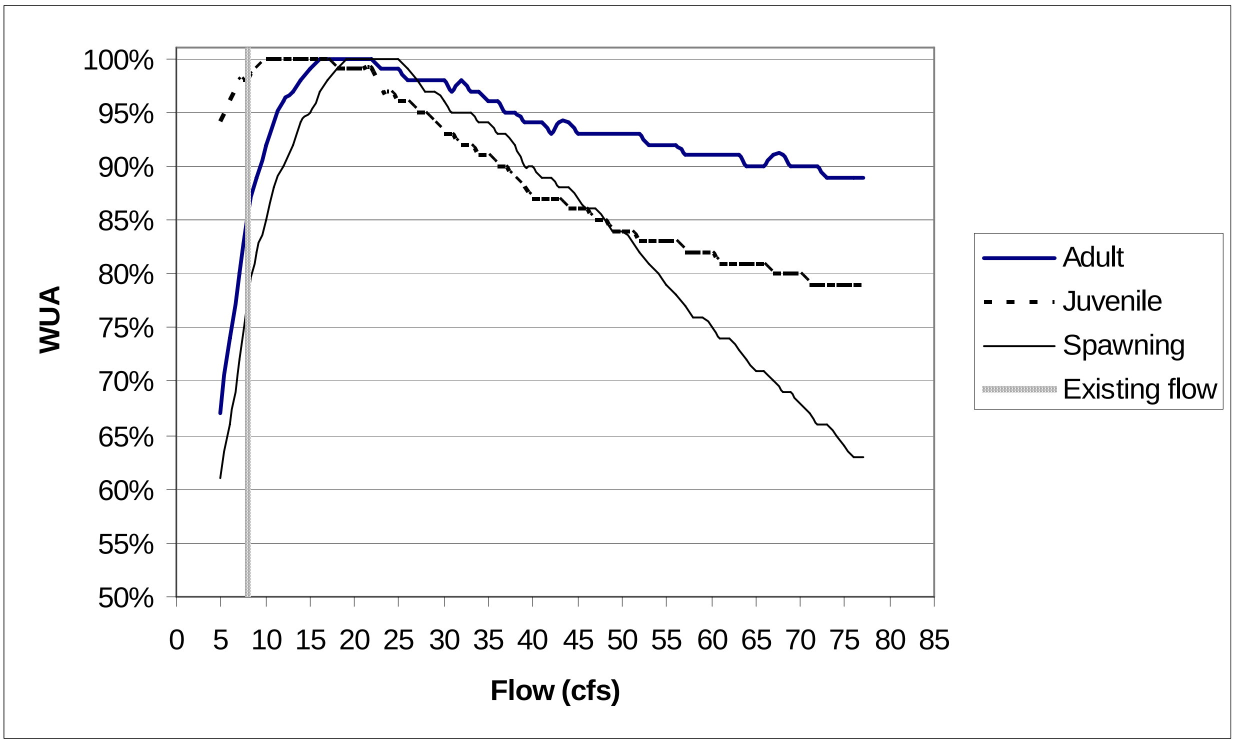

Figure 3-23. Rainbow trout composite WUA for Gerle Creek below Loon Lake dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Associate Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, Sacramento Valley Central Sierra Region CDFG, dated October 9, 2006)

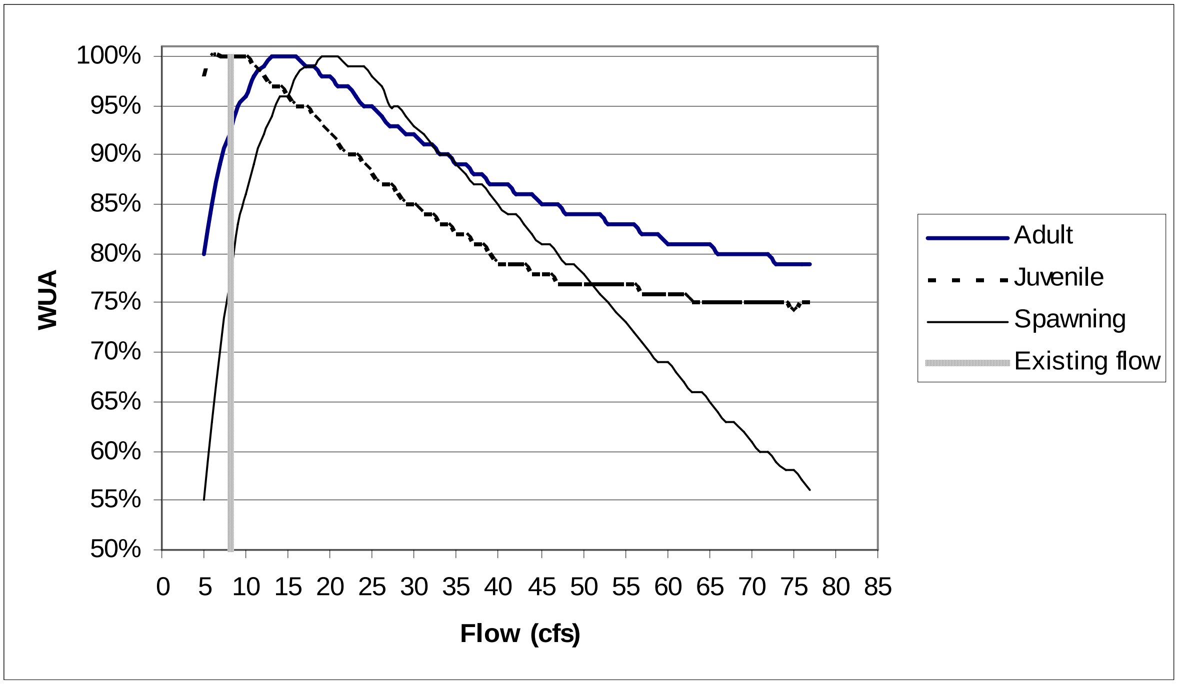

Figure 3-24. Brown trout composite WUA for Gerle Creek below Loon Lake dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Associate Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, Sacramento Valley Central Sierra Region CDFG, dated October 9, 2006)

The proposed increases in minimum streamflows would result in increased channel size and wetted perimeter downstream of the meadow section of Loon Lake reach of Gerle Creek, where channel mapping showed that increased flow would add habitat along the sides of the stream that may serve as a nursery for juvenile trout.

Increased flows during the spring months would result in inundation of stream margin habitats and primary flood terraces that would occur under an unimpaired flow regime. Such variations in streamflows and inundation are anticipated to increase the health of riparian vegetation and increase functioning of the riparian ecosystem by promoting stream bank stability and water quality, reducing the potential for erosion, increasing storage of nutrients and water, and providing forage and habitat for wildlife.

Gerle Creek has been identified as an important and unique brown trout fishery by sports anglers who recreate in the Crystal Basin. Brown trout residing in Gerle reservoir travel upstream to Gerle Creek for their October and November spawning.

The confluence of Gerle Creek with Gerle reservoir is marked by an alluvium delta deposit in the stream channel, which varies in location and depth due to the ongoing geomorphic processes. Recent information (letter from SMUD to FERC dated November 13, 2007) indicates that this alluvium deposit, consisting of mostly boulders and cobbles, is located mostly on the left side of the channel and currently does not have the potential to pose a migration barrier for brown trout. However, SMUD also indicates in its letter that cobble and boulders deposited at the head of the delta extends well upstream of the reservoir to an elevation of 5,231 feet. SMUD notes that this sediment deposit is caused by sediment falling out of the water as the stream slows due to the backup of water at Gerle Creek reservoir.

In streams such as Gerle Creek that are capable of carrying large sediments, these deposits can progressively work their way upstream as the sediments that are deposited at the head of the delta act to extend the backwater effect of the reservoir farther and farther upstream. Passage conditions in these areas can be altered substantially by flood events, which may alter the shape of the channel through the deposit or increase the size of the deposit by contributing large volumes of new material from upstream. Changes in the size and shape of the delta that could cause possible passage barriers are hard to predict and would vary in the future depending on sediment load, flood events, reservoir levels, and other factors and may require measures such as channel modifications by SMUD to ensure continued upstream passage of brown trout into Gerle Creek.

Robbs Peak Dam Reach and Gerle Creek below Gerle Dam

Rainbow trout and non-native brown trout populations inhabit the Gerle Creek dam reach. Agency goals for fish are to increase biomass of rainbow trout and maintain that of brown trout in Gerle Creek, and improve cold freshwater habitat.

The proposed minimum flows are presented below in table 3-39. Minimum streamflows for this reach are currently measured as combined flows below the confluence of Gerle Creek and SFRR.

Table 3-39. Proposed minimum streamflow (cfs) schedule for Gerle Creek below Gerle dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	9	10	10	10
November	4	4	6	6	6
December	4	5	6	6	6
January to February	5	6	6	6	6
March	7	10	12	9	9
April	9	12	15	9	9
May to June	9	12	15	15	15
July	7	10	13	15	15
August	5	9	12	12	12
September	5	9	10	10	10

Our Analysis

Currently brown trout and rainbow trout are present in this short reach, providing valued opportunities for anglers. The existing minimum flows in this reach range between 4 cfs (CD, Dry, and BN years) and 7 cfs (during May through Oct of AN and Wet years). The current 4 cfs flows provide only 59 and 76 percent of WUA for brown trout and rainbow trout, respectively (figures 3-25 and 3-26). The proposed minimum flows would provide higher streamflows during the spring, which would increase the WUA available for rainbow trout spawning and adults, which may lead to increased production in the reach. The proposed minimum flows provide for increased flows during the fall brown trout spawning season as well, which could benefit production in the reach. The proposed flow releases more closely resemble an unimpaired hydrograph, which would likely benefit the production of healthy riparian vegetation and improve channel morphology.

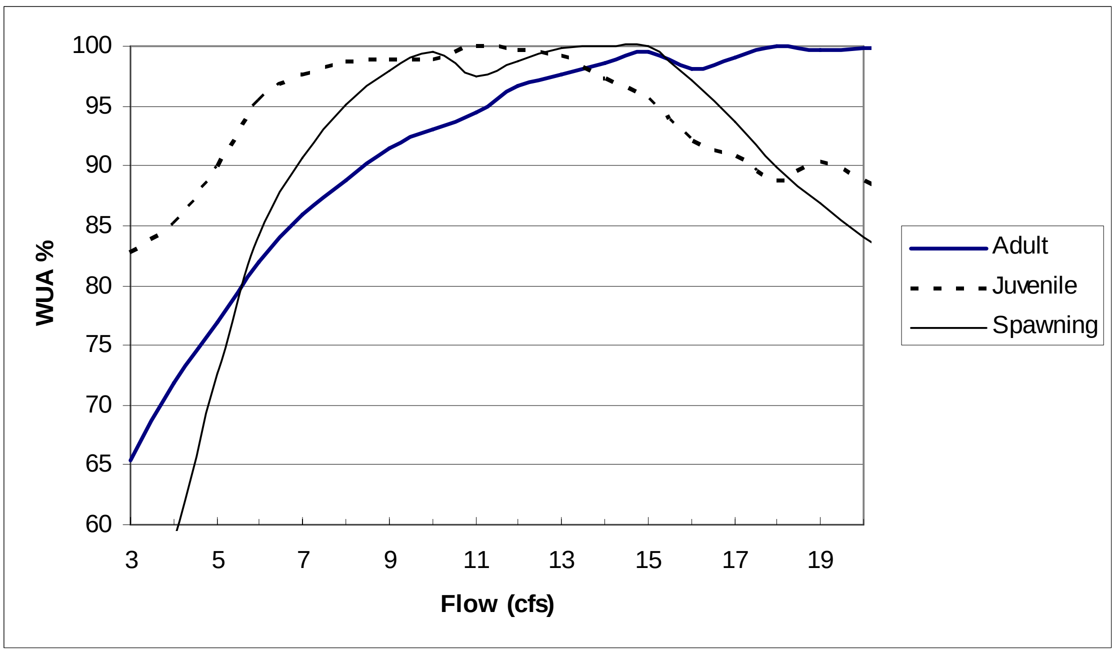

Figure 3-25. Brown trout composite WUA for Gerle Creek below Gerle dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, CDFG, dated October 9, 2006)

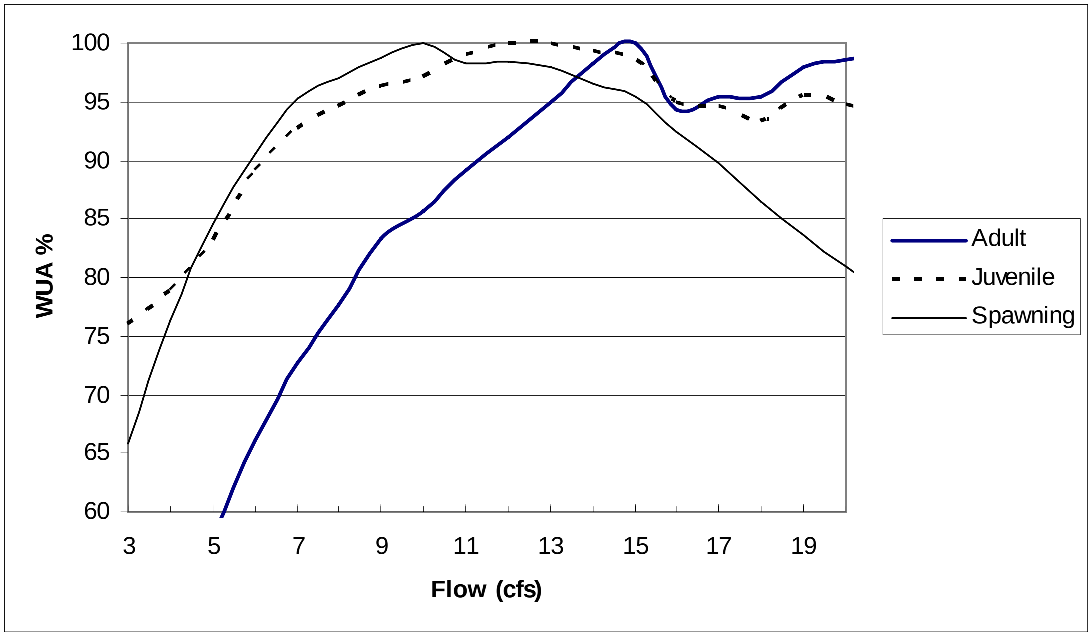

Figure 3-26. Rainbow trout composite WUA for Gerle Creek below Gerle dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, CDFG, dated October 9, 2006)

South Fork of the Rubicon River below Robbs Peak Dam

Agency objective for the fisheries resources in this reach are to increase rainbow trout production and maintain production of brown trout. Current minimum flow releases for this reach are 1 cfs for all months and water years, except that in AN and Wet years 3 cfs are released from May through October. The proposed minimum streamflow schedule is presented below in table 3-40.

Our Analysis

The proposed minimum streamflow schedule would establish a more natural hydrograph compared with the existing 1 or 3 cfs releases. The Agency goal for fisheries in this reach is to increase rainbow trout and maintain brown trout biomass.

Table 3-41 shows the percent WUA for all water types for rainbow trout for the proposed minimum flows. For all water year types there will be more juvenile and adult trout habitat available under the proposed flow regime than there would be under the unimpaired hydrograph or under the existing flow regime. The increased flows are also anticipated to decrease the potential for entrainment at the entrance to the Robbs Peak powerhouse tunnel. If this is found not to be successful based on monitoring results, the adaptive management program described in Proposed Article 1-6, *Adaptive Management Program* of the Settlement Agreement includes, but is not limited to, mitigation for the entrainment by installing a partial-flow fish screen in the

SFRR upstream of Ice House Road, or other appropriate mitigation measures that are approved by the Forest Service, CDFG, and the Water Board.

Table 3-40. Proposed minimum streamflow (cfs) schedule for the SFRR below Robbs Peak dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	3	3	3	3	3
November	1	2	3	3	3
December	1	3	4	4	4
January	2	5	7	7	7
February	2	5	8	8	8
March	3	7	11	9	9
April	4	9	13	10	10
May to June	4	9	13	13	13
July	3	5	6	13	13
August	3	5	6	11	11
September	3	5	6	6	6

Table 3-41. Percent WUA for all water year types for rainbow trout for SFRR below Robbs Peak dam. (Source: CDFG, 2007)

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
October to December	CD	1–3	53–86 (no PHABSIM for 1 cfs)	Adult
	Dry	2–3	53–86	Adult
	BN, AN, Wet	3–4	86–93	Adult
January to March	CD	2-3	53–86	Adult
	Dry	5-7	98	Adult
	BN	7-11	90-98	Adult
	AN, Wet	7-9	90-98	Adult
April	CD	4	93/85	Adult/spawning
	Dry	9	90/98	Adult/spawning
	BN	13	69/100	Adult/spawning
	AN, Wet	10	85/99	Adult/spawning
May to June	CD	4	93/81/100	Adult/spawning/juvenile
	Dry	9	90/98/90	Adult/spawning/juvenile

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
	BN, AN, Wet	13	69/100/82	Adult/spawning/juvenile
July	CD	3	86/72/99	Adult/spawning/juvenile
	Dry	5	98/85/99	Adult/spawning/juvenile
	BN	6	100/90/97	Adult/spawning/juvenile
	AN, Wet	13	69/100/82	Adult/spawning/juvenile
August	CD	3	86/99	Adults/juveniles
	Dry	5	98/99	Adults/juveniles
	BN	6	100/97	Adults/juveniles
	AN, Wet	11	80/85	Adults/juveniles
September	CD	3	86/99	Adults/juveniles
	Dry	5	98/99	Adults/juveniles
	BN, AN, Wet	6	100/97	Adults/juveniles

The PHABSIM modeling showed the May minimum streamflow of 13 cfs would inundate some areas of the primary flood terrace in the reach, which is anticipated to benefit riparian vegetation during the growing season, thus improving riparian cover in the reach.

The proposed increase in winter flow releases from Robbs Peak reservoir would help maintain the wetted width of the channel, which would help to minimize freezing and the chance of significant ice formation, and increase available overwintering habitat for adult and juvenile trout.

Minimum streamflows for this reach and Gerle Creek below Gerle dam are currently combined and measured below the confluence of Gerle Creek and SFRR. Therefore current the streamflow gaging in this reach is inadequate to determine actual flows. Installation of a stream gage as proposed in Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, would ensure minimum streamflows are being released.

South Fork of Silver Creek below Ice House Dam

The Ice House dam reach of SFSC was historically fishless; however, it now contains naturalized populations of rainbow trout, brown trout and, in the lower reaches, Sacramento sucker. Currently the watershed in the lower portion of the reach is not forested because of a wildfire that swept through the area in 1992. The trout biomass is well above average in the upper portion of Ice House dam reach, while the lower portion of the reach exhibits below average trout biomass, which may be related, in part, to a combination of habitat features and high mean daily temperatures during summer months in SFSC. Water released from Ice House dam originates in the hypolimnion of

Ice House reservoir and remains cold throughout the year, with summertime temperatures of about 7ºC. In the summer, temperatures in the lower portions of this reach are often 20º to 21ºC, outside the optimal range for rainbow trout. While stream flow strongly influences stream temperature in the reach, high summer temperatures in the lower segment of the Ice House dam reach are also likely due to the loss of vegetation shading throughout most of the reach as a result of the 1992 wildfire.

Agency objectives for minimum flow releases to SFSC below Ice House dam for fisheries include providing peak flows to ensure bedload is moved through this reach; providing out-of-bank flows to inundate the lower terrace and floodplain to maintain the riparian ecosystem and keep the banks stabilized; providing temperatures that allow for management of native coldwater fish species. The goals for improving rainbow trout biomass at study sites in the reach are listed in table 3-35. Currently, rainbow trout biomass in the SFSC below Ice House dam is below agency objectives for the reach. The proposed minimum streamflow schedule is presented in table 3-42.

Table 3-42. Proposed minimum streamflow (cfs) schedule for SFSC below Ice House dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	10	15	15	15
November	5	7	8	8	8
December	5	8	11	11	11
January to February	6	12	18	18	18
March	8	16	24	24	24
April	15	28	41	41	41
May	30	46	68	68	68
June	25	31	46	46	46
July	21	21	30	30	30
August	14	14	15	15	15
September	10	10	15	15	15

Note: Compliance point, USGS gage 11441500, located on SFSC approximately 0.4 mile downstream from Ice House dam.

Our Analysis

The proposed minimum flow regime would more closely simulate the snowmelt period in the spring and provide quality habitat coinciding with the life history of native fish and amphibians. Figure 3-27 and table 3-43 show the percent WUA that would be available under the proposed flow regime. The minimum streamflow schedule was developed with the goal of maximizing both rainbow trout adult habitat and spawning habitat, particularly in May.

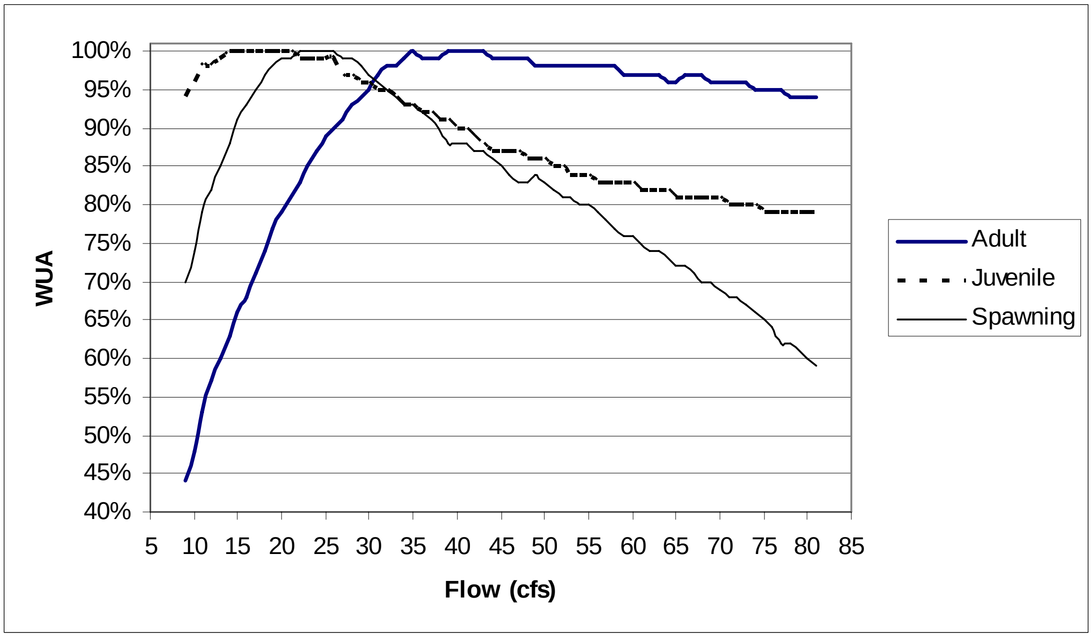

Figure 3-27. Rainbow trout composite WUA for the SFSC below Ice House dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Fishery Biologist, CDFG, dated October 9, 2006)

Table 3-43. Percent WUA for all water year types for rainbow trout for SFSC below Ice House dam. (Source: CDFG, 2007)

Month	Water Year Type	Flow Range (cfs)	Percent WUA	Benefiting Life Stage
October	CD	5	44/73	Adults/juveniles
	Dry	10	48/76	Adults/juveniles
	BN, AN, Wet	15	65/88	Adults/juveniles
November to December	CD	5	Below 44	Adults
	Dry	7 to 8	Below 44	Adults
	BN, AN, Wet	8 to 11	Below 44 to 53	Adults
January to February	CD	6	Below 44 to 53	Adults
	Dry	12	57	Adults
	BN, AN, Wet	18	74	Adults
March	CD	8	Below 44	Adults
	Dry	16	68	Adults

Month	Water Year Type	Flow Range (cfs)	Percent WUA	Benefiting Life Stage
	BN, AN, Wet	24	87	Adults
April	CD	15	65	Adults
	Dry	28	93	Adults
	BN, AN, Wet	41	100	Adults
May	CD	30	95/97	Adult/spawning/juvenile
	Dry	46	99/84	Adult/spawning
	BN, AN, Wet	68	96/71	Adult/spawning
June	CD	25	89/100/99	Adult/spawning
	Dry	31	97/96/100	Adult/spawning
	BN, AN, Wet	46	99/84/97	Adult/spawning
July	CD	21	81/99/96	Adult/spawning
	Dry	21	81/99/96	Adult/spawning
	BN, AN, Wet	30	95/97/100	Adult/spawning
August to September	CD, Dry	10 to 14	48/76 to 63/86	Adult/juvenile
	BN, AN, Wet	15	65	Adult/juvenile

The Agencies state the recommended minimum streamflows were referenced against the PHABSIM transects to ensure that inundation of the primary flood terraces and bank margins would occur. This would benefit riparian vegetation during the spring by promoting initial scouring, sediment and nutrient deposition, and seed dispersal (CDFG, 2007).

As stated in section 3.3.3.2, water temperature modeling shows the proposed minimum flows would result in cooler June and July conditions than existing minimum flows, and mean daily temperatures of 20°C or less would be maintained throughout the entire reach. Simulated temperatures were as much as 15°C cooler (7°C versus 22°C existing) just downstream of the dam, about 3 to 4°C cooler near the middle of the reach, and virtually the same at the lower end of the reach. Bell (1991) reports an optimal range for rainbow trout of 12 to 19°C, while Moyle (2002) reports an optimal growth range of 15 to 18°C, therefore cooler temperatures would benefit rainbow trout populations in the reach.

Silver Creek below Junction Dam

The Junction dam reach was historically fishless, but now supports reproducing populations of rainbow trout and brown trout. Agency objectives for establishing minimum flows in Silver Creek below Junction dam include providing temperatures that allow for management of native fish and address foothill yellow-legged frog breeding, to establish some similarity to the natural hydrograph, and to provide connectivity of flows from the SFSC below Ice House dam through Silver Creek below Junction dam. The existing biomass for rainbow trout for this reach is 7.5 pounds per surface acre, below the resource agency biomass objective of 24 pounds per surface acre. The proposed minimum streamflow regime (table 3-44) was designed to increase instream habitat to improve the rainbow trout biomass and move it closer to the objective. Currently, SMUD releases between 5 and 20 cfs during various flow years.

Table 3-44. Proposed minimum streamflow (cfs) schedule for Silver Creek below Junction dam. (Source: SMUD and PG&E, 2007)

Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
October	5	10	15	15	15
November	5	7	20	20	20
December	5	8	20	20	20
January to February	6	12	20	20	20
March	8	16	25	25	25
April	15	28	42	42	42
May	30	46	68	68	68
June	25	31	50	59	59
July	21	21	30	35	35[a]
August	14	14	15	18	18[a]
September	10	10	15	18	18[a]

[a] SMUD would be required to release additional water into Silver Creek below Junction dam annually in July, August and/or September in Wet water year types for temperature control upon approval of the Agencies. A block of water would not exceed the acre-feet of water as follows: July, 1,044 acre-feet; August, 491 acre-feet; September, 475 acre-feet. Details of the block of water release flows are described in Proposed Article 1-1, *Minimum Streamflows*.

Our Analysis

The proposed minimum streamflows provide for increased flows through the reach for most all months and water year types. The minimum streamflow regime maximizes WUA for adult rainbow trout during most water years, although it decreases WUA available for rainbow trout spawning WUA when compared to existing conditions (figure 3-28). Table 3-45 displays the percent WUA for all water year types for rainbow trout for Silver Creek below Junction dam for the proposed minimum flow releases. The increase in streamflows during May through July would likely substantially reduce stream temperatures in the reach, which could benefit trout spawning, however the decrease in flows during August and September of AN and Wet years may slightly increase temperatures. However these warmer temperatures would most likely occur in edgewater habitat in lower portions of the reach (see discussion in section 3.3.2.2, *Water Temperature*) and would not likely have an impact on adult fish.

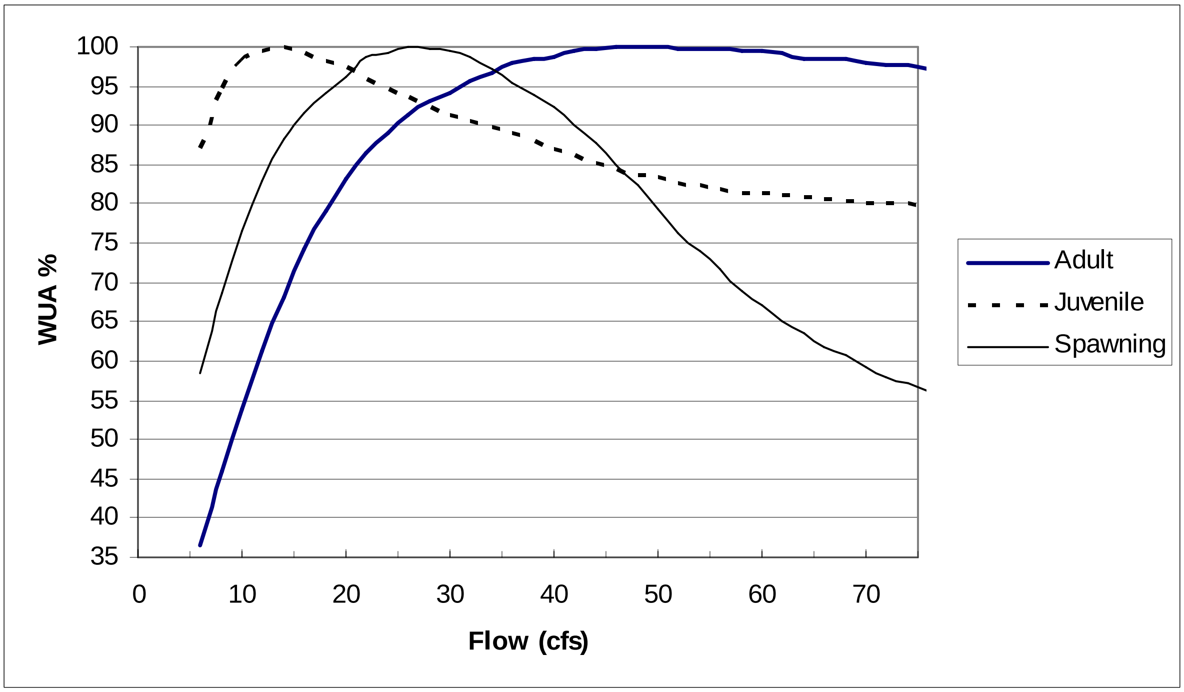

Figure 3-28. Rainbow trout WUA for Silver Creek below Junction dam. (Source: DTA and Stillwater Sciences 2004b)

Table 3-45. Percent WUA for all water year types for rainbow trout for SFSC below Junction dam. (Source: DTA and Stillwater Sciences, 2004b)

Month	Water Year Type	Flow (cfs)	Percent WUA	Benefiting Life Stage
October	CD	5	<36/<86	Adult/juvenile
	Dry	10	54/98	Adult/juvenile
	BN	15	71/99	Adult/juvenile
	AN	15	71/99	Adult/juvenile
	Wet	15	71/99	Adult/juvenile
November to February	Dry	7	41	Adult
	BN	20	83	Adult
	AN	20	83	Adult

Month	Water Year Type	Flow (cfs)	Percent WUA	Benefiting Life Stage
	Wet	20	83	Adult
	CD	8	46	Adult
March	CD	8	46	Adult
	Dry	16	74	Adult
	BN	25	90	Adult
	AN	25	90	Adult
	Wet	25	90	Adult
April	CD	15	71/90	Adult/spawning
	Dry	28	93/100	Adult/spawning
	BN	42	100/90	Adult/spawning
	AN	42	100/90	Adult/spawning
	Wet	42	100/90	Adult/spawning
May	CD	30	95/100	Adult/spawning
	Dry	46	100/85	Adult/spawning
	BN	68	98/61	Adult/spawning
	AN	68	98/61	Adult/spawning
	Wet	68	98/61	Adult/spawning
June	CD	25	90/99/94	Adult/spawning/juvenile
	Dry	31	95/99/91	Adult/spawning/juvenile
	BN	50	100/79/84	Adult/spawning/juvenile
	AN	59	100/68/81	Adult/spawning/juvenile
	Wet	59	100/68/81	Adult/spawning/juvenile
July	CD	21	85/97/96	Adult/spawning/juvenile
	Dry	21	85/97/96	Adult/spawning/juvenile
	BN	30	94/100/91	Adult/spawning/juvenile
	AN	35	97/96/89	Adult/spawning/juvenile
	Wet	35	97/96/89	Adult/spawning/juvenile
August to Sept	CD	14	68/98-100	Adult/juvenile
	Dry	14	68/98-100	Adult/juvenile
	BN	15	71/99	Adult/juvenile
	AN	18	79/98	Adult/juvenile
	Wet	18	79/98	Adult/juvenile

Currently, coldwater releases from Junction dam in summer months create a mean daily temperature range between approximately 8°C at the dam and 20°C at the bottom of the reach. Bell (1991) reports an optimal range for rainbow trout of 12 to 19°C, while Moyle (2002) reports an optimal growth range of 15 to 18°C. As stated in section 3.3.3.2, the large increases flow in May through July would substantially reduce temperatures in the reach, which may benefit trout. Reducing flows during August and September of Wet and AN years would likely only slightly increase temperatures.

Monitoring water temperatures and releasing blocks of water as described in Proposed Article 1-1, *Minimum Streamflows*, would provide a larger influx of cooler water, helping to maintain instream temperatures below 20°C and protecting trout in the stream.

Silver Creek below Camino Dam

Agency objectives for minimum flows in this reach are to provide habitat for healthy macroinvertebrate populations and foothill yellow-legged frogs in the entire reach, provide connectivity of flows from SFSC below Ice House dam through Silver Creek below Junction and Camino dams, provide temperatures that allow for management of native fish, and provide good water/habitat quality, resulting in improved bioassessment composite metric scores for rainbow trout, particularly in the lower reach. The proposed minimum streamflow schedule is presented in table 3-46.

Table 3-46. Proposed minimum streamflow (cfs) schedule for Silver Creek below Camino dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	10	15	15	15
November	5	7	20	20	20
December	5	8	20	20	20
January–February	6	12	20	20	20
March	8	16	25	25	25
April	15	28	42	42	42
May	30	46	68	68	68
June	25	31	50	59	59
July	21	21	30	35	35[a]
August	14	14	15	18	18[a]
September	10	10	15	18	18[a]

[a] SMUD would be required to release additional water into Silver Creek below Camino dam annually in the months of July, August, and/or September in Wet water year types for temperature control upon approval of the Agencies. A block of water would not exceed these amounts: July, 1,044 acre-feet; August, 491 acre-feet; and September, 475 acre-feet. Details of the block of water release flows are described in proposed Article 1-1, *Minimum Streamflows*.

Our Analysis

Flows in this reach were shaped to mimic the natural hydrograph, with decline of discharges during the summer that result in decreasing water depths and warmer water temperatures in order to facilitate reproduction of the foothill yellow-legged frog in the reach (CDFG, 2007). The flow regime was also developed to provide continuous streamflows from Silver Creek below Junction dam to improve habitat for rainbow trout in the reach.

Based on snorkel surveys, there are an estimated 137 rainbow trout per mile in this reach (CDFG, 2007), and the stated goal for this reach is 278 adult fish per mile. The proposed minimum streamflows regime in this reach would result in an increase in available WUA for rainbow trout adults and spawning habitat during most months in all water years, although habitat for rainbow trout juveniles will decrease somewhat due to the higher flow regime (figure 3-29). The increase in habitat for adult and spawning rainbow trout is greater than the loss of juvenile habitat, thus the net result is anticipated to be that production of trout in the reach would likely increase.

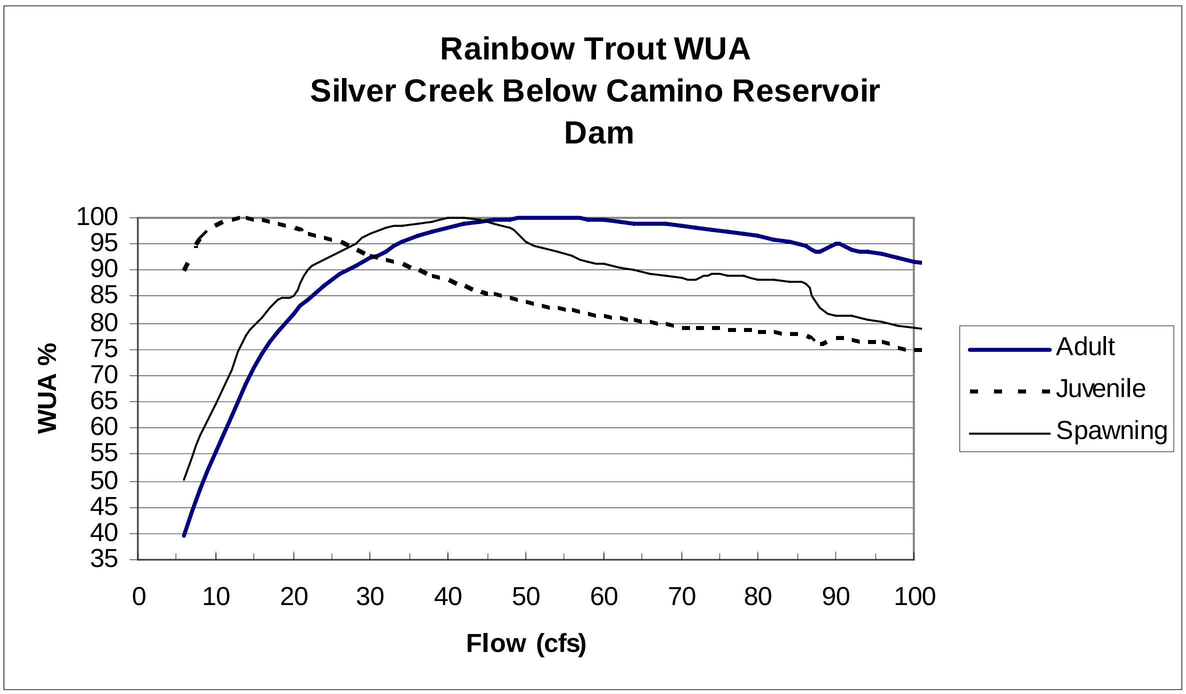

Figure 3-29. Rainbow trout WUA for Silver Creek below Camino dam. (Source: DTA and Stillwater Sciences 2004b)

As discussed in section 3.3.3.2, instream temperatures exceeded 20ºC in the lower end of the reach nearly 70 percent of the time in July, 20 percent of the time in June and August, and occasionally in May. The proposed streamflow release schedule would reduce mean daily temperatures approximately 5ºC in May and June, about 3ºC in July. It would likely keep stream temperatures below 20ºC from May through July in

BN years, which would benefit rainbow trout in the reach during those months. However it is not clear if the increased streamflows in other years would lower temperatures below 20ºC, particularly in July and August. Monitoring water temperatures and releasing blocks of water as described in Proposed Article 1-1, *Minimum Streamflows*, would provide a larger influx of cooler water, helping to maintain instream temperatures below 20°C, thereby keeping temperatures closer to the preferred levels for trout in the stream.

Brush Creek below Brush Creek Dam

Historically, Brush Creek was fishless except at its confluence with the SFAR. Naturalized populations of rainbow and brown trout now occupy the stream. This reach has the highest productivity, in terms of fish per mile, of any of the other streams surveyed in 2003, and it appears there is strong recruitment of YOY fish for both trout species, with a distribution of older age classes up to the 3+ age group. The presence of multiple age classes indicates the rainbow and brown trout populations in the reach are reproducing in the reach.

Agency objectives for this reach are to manage flows to benefit native aquatic species. The Agencies recommended a mean rainbow trout biomass objective of 35 pounds per surface acre. The current mean biomass present in Brush Creek is 14.7 pounds per surface acre, so the recommended minimum streamflows were developed to increase biomass by increasing the available stream habitat. The proposed minimum streamflow schedule is presented in table 3-47.

Table 3-47. Proposed minimum streamflow (cfs) schedule for Brush Creek below Brush Creek dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	4 or NF	4 or NF	4 or NF	4 or NF	4 or NF
November	6 or NF	7 or NF	8 or NF	9 or NF	9or NF
December–May	6 or NF	7 or NF	8 or NF	9 or NF	10or NF
June	6 or NF	7 or NF	8 or NF	9 or NF	9 or NF
July	5 or NF	5 or NF	5 or NF	5 or NF	5 or NF
August	4 or NF	4 or NF	4 or NF	4 or NF	4 or NF
September	3 or NF	3 or NF	3 or NF	3 or NF	3 or NF

Notes: NF=natural inflow. In all months and all water year types, if natural inflow is below 1 cfs, the minimum flow would be 1 cfs. Compliance point, USGS gage 11442700, located on the Brush Creek dam outlet structure.

Our Analysis

Current minimum streamflow releases from Brush Creek dam range from 2 to 3 cfs from June through October, and 4 to 6 cfs from November through May. The proposed minimum flow regime varies from 3 to 12 cfs from June through October, and 6 through 10 cfs from November through May (or natural inflow, or 1 cfs if natural inflow is less than 1 cfs).

The proposed minimum flows are increased over existing releases in all water years and months, except for the month of September in wetter years, where is it unchanged. Based on analysis of rainbow trout WUA, these proposed flows will increase available habitat for adult, juvenile, and spawning rainbow trout in Brush Creek compared to the existing conditions (figure 3-30). An increase in available habitat is anticipated to increase production of trout to meet agency biomass objective for this reach.

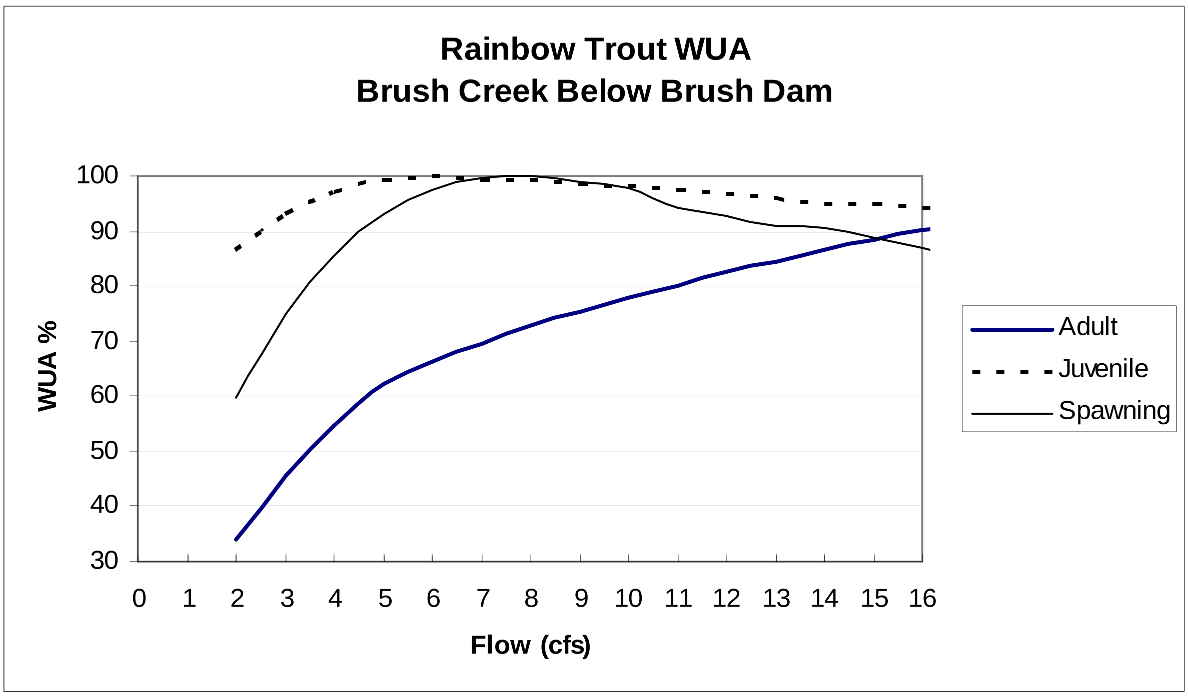

Figure 3-30. Rainbow trout WUA for Brush Creek below Brush Creek dam. (Source: DTA and Stillwater Sciences 2004b)

South Fork of the American River below Slab Creek Dam

The existing flow regime in the Slab Creek dam reach supports a wide variety of fish species. The reach is located within a transitional zone where the stream fish community comprises both coldwater and coolwater species. Trout are dominant in the upper portion of the reach, while hardhead, a special status species, are found as part of a native transition zone fish community (sucker-pikeminnow-hardhead) in the lower portion of the reach. The primary cause of this is rising water temperatures from upstream to downstream. The Agencies' objectives for fisheries resources in the SFAR below Slab Creek dam are to provide habitat for hardhead, and to provide temperatures that allow for management of native fish (hardhead and rainbow trout); to reduce non-native species, such as bullfrogs and bass; to reestablish some similarity to a natural hydrograph; and to maintain streamflows in the SFAR above Slab Creek reservoir below Slab Creek dam.

The proposed minimum flow releases schedule is presented in tables 3-48 and 3-49. Because the higher spring flows would require SMUD to modify facilities, there is a minimum streamflow regime for years 1 to 3 of the new license that is within the capability of the existing facility, and then the minimum streamflows increase once appropriate facility modifications are made to accommodate the flows.

Our Analysis

The coldwater releases from Slab Creek reservoir facilitate a coldwater trout fishery in the upper portion of the reach, although there is a warmer water "transition zone" fishery above Slab Creek reservoir. The summer flow regime creates warmer water conditions in the lower portion of the reach that do not sustain a significant trout population. The existing biomass for rainbow trout in this reach is 4.6 pounds per surface acre, below the agency biomass objective of 13 pounds per surface acre. The proposed flow regime is designed to improve instream habitat to increase the trout biomass and move it closer to the desired objective.

Table 3-48. Proposed minimum streamflow (cfs) schedule for SFAR below Slab Creek dam, years 1–3. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October–February	63	63	70	80	90
March	63	101	110-130-150-180	110-130-150-180	110-130-150-180
April	100	101-132-156-183	188-197-213-222	188-197-213-222	188-197-213-222
May	109	164-145-126-107	229-236-247-263 [a]	229-236-247-263 [a]	229-236-247-263 [a]
June	90	90	228-193-158-123	228-193-158-123	228-193-158-123
July	77	90	90	90	90
August	63	70	70	70	70
September	63	63	70	70	70

Note: In months with more than one minimum streamflow, SMUD would maintain each minimum streamflow listed for 1 week prior to reducing to the next minimum streamflow for the month. Minimum streamflow would be measured at USGS gage 11443500, located approximately 500 feet upstream from Iowa Canyon Creek.

[a] Or maximum capacity of the valve, whichever is less.

Table 3-49. Proposed minimum streamflow (cfs) schedule for SFAR below Slab Creek dam, years 4 through term of license. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October–February	63	63	70	80	90
March	63	101	110-130-150-180	110-130-150-180	110-130-150-180
April	100	110-130-150-183	222-236-247-263	222-236-247-263	222-236-247-263
May	109	164-145-126-107	272-286-297-303	272-316-367-395[a]	272-337-387-415[a]
June	90	90	255-210-165-120	324-256-188-120	352-274-197-120
July	77	90	90	90	90
August	63	70	70	70	70
September	63	63	70	70	70

Note: In months with more than one minimum streamflow, SMUD would maintain each minimum streamflow listed for 1 week prior to reducing to the next minimum streamflow for the month. Minimum streamflow would be measured at USGS gage 11443500, located approximately 500 feet upstream from Iowa Canyon Creek.

[a] Or maximum capacity of the valve, whichever is less.

Rainbow trout spawning in the reach occurs in pocket gravels, pool-tail crests and small lateral bar areas that increase in availability and area with higher flows. Results of licensee's WUA analysis of flows in this reach are presented in table 3-50 and figure 3-31. The proposed release schedule would increase releases from the dam during the all months. Increasing minimum streamflows would provide increase available rainbow trout WUA compared to the existing flow regime (figure 3-31). The WUA analysis predicted rainbow trout spawning habitat would increase as flow increases to a point where the flow inundates the entire channel and additional spawning habitat is not available

Table 3-50. Percent WUA for all water year types for rainbow trout for SFAR below Slab Creek dam. (CDFG, 2007)

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
October through February	CD	63	80	Adult rainbow trout
	Dry	63	80	Adult rainbow trout
	BN	70	83	Adult rainbow trout
	AN	80	89	Adult rainbow trout
	Wet	90	92	Adult rainbow trout

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
March	CD	63	80	Adult rainbow trout
	Dry	101	95	Adult rainbow trout
	BN	180	100	Adult rainbow trout
	AN	180	100	Adult rainbow trout
	Wet	180	100	Adult rainbow trout
April/May	CD	100–109	81–82	Rainbow trout spawning
(years 1–3)	Dry	107–183	81–82	Rainbow trout spawning
	BN	222–263	93–95	Rainbow trout spawning
	AN	222–263	93–95	Rainbow trout spawning
	Wet	222–263	93–95	Rainbow trout spawning
April/May	CD	100–109	81–82	Rainbow trout spawning
(years 3 through license term)	Dry	107–183	81–82	Rainbow trout spawning
	BN	263–303	95–96	Rainbow trout spawning
	AN	263–395	95	Rainbow trout spawning
	Wet	263–415	95	Rainbow trout spawning
June	CD	90	75	Rainbow trout spawning
(years 1 through 3)	Dry	90	75	Rainbow trout spawning
	BN	123–228	84–94	Rainbow trout spawning
	AN	123–228	84–94	Rainbow trout spawning
	Wet	123–228	84–94	Rainbow trout spawning
June	CD	90	75	Rainbow trout spawning
(years 3 through license term)	Dry	90	75	Rainbow trout spawning
	BN	120–255	84–92	Rainbow trout spawning
	AN	120–324	84–97	Rainbow trout spawning
	Wet	120–352	84–97	Rainbow trout spawning

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
July	CD	77	85/87	Rainbow trout juveniles / adults
	Dry	90	80/92	Rainbow trout juveniles / adults
	BN	90	80/92	Rainbow trout juveniles / adults
	AN	90	80/92	Rainbow trout juveniles / adults
	Wet	90	80/92	Rainbow trout juveniles / adults
August/September	CD	63	90/80	Rainbow trout juveniles / adults
	Dry	70	88/83	Rainbow trout juveniles / adults
	BN	70	88/83	Rainbow trout juveniles / adults
	AN	70	88/83	Rainbow trout juveniles / adults
	Wet	70	88/83	Rainbow trout juveniles / adults

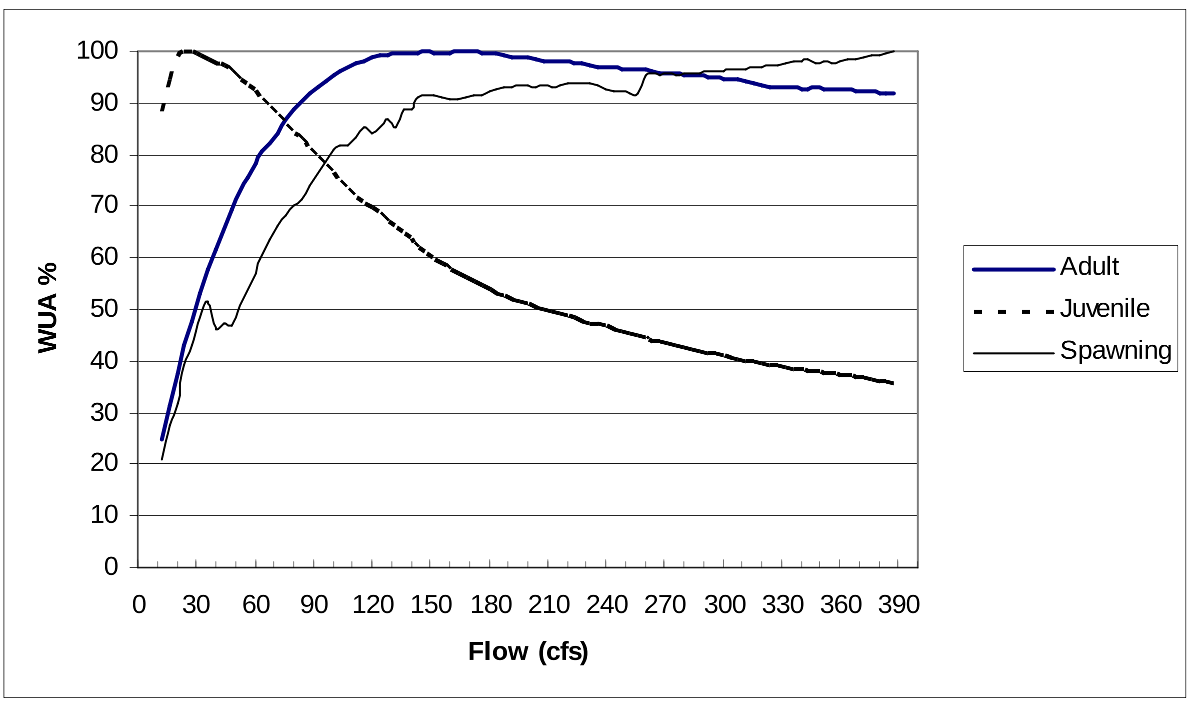

Figure 3-31. Rainbow trout WUA in the SFAR below Slab Creek dam. (Source: DTA and Stillwater Sciences, 2004b)

The proposed flow schedule would also restore to the reach a flow regime that more closely resemble a natural hydrograph, with increase in flows during the spring (March through June), and decreasing flows later in the year. This decline in the hydrograph during June is anticipated to serve as an important cue for hardhead spawning. Details on hardhead spawning are not yet fully understood, however they mainly spawn in spring, when the hydrograph is declining (Moyle, 2002) therefore the proposed flow regime may facilitate hardhead spawning in the reach.

Higher spring flows in BN, AN, and Wet years would redistribute spawning gravels to maintain trout habitat and transport some large woody debris downstream. Because approximately 75 percent of this reach is low gradient, large woody debris and spawning gravels should frequently settle into niche areas.

Modeling the proposed release flows indicates that mean daily temperatures are the lower end of the reach would be substantially reduced compared to existing conditions (section 3.3.2.1, *Water Resources*, *Water Quality*), extending downstream the range of temperatures preferred by rainbow trout. Mean daily temperatures would generally be 10 to 15ºC in May, 14 to 21ºC in June, 19 to 22 ºC in July, 17 to 21 ºC in August, and 13 to 19 ºC in September. While in years when temperatures above 20 ºC would be less optimal for rainbow trout, they would still support hardhead (optimal temperatures for hardhead appear to be 24 to 28ºC (Moyle, 2002).

South Fork of the American River below Chili Bar Dam

Flow fluctuations can affect aquatic resources in this reach by influencing the potential for fish stranding, causing changes to fish habitat, benthic macroinvertebrate populations, changing stream flow time-of-travel, and affecting fish access to and use of tributaries of the SFAR. This reach showed a low overall abundance of fish; however, low number of juvenile fish observed may not necessarily indicate spawning limitations in this reach. The sampling methods used (snorkeling) were appropriate to document the abundance of adult fish, but the snorkeling surveys may likely have underestimated the true abundance of juvenile fish present as juvenile fish are difficult to observe. The proposed minimum streamflow schedule is presented in table 3-51.

Table 3-51. Proposed minimum streamflow (cfs) schedule for SFAR below Chili Bar dam. (Source: SMUD and PG&E, 2007)

Month	**SD**	**CD**	**Dry**	**BN**	**AN**	**Wet**
September–October	150	185	200	250	250	250
November–March	150	185	200	200	200	250
April	150	200	250	250	300	350
May	150	200	250	250	350	500
June	200	200	250	250	350	500
July	150	185	200	250	300	350
August	150	185	200	250	300	300

Our Analysis

Fish abundance is low in this reach. The specific mechanisms causing low fish abundance are unclear but flow fluctuations above the typical base flow reduce the quantity of suitable habitat for all species and life stages studied. The flow fluctuations cause disturbance and subject fish to stresses that may limit feeding behavior, making it more difficult to forage for food during these daily high velocity events and increasing risks of stranding during rapid dewatering as flows decrease.

The current flow fluctuation regime in this reach does not appear to have significant effects on most metrics of the benthic macroinvertebrate community in the base flow channel, although overall benthic macroinvertebrate abundance appears to be low and benthic macroinvertebrates decrease in numbers in the flow fluctuation zone. In areas of the stream channel with periodic exposure to air due to flow fluctuations, total taxa richness, total insect taxa, total Ephemeroptera (mayfly), Plecoptera (stonefly), or Trichoptera (caddisfly) taxa, and individuals per square foot of benthic macroinvertebrates decrease as the period of time the substrate is exposed increases.

The Settlement Parties report the minimum streamflow regime would reduce the difference between daily high and low flows, and increase wetted perimeter. This would provide more stable and suitable habitat for benthic macroinvertebrate colonization and for fish, which will likely result in greater productivity in the reach. If the standing crop of benthic macroinvertebrate were increased, it would likely lead to a reduction in the energetic demands on foraging fish, and thereby support fish growth in the reach.

Ramping Rates

Significant rapid flow reductions in a stream channel have the potential to strand fish in areas of the channel that are relatively low-gradient, or where pockets or side channels exist in the river channel. Smaller juvenile fish (less than about 2 inches long) are most vulnerable to potential stranding due to weak swimming ability and preference for shallower, near-shore areas with slower velocities in a stream channel. Up-ramping flows generally do not affect fish stranding; however, the magnitude of flow change both upward and downward can affect fish behavior and habitat use, as well as affect production of benthic macroinvertebrates, which are an important source of food for most riverine fish species. Rapid changes in flow also can affect benthic macroinvertebrates, which become vulnerable to stranding and drift (leaving the substrate and floating downstream).

Proposed Article 1-3, *Ramping Rates*, specifies 1 foot per hour ramping rates for the following Project-controlled releases:

1. Pulse flows in Gerle Creek below Loon Lake dam and SFSC below Ice House dam.
2. Minimum streamflow releases in Silver Creek below Junction dam, Camino dam and the SFAR below Slab Creek dam.
3. Recreational streamflow releases in SFSC below Ice House dam, and the SFAR below Slab Creek dam.

For the SFAR below Chili Bar dam, the proposed ramping rates are shown in table 3-52.

Table 3-52. Proposed ramping rates for the SFAR below Chili Bar dam. (Source: SMUD and PG&E, 2007)

Ramp Up	Ramp Down
500 cfs per hour for flows between 150 and 1,000 cfs	1 foot per hour for flows between 1,000 and 1,950 cfs
1 foot per hour for flows between 1,000 and 1,950 cfs	500 cfs per hour for flows between 1,000 and 600 cfs
	250 cfs per hour for flows between 600 cfs and 150 cfs

Our Analysis

Implementation of controlled fluctuations in flows may result in dramatic changes over a short term to the wetted perimeter of stream channels. The magnitude and temporal progression of the change is a function of the stream channel morphology, and extent of flow fluctuation in the reach. Impacts associated with ramping are variable, depending on species, life-stage, and in some case, time of day of the ramping event. Limiting ramping rates would decrease the potential for such stranding to occur. The proposed 1 foot ramping rate is typical for other hydropower projects in the Sierras, and has a history of success (CDFG, 2007).

Studies conducted by SMUD and PG&E in the reach below Chili Bar dam indicated that fish stranding potential at most study sites peaked when flows decrease in the 400- to 200-cfs and 600- to 400-cfs ranges, with smaller peaks occurring in the 1,400- to 1,200-cfs and 800- to 600-cfs ranges. The Gorilla Rock study site was the primary site for stranding impacts at these lower flow ranges and the Camp Lotus site was affected largely by the flow fluctuations from 2,400 to 2,000 cfs and 400 to 200 cfs. The study concluded that base flows established at or above 600 cfs would minimize the impacts of stranding throughout the reach, and minimum flows of 400 cfs could significantly reduce losses.

Proposed minimum flows for most months of the Wet and AN water year types are high enough to moderate rates of stranding, and monthly base flows for all other water year types should provide an improvement over the existing rate of stranding (CDFG, 2007). Adherence to the proposed ramping rates will reduce the effects of flow fluctuations on sensitive aquatic species that are vulnerable to sudden changes in flow.

Pulse Flows

In an unregulated system, periodic peak flows serve to improve channel conditions by shaping and maintaining depositional features, transporting sediments, and moving large woody debris, all important elements in maintaining well-functioning habitat for aquatic resources. Under natural conditions, periodic high flows would move sediments through the river system. Based on geomorphology studies, SMUD and the Agencies identified three reaches that would benefit from periodic pulse flows: Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam (see section 3.3.1.2, *Geology and Soils*, for a description of pulse flows under Proposed Article 1-2, *Pulse Flows*).

Our Analysis

The addition of pulse flows in these three reaches would simulate peak flows that would occur naturally. Such flows help reduce riparian vegetation that is encroaching in the channels, which would benefit fish and other aquatic species. Pulse flows also serve to sort and clean spawning gravel, increase depth of pools by scour, and form exposed bar features, which are important components of healthy aquatic ecosystems.

In the SFSC below Ice House dam reach, the flushing flows would scour the finer sediments in areas where sediment supply has exceeded transport capacity, which in turn would restore the channel condition that existed before the deposition of fines from the Cleveland Fire. In all reaches where pulse flows are proposed, the channel bed would continue to be mobilized more frequently, so that future events that affect the channel substrate could be flushed in a more natural period of time. This would help improve instream habitat for fish and facilitate increased production towards the desired biomass goals.

Monitoring and Adaptive Management Program

In order to assess the effects of ongoing Project operations under the terms of the new license, SMUD and PG&E would develop and implement monitoring plans in consultation with the Agencies. Results of the monitoring would be used to determine the need for measures described in Proposed Articles 1-6 and 2-5, *Adaptive Management Program*.

Fish monitoring methods include repeating electrofishing and/or snorkeling surveys (as conducted in 2002–2003 by the licensee) during late summer/fall for brown trout in the Gerle Creek below Loon Lake dam reach only, and hardhead sampling in SFAR below Slab Creek dam reach only.

Rainbow trout would be monitored in the Rubicon River below Rubicon dam, Little Rubicon River below Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle Creek dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam. Brush Creek below Brush Creek dam would be surveyed once every 10 years after license issuance. Hardhead snorkeling would be conducted in the SFAR below Slab Creek dam from immediately downstream of Mosquito Road Bridge to and including site SCD-F2.

Electrofishing and/or snorkeling for rainbow and brown trout would be conducted in the SFAR at two stations. Hardhead detected would be noted.

The frequency of fish monitoring actions would be as follows:

- Rainbow trout and brown trout: Years 5, 6, 10, 11, 15, 16, and thereafter for 2 consecutive years during every 10 years for the term of the license.
- Hardhead: Years 2, 3, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 10 years for the term of the license.

The proposed adaptive management monitoring program calls for an examination of whether fish are being entrained in the Robbs Peak powerhouse during downstream migration. If so, the measure calls for the licensee to implement appropriate adaptive management measures as approved by the agencies.

SMUD and PG&E would develop and implement an aquatic macroinvertebrate monitoring plan in consultation with the Agencies. Monitoring would include sites in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam (impaired reach), SFRR below Robbs Peak dam, SFSC below Ice House dam (impaired reach), Silver Creek below Junction dam, Silver Creek below Camino dam, the SFAR below Slab Creek dam, and the SFAR below Chili Bar dam (see figures 3-17 through 3-20). Reference streams that were sampled as part of the macroinvertebrate monitoring program during the relicensing would be incorporated into the monitoring program if the Agencies determine they are necessary.

Our Analysis

SMUD and PG&E have conducted extensive sampling of aquatic resources in the Project area, and the resources agencies have developed objectives and goals for instream resources for each reach affected by Project operations (see table 3-35). The Proposed Action includes measures intended to improve habitat conditions and increase biomass of desired populations of fish, amphibians, and invertebrates in the Project area. In the case of minimum flow releases, for example, the post-license hydrograph in many reaches would change. Monitoring the response of instream resources to the new measures over the term of the license would provide information that can be used to inform resource managers whether or not the stated goals are being met.

Analysis of monitoring results would allow the parties to determine any need to modify proposed measures. Decisions based on monitoring results, new scientific information, or new technologies would aid in the achievement, or modification where appropriate, of goals and objectives established during the Settlement Agreement process.

Currently there is little evidence that fish are being entrained at the Robbs Peak powerhouse. Studies performed by the licensee showed that the population of rainbow trout in the SFFR upstream of the powerhouse is naturally limited by intermittent summer flow, sub-optimal water temperatures, and unfavorable winter conditions (DTA and Stillwater Sciences, 2005g). Fish that transit the Gerle Canal from Gerle reservoir may also become entrained in the powerhouse. However, the canal provides very little suitable habitat for trout; during a canal maintenance drawdown conducted in October, 2004, only 97 California roach, 41 brown trout, and 3 rainbow trout were captured in the 1.9-mile-long canal (DTA and Stillwater Sciences, 2005g). While studies performed during relicensing show that the potential for fish to become entrained at Robbs Peak powerhouse is extremely low, the adaptive management program nevertheless calls for development of mitigation measures should monitoring indicate fish are being entrained there. The development of mitigation to minimize any entrainment at Robbs Peak afterbay through the adaptive management program would likely protect the few native trout currently in the SFRR, where populations appear to be declining.

Large Woody Debris

Large woody debris is an important component of a healthy stream ecosystem. Large trees and snags that fall into streams play an important role in forming pools, metering sediment, trapping spawning gravels, and creating a more complex stream environment. Heavier pieces require higher flows for mobilization, and longer pieces are more likely to be caught by the stream bank and its vegetation. The presence of dams can interfere with downstream movement of large woody debris.

Under Proposed Articles 1-9 and 2-7, *Large Woody Debris*, SMUD and PG&E would ensure that, provided conditions permit safe and reasonable access and working conditions, mobile instream large woody debris continues downstream beyond Robbs dam, Junction dam, Camino dam, Slab Creek dam, and Chili Bar dam. At a minimum, all sizes greater than both 20 centimeters wide and 12 meters long would be allowed to continue downstream beyond the dams. Smaller sizes would be allowed but would not be required to be moved beyond these dams.

Our Analysis

Currently SMUD removes woody debris at each of the Project reservoirs prior to July 15 of each year. SMUD reports that this is a necessary procedure due to concerns over boating safety and the eventual sinking of the material and resultant clogging of intake structures or low-level outlets. The removed woody debris is stockpiled in various locations within the Project boundary and eventually burned.

Transporting woody debris that collects in the UARP and Chili Bar Project reservoirs to the natural stream downriver will result in an enhancement of aquatic resource habitat and populations in each of the Project reaches included in the plan.

Iowa Hill Development

The proposed Iowa Hill development may affect aquatic resources in Slab Creek reservoir if operation or construction alters fish habitat by affecting water quality (turbidity or temperature) or physically changing the shoreline habitat used for rearing or spawning through water level fluctuations, or if fish become entrained in the intakes.

Slab Creek reservoir historically supported three species of fish that potentially spawn in reservoirs: kokanee salmon, speckled dace, and smallmouth bass. Kokanee salmon and smallmouth bass would have been introduced and recent surveys have not documented their persistence in the reservoir. Kokanee salmon and speckled dace typically spawn in tributary streams and would not be affected by fluctuation in reservoir levels associated with the Proposed Action. The reservoir contains a very small amount of spawning habitat for these species.

Five fish species historically documented in Slab Creek reservoir could potentially rear in the reservoir: Sacramento sucker, smallmouth bass, hardhead, Sacramento pikeminnow, and kokanee salmon. Juvenile pikeminnow, hardhead, and suckers are known to rear in the SFAR upstream of Slab Creek reservoir. Juvenile suckers would find little rearing habitat within the reservoir due to the lack of emergent vegetation. Smallmouth bass may find some habitat in Slab Creek reservoir for rearing, since the upper sections of the reservoir contain moderately shallow edges along with some woody debris, although the species is not currently documented there. Habitat for smallmouth bass may be restricted due to cool water temperatures and the high velocity of the water flowing through this section that makes the habitat unsuitable. Kokanee salmon would be expected to find rearing habitat in Slab Creek reservoir, although the species is not currently documented there. Hardhead are known to inhabit Slab Creek reservoir.

Studies conducted to document fish abundance and distribution in the reservoir show hardhead and Sacramento sucker were the most common, and were observed throughout the reservoir. The highest frequency of occurrence for hardhead was along the shorelines. In spring months, the concentration of hardhead appears to be much higher in the upstream segments of the reservoir. In summer, hardhead shift in distribution to the lower end of the reservoir, with the highest concentrations occurring along the shoreline. In the pelagic (open water) zone, hardhead numbers decrease with depth, with the lowest hardhead numbers occurring at the 100 foot depth. Surveys were not conducted in water deeper than 100 feet.

Spawning and rearing habitat for hardhead occurs primarily in streams (Moyle, 2002). While juvenile hardhead are known to rear upstream of Slab Creek reservoir in the SFAR, they also rear in the reservoir since they can utilize woody debris or other larger cover objects that occur in the reservoir in place of vegetation. This was confirmed by the capture of juvenile hardhead along the margins of Slab Creek reservoir. However, even though the reservoir contains their preferred warm-water environment (primarily downstream from the inlet of the SFAR) with large cobble and boulder substrate, it is missing the preferred habitat characteristics of shallow water and densely vegetated shorelines (Moyle, 2002), thus rearing habitat is limited.

Under Proposed Article 1-40, *Aquatic Resources*, SMUD would:

1. For 2 years prior to and 2 years after the Iowa Hill development begins to operate, monitor hardhead during all four seasons of the year to establish the locations of all life stages in Slab Creek reservoir (including edgewater locations) and in the water fluctuation zone upstream on SFAR above and below the Iowa Hill development.
2. Monitor edgewater temperatures of Slab Creek reservoir between May and September in locations approved by the Agencies to demonstrate that pump discharge is not affecting hardhead distribution by reducing temperatures in shallow water areas of the Slab Creek reservoir.
3. Ensure the operation of Iowa Hill would not further reduce water temperature below 12°C during the months of June (after the descending limb of the hydrograph), July, and August in the Slab Creek dam reach below Mosquito Bridge.
4. Ensure that flow fluctuations in the SFAR below Slab Creek dam do not occur as a result of the Iowa Hill development, with the exception of flow fluctuations that occur as a result of specific requirements of the license (recreational streamflows).
5. Monitor hardhead using a method approved by the Agencies to determine whether entrainment is occurring as a result of the Iowa Hill development. If entrainment is occurring, the Agencies reserve the right to establish appropriate mitigation measures.

Our Analysis

Historically, the Slab Creek reservoir elevation levels remained fairly constant with a minimal average daily fluctuation of 3.3 feet (DTA and Stillwater Sciences, 2005b). Under the proposed Iowa Hill development project operations, water elevations in the reservoir would increase then decrease 9 to15 feet (maximum of 30 feet) on a daily basis (DTA and Stillwater Sciences, 2005b). This change in water levels at the upstream end of the reservoir could affect fish passage at Brush Creek and Slab Creek by limiting connectivity to those coldwater streams when temperatures in the reservoir are not optimal for trout, or by making habitat unsuitable that was previously used for trout spawning. Although operation of the Iowa Hill development would increase the daily range of fluctuation and the rate of drawdown, it would not change the current weekly range of water surface fluctuation in Slab Creek reservoir (i.e., between 1,810 and 1,850 feet).

As discussed in section 3.3.1.2, *Geology and Soils*, the daily drawdown of the reservoir would mobilize a small amount of sediment in the upstream portion of Slab Creek reservoir, but neither high turbidity nor chronic erosion of sediments in the vicinity of the intake/outlet structure would occur in Slab Creek reservoir. The minor increase in turbidity that would occur at the beginning of operations would not likely affect any fish in the vicinity of the intakes. Shoreline in the reservoir is predominately steep bedrock, boulder and cobble, and not likely to experience significant erosion associated with the increased frequency of reservoir fluctuations. Because the operation of the Iowa Hill development would have a less-than-significant effect on turbidity and sedimentation in Slab Creek reservoir, and no effect on shoreline erosion, its operation would not affect the abundance and composition of near-shore habitat for fishes in the reservoir.

Water temperature modeling results show that operation of the Iowa Hill development would not significantly alter the thermal regime of Slab Creek reservoir or the SFAR (section 3.3.3.2, *Water Quality*); therefore, there would likely be no effects on fishery resources and hardhead due to changes in reservoir water temperatures or for about 4.3 miles of the downstream reach

Trout is a management indicator species (MIS) for the Eldorado National Forest. An MIS analysis was completed for the Iowa Hill development (Williams, 2007a). Trout adults and juvenile life stages could be affected by the Iowa Hill development as a result of the daily pumping of stored water. The proposed Iowa Hill development would have the potential to entrain trout and other fish that may be in the vicinity of the intakes. The base of the multi-port intake/outlet facility in the reservoir would be located at an elevation of approximately 1,770 feet. Although not specifically described in SMUD's filings with the Commission, it appears that the top of the intake structure would be at approximately 1,785 feet. SMUD states that the typical weekly fluctuation of Slab Creek reservoir would be between 1,820 feet and 1,850 feet. Historical records show that the reservoir elevation has dropped down to 1,820 feet and even down to 1,810 feet during 1998 and 1999, and 1,807 feet in 2005. Therefore, the depth of water above the Iowa Hill intake structure would normally fluctuate between 50 and 80 feet, although during low flow years it could be 35 feet or less. Trout were found only at the 10- to 25-foot depths, and hardhead were primarily found at depths of 50 feet or less (DTA and Stillwater Sciences, 2005b). This suggests that entrainment of trout into the intake would be minimal, since most of the fish are at shallower depths and/or near the reservoir margins.

The highest frequency of occurrence of hardhead was along the shoreline, and juvenile hardhead are not expected to occur at the depth of the intake. Because hardhead exist at depths of 35 feet, the depth at which the intake structure could be located during the pumping phase, there is the potential that hardhead may be entrained during the pumping phase. Also, because hardhead can exist even below 35 feet, though in reduced numbers, there is the potential that hardhead may be entrained when the water depth above the intake structure is deeper than 35 feet. Depending on the operations, the potential for entrainment could have substantial effects on the hardhead population within Slab Creek reservoir.

It is unknown whether hardhead upstream from the reservoir would move into the reservoir and be entrained. Monitoring using fish tagging may be able to determine this. SMUD's proposal to monitor hardhead distribution and whether entrainment of these fish (or others) occurs as a result of the Iowa Hill development would document whether this expectation is borne out. If entrainment is found to occur, the reservation of the right of the Agencies to establish appropriate mitigation measures would be expected to address entrainment mortality.

Based on the above information, we find that Project-level habitat effects would likely contribute to a stable forest-wide habitat trend for trout (Williams, 2007a).

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. Minimum flows, pulse flows, ramping rates, monitoring and adaptive management programs, and large wood debris management would remain the same as described under SMUD's Proposal. As a result, the effects of the UARP-only Alternative on fish populations and macroinvertebrates would be the same as those described under the Proposed Action, except that the effects associated specifically with the Iowa Hill development would not occur.

3.3.3.3 Unavoidable Adverse Effects

None.

3.3.4 Terrestrial Resources

3.3.4.1 Affected Environment

Vegetation

The UARP area encompasses a mosaic of forests, shrublands, grasslands, wetlands, agriculture, and other vegetation cover types within parts of the Central Valley, Sierra Nevada Foothills, and Sierra Nevada Highlands floristic regions. Undeveloped lands support vegetation typical of these regions: coniferous forests in theSierra Nevada Highlands and upper Sierra Nevada Foothills floristic regions, and grasslands and oak woodlands in the Central Valley and lower Sierra Nevada Foothills regions.

Upland Vegetation

Twenty-nine vegetation alliances are found in the Project area, including 16 forested and nine shrubland alliances. Upland vegetation generally reflects the topographic and precipitation patterns of the area. Uplands surrounding the Rubicon and Loon Lake reservoirs are dominated by broad expanses of high-elevation evergreen shrubs such as huckleberry oak interspersed with granitic outcrops devoid of vegetation and sparse tree cover. Coniferous forests are the dominant upland vegetation type beginning just below Loon Lake reservoir and continuing west past the Slab Creek reservoir area, including the lands surrounding the Gerle Creek, Union Valley, Ice House, Junction, Camino, and Brush Creek reservoirs and their associated reaches. White fir, red fir, and Jeffrey pine are common dominants near Ice House and Gerle Creek reservoirs, giving way to Douglas-fir, ponderosa pine, and California black oak at lower elevations.

UARP transmission line corridors that traverse coniferous forests are subject to large tree removal, which results in the corridors having a mixed chaparral habitat dominated by shrubs such as mountain whitethorn, wedgeleaf ceanothus, bitter cherry, and greenleaf manzanita. At the lower elevations west of White Rock powerhouse, however, chaparral becomes a common habitat across the landscape. Typical species in chaparral habitats of the Project vicinity include whiteleaf manzanita, hoary coffeeberry, deerbrush, and western poison oak.

Upland vegetation at the Iowa Hill development was identified and mapped by SMUD in 2003 as part of a focused relicensing study. Mapped sites included proposed locations of the upper reservoir and berm, intake structure, transportation and construction access routes, temporary spoils sites, laydown areas, and a preliminary transmission line route (the precise alignment of the transmission line had not yet been established by engineering field surveys). Nearly 520 acres were mapped into five different types using the California Wildlife Habitat Relationships classification system. The following vegetation types were identified: Sierran Mixed Conifer (397.2 acres), Ponderosa Pine (93.2 acres), Mixed Chaparral (15.2 acres), Montane Hardwood (12.1 acres), and Barren (0.9 acre). Habitat types were further subdivided based on size class and canopy coverage. Most of the study area was mature mixed-conifer with dense (>60 percent) canopy closure (390.8 acres, 75.4 percent). These stands were dominated by Douglas-fir, with black oak subdominant, and ponderosa pine, sugar pine, canyon live oak, and incense cedar as common associates. Stands that had been selectively logged predominantly comprised ponderosa pine, with fewer Douglas-fir; these stands were classified as Ponderosa Pine habitat type. Montane Hardwood dominated by canyon live oak occurs on the steep, west-facing slope above Slab Creek reservoir, and patches of Mixed Chaparral dominated by whiteleaf manzanita also occur. A small, partially eroded area near the edge of Slab Creek reservoir was characterized as Barren.

The Chili Bar Project area is located on the steep slopes along the SFAR. Overall, much of the Chili Bar Project area is composed of cismontane woodlands and lower montane coniferous forests. Dominant canopy species along south-facing slopes include interior live oak, black oak, California buckeye, ponderosa pine, and gray pine. Douglas fir and white fir dominate many of the north-facing slopes. Much of the understory is dominated by poison oak, scotch broom, California wild grape, and Himalayan blackberry.

Special-Status Plants

Fifteen special-status plants are found in the UARP area (table 3-53). Special-status plants are not uniformly distributed; rather, a few key habitats support most occurrences. Chief among these is the gabbro chaparral near Pine Hill, in the westernmost section of the Project area. Three federally listed species, Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannelbush (*Fremontodendron decumbens)*, and Layne's ragwort (*Senecio layneae*) occur within the Pine Hill area and discussed in section 3.3.5, *Threatened and Endangered Species*.

Table 3-53. Summary of special-status plant occurrences documented in the UARP area in 2000 and 2003. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Allium jepsonii Jepson's onion	Fed: none CA: none CNPS: 1B ENF: none	1 occurrence. Serpentine outcrop in Greenstone Country subdivision
Bolandra californica Sierra bolandra	Fed: none CA: none CNPS: 4 ENF: W	1 occurrence. Forest near Camino reservoir
Calochortus clavatus var. *Avius* Pleasant Valley mariposa lily	Fed: none CA: none CNPS: 1B ENF: S	3 occurrences. Chaparral and *Quercus chrysolepis* forest near Junction and Camino reservoirs
Ceanothus roderickii Pine Hill ceanothus	Fed: E CA: R CNPS: 1B ENF: none	1 occurrence. Transmission line corridor near Pine Hill

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Chlorogalum grandiflorum Red Hills soaproot	Fed: none CA: none CNPS: 1B ENF: W	3 occurrences. Transmission line corridor near Pine Hill and Independence Point
Clarkia biloba ssp. *Brandegeeae* Brandegee's clarkia	Fed: none CA: none CNPS: 1B ENF: none	1 occurrence. Roadcut along Slab Creek reservoir access road
Drosera rotundifolia Round-leaved sundew	Fed: none CA: none CNPS: none ENF: W	3 occurrences. Seepage area south of Ice House Dam, Silver Creek, and a wetland at Union Valley reservoir
Fremontodendron decumbens Pine Hill flannelbush	Fed: E CA: R CNPS: 1B ENF: none	4 occurrences. Transmission line corridor near Pine Hill
Navarretia prolifera ssp. *Lutea* Yellow bur navarettia	Fed: none CA: none CNPS: 4 ENF: S	4 occurrences. Transmission line corridor between Iowa Hill and Badger Hill
Phacelia stebbinsii Stebbins' phacelia	Fed: none CA: none CNPS: 1B ENF: S	Numerous occurrences. Three general localities in chaparral and rock outcrops near Camino and Junction reservoirs
Phacelia vallicola Mariposa phacelia	Fed: none CA: none CNPS: none ENF: W	1 occurrence. Rock outcrops near Camino reservoir
Senecio layneae Layne's ragwort	Fed: T CA: R CNPS: 1B ENF: S	2 occurrences. Transmission line corridor near Pine Hill

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Taxus brevifolia Pacific yew	Fed: none CA: none CNPS: none ENF: W	4 occurrences. Transmission line corridor southeast of Slab Creek reservoir; mouth of Brush Creek at Brush Creek reservoir
Viola tomentosa wooly violet	Fed: none CA: none CNPS: 1B ENF: W	10 occurrences. Campgrounds at Union Valley and Gerle Creek reservoirs, transmission line corridor west and southwest of Loon Lake reservoir
*Wyethia reticulata*El Dorado County mule ears	Fed: none CA: none CNPS: 1B ENF: none	2 occurrences. Transmission line corridor near Pine Hill

[a] Status listings definitions are as follows:

Federal:

E = listed as endangered under the Endangered Species Act.

T = listed as threatened under ESA.

California (CA):

R = state listed rare plant.

California Native Plant Society (CNPS):

1B = plants considered to be rare, threatened, or endangered in California and elsewhere.

2 = plants considered to be rare, threatened or endangered in California, but more common elsewhere.

3 = plants about which more information is needed – a review list.

4 = plants of limited distribution – a watch list.

Eldorado National Forest (ENF):

S = sensitive plants. Plants known to occur or that have the potential to occur on National Forest Lands that are considered valid candidates for federal threatened or endangered classification under the ESA.

W = a watch list of plants that do not meet all the criteria to be included on the Regional Forester's Sensitive List, but are of sufficient concern that they need to be considered in the planning process.

A serpentine-soil outcrop in the western half of the UARP supports the only known occurrence of Jepson's onion (*Allium jepsonii*) in El Dorado County. Key habitats elsewhere in the Project area include rock outcrops, roadcuts, and chaparral near UARP reservoirs and facilities, which support occurrences of Stebbins' phacelia (*Phacelia stebbinsii*), mariposa phacelia (*Phacelia vallicola*), Sierra bolandra (*Bolandra californica*), and Pleasant Valley mariposa lily *(Calochortus clavatus* var. *avius*). Round-leaved sundew (*Drosera rotundifolia*) occurs in small wetlands immediately below Ice House dam and nearby Silver Creek, and in a meadow adjacent to Union Valley reservoir. Only Pacific yew (*Taxus brevifolia*) and woolly violet (*Viola tomentosa*) are found in the forested habitats most common in the UARP area, and these occur in riparian zones and granitic gravel and duff, respectively.

No sensitive plant species are known or expected to occur within the Iowa Hill development area. No special-status plant species were observed within the Chili Bar Project boundary during 2004 special-status plant surveys. Potentially suitable habitat was found for five special-status species: Big-scale balsamroot (*Balsamorhiza macrolepis* var. macrolepis), Brandegee's clarkia (*Clarkia bibloa* ssp. *brandegeeae*), Butte County fritillary (*Fritillaria eastwoodiae*), Stebbin's phacelia (*Phacelia stebbinsii*), and oval-leaved viburnum (*Viburnum ellipitcum*).

Noxious and Invasive Weeds

The Noxious and Invasive Weeds Study conducted by UARP in 2000, 2003, and 2004 identified 10 species within the UARP area (table 3-54). Noxious and invasive weeds are concentrated in the western part of the Project area (primarily in the lower transmission line corridor west of White Rock powerhouse), and are especially prevalent near development, along roadsides, in agricultural fields, and in annual grassland and oak woodland habitats. In this western area, dominance by yellow starthistle or medusahead is uniformly associated with disturbed habitats, and roadsides are commonly infested with rush skeleton weed. Few weeds occur in the forested habitats found in the eastern parts of the Project area, even where transmission line clearing has resulted in bare soil and sparsely vegetated areas. Burned areas along the Jones Fork-Union Valley transmission line are a notable exception, supporting strong infestations of cheatgrass and ripgut grass.

Five weeds are found in close association with UARP facilities. Yellow starthistle occurs near White Rock access roads and powerhouse, Slab Creek access roads and dam areas, Camino reservoir access road and Jaybird powerhouse, and Union Valley campgrounds. Scotch broom occurs near White Rock powerhouse access roads, adit, and penstock. Goatgrass is found near Slab Creek reservoir access roads and Camino reservoir access road. Italian thistle occurs near White Rock powerhouse and access roads, Slab Creek access roads and reservoir, Brush Creek reservoir access road, and Camino reservoir access road. Rush skeleton weed is found near Camino reservoir access road.

Table 3-54. Noxious weeds located during 2000, 2003 and 2004 survey efforts. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Scientific Name Common Name	Distribution in Study Area
Aegilops triuncialis Goatgrass	Uncommon to occasional in annual grasslands and along roadsides. Western and southwestern sections of the study area
Carduus pycnocephalus Italian thistle	Uncommon to occasional in annual grasslands. Western section of the study area
Centaurea solstitialis Yellow starthistle	Common to dominant in physically disturbed areas, especially roadsides and developed areas. Western and southwestern sections of the study area.
Chondrilla juncea Rush skeleton weed	Occasional along roadsides or in developed areas. Western and southwestern sections of the study area
Cytisus scoparius Scotch broom	Occasional along roadsides and in transmission line corridor. Southwestern and upper western sections of the study area
Genista monspessulana French broom	Occasional along roadsides and in transmission line corridor. Southwestern and upper western sections of the study area
Lythrum salicaria Purple loosestrife	One occurrence in wetland/creek. Far western section of the study area
Bromus tectorum cheatgrass	Occasional in annual grasslands and along roadsides; common in burned areas under transmission line. All sections of the study area
Bromus diandrus Ripgut grass	Occasional to dominant in annual grasslands, less often on roadsides; common in burned areas under transmission line. West, southwest, southeast sections of the study area
Taeniatherum caput-medusae Medusahead	Occasional to common in annual grasslands; dominant where physically disturbed. Western section of the study area

Four noxious weed species were documented on the site of the proposed Iowa Hill development: ripgut grass, cheatgrass, Italian thistle, and rush skeleton weed. These weeds are uncommon and concentrated in areas of disturbance such as along roads and in clear-cuts.

PG&E identified eight species of noxious weeds within the Chili Bar Project area: barbed goatgrass, Italian thistle, yellow starthistle, rush skeletonweed, Scotch broom, klamathweed, Himalayan blackberry, and medusahead. Scotch broom dominated significant portions within the Project area including the reservoir shorelines and roadsides. Smaller populations of other noxious weeds, including barbed goatgrass, Italian thistle, yellow starthisle, rush skeletonweed, klamathweed, and medusahead were observed and mapped throughout the Project area. In addition, Himalayan blackberry, a non-target, invasive weed, was observed throughout the Project area, dominating portions of the riparian understory and other adjacent areas.

Riparian Vegetation

The applicants conducted an overlapping study for both Projects to identify riparian vegetation within both Project boundaries and along Project-affected stream reaches. About 360 acres of riparian vegetation are found in the UARP boundary, mostly in the form of a narrow fringe on the edge of the stream channel. Riparian vegetation is sparse or absent in sub-reaches characterized by bedrock or boulder banks, but generally occurs elsewhere, wherever there are suitable substrates. Nine riparian vegetation alliances are found; however, three are predominant: Mountain Alder, White Alder, and Mixed Riparian Hardwoods. Riparian vegetation alliances follow predictable patterns based on elevation (table 3-55), with composition similar to that reported elsewhere for North and Central Sierra Nevada riparian systems.

At most sites where riparian vegetation is found, there is evidence of periodic regeneration of woody vegetation, based on moderate to high numbers of seedlings and saplings, and the presence of relatively young mature shrubs. However, more stable conditions and only infrequent replacement may occur at the Robbs Peak dam reach site (less than 0.5 mile downstream of dam) and the uppermost Ice House dam reach site (about 1.5 miles downstream of the dam), where there are dense, mature shrubs and few seedlings or saplings.

Channel encroachment by woody species is generally not evident. However, at the Robbs Peak dam reach site, dense woody vegetation has colonized alluvial bars on both sides of the stream, suggesting an absence of recent high flows capable of scouring vegetation. In the Loon Lake dam reach just below the dam, there is also limited encroachment by small mountain alder and lodgepole pine. The number of herbaceous species is highest in the upper reaches where the dominant species are strongly indicative of moist soil conditions.

The dominant vegetation alliances around Chili Bar reservoir are upland forests supporting ponderosa pine, Douglas fir, and canyon live oak. In general the occurrence of riparian vegetation along the reservoir is constrained by steep slopes and well-drained substrates. Some small areas of riparian-influenced (but often upland) vegetation do occur, most often as patches or thin bands of relatively modest gradient. The riparian habitats are dominated by tree and shrub-sized shining willow, California sycamore, Freemont cottonwood, and white alder, with lesser coverage of black walnut, tree-of-heaven, and occasional upland species such as black oak.

The reach of SFAR below Chili Bar dam extends 19.1 miles from the base of Chili Bar dam to the normal high water line of Folsom Lake, ranging in elevation from 960 feet to approximately 470 feet. The reach downstream of Chili Bar contains three geomorphic sub-reaches: the Georgia Sub-reach, the Coloma Sub-reach, and the Canyon Sub-reach. Of these only the Coloma Sub-reach is confined and line with poorly vegetated boulder/cobble complexes, areas that are geomorphically unable to sustain well-developed stands of riparian vegetation.

Table 3-55. The extent, type, and limitations of riparian vegetation along UARP reaches. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Project Reach	Length of Reach	Percent of Reach with Riparian Vegetation	Width of Riparian Vegetation Zone	Dominant Riparian Vegetation Alliance	Limiting Factors
Rubicon Dam	4.2	15.4	5–50 feet	Mountain alder	Bedrock and boulder banks extensive; some steep sections
Rockbound Dam	0.3	None detectable	Not applicable	Not applicable	Entirely bedrock banks and steep
Buck Island Dam	2.5	1.5	5–20 feet	Mountain alder	Bedrock banks extensive, mostly steep
Loon Lake Dam	8.5	94.7	5–200 feet	Mountain alder	About a third of reach is steep with bedrock, but much is lower gradient with alluvium or glacial till
Gerle Creek Dam	1.2	97.0	5–30 feet	Mountain alder	Small areas of bedrock and boulder banks
Robbs Peak Dam	5.9	43.2	5–65 feet	Mountain alder	Extensive areas of bedrock
Ice House Dam	11.5	81.5	5–80 feet	Mountain alder	Width of riparian zone limited by valley form
Junction Dam Reach	8.3	29.7	5–35 feet	White alder	Extensive areas of bedrock
SFAR	2.8	27.3	5–70 feet	White alder	Extensive bedrock confinement
Camino Dam	6.2	42.1	10–85 feet	White alder	Extensive bedrock banks and steep slopes
Brush Creek Dam	2.2	Not discernible	Unknown	Unknown	Very steep
Slab Creek Dam	8.0	83.2	10–85 feet	White alder	Relatively steep canyon limits width; areas of bedrock and boulder banks have scant vegetation

The near-channel species composition of areas that are vegetated is similar in each sub-reach. Overstory dominants are typically white alder, arroyo willow, or shining willow, most often 10 to 20 feet in height and fewer than 20 years old, based on increment bores. In the Coloma Sub-reach, but rarely elsewhere, Freemont cottonwood is well represented, either as large trees on high banks, or as occasional young saplings (few cottonwood of intermediate size occur anywhere on the reach downstream of Chili Bar). Overall, 62 percent of the shoreline of the reach downstream of Chili Bar supports riparian vegetation. A total of about 192 acres of riparian vegetation were mapped, 167.4 acres (87.3 percent of the total) of which were Mixed Riparian Hardwood. Other vegetation alliances mapped were Willow (11.7 acres), Fremont Cottonwood (6.5 acres), White Adler (5.8 acres), and Wet Meadow (0.4 acre).

Wetlands

The applicants conducted an overlapping study for both Projects to identify wetlands within both Project boundaries. Wetlands can be found near the three UARP storage reservoirs (Union Valley, Ice House, and Loon Lake), and at Gerle Creek, Buck Island, and Rubicon reservoirs (table 3-56). Most reservoir-associated wetlands are in good condition, dominated by native plant species with few or no weeds. Wetlands are located on shorelines and small lakeshore-basin meadows with only slight topographic relief at Rubicon, Buck Island, and Gerle Creek reservoirs. Vegetation comprises inflated sedge and a few other species.

Other wetlands within or adjacent to the Project areas are located along the UARP transmission lines, near the Gerle Canal, and adjacent to the Robbs Peak penstock. These include a very large (more than 10 acres) wetland complex at Robbs Valley behind a commercial campground, which includes emergent, shrubs, and forested components. The remaining wetlands are less than 0.25 acre in size. Some of these wetlands are proximate to, or intersected by, Project service access roads, and two appear to be created and maintained because the roads impede drainage.

No palustrine wetlands were found within the area of the proposed Iowa Hill development. Small drainages on the site are generally intermittently flooded and do not fall within the definition of riverine wetlands. At least one small drainage located along the proposed transmission line route is a seasonally flooded riverine wetland.

Although NWI wetland maps do not indicate any wetlands along the steep-sided Chili Bar reservoir, field investigations conducted in 2004 by PG&E documented occasional small herbaceous wetlands within the water fluctuation zone of Chili Bar reservoir. In general they are too small to map and exist as a thin (less than 7 feet wide), steep fringe of hydrophytes that is frequently submerged. According to NWI maps, a series of palustrine scrub-shrub and palustrine forested wetlands occurs along that reach downstream of Chili Bar, mostly within the Coloma Sub-reach. No palustrine emergent wetlands occur.

Table 3-56. The extent, type, and limitations of wetlands associated with UARP. (SMUD, 2005, PG&E, 2005, as modified by staff)

Reservoir	Area (acres)	Types	Limiting Factors
Rubicon	15.0	Lakeshore meadows	Wetlands mostly restricted to a few shallow coves and gradually sloping shorelines.
Buck Island	8.2	Lakeshore meadows	Wetlands mostly restricted to small areas of gradually sloping shorelines. Through most of the growing season water level varies by no more than 6 feet.
Loon Lake	37.9	Lakeshore meadows, and depressions within swales	Wetlands occur in shallow bays and associated with swales, but are absent in areas of bedrock and areas submerged for prolonged periods by deep water.
Gerle Creek	0.9	Lakeshore meadows	Wetlands occur in the relatively narrow fluctuation zone on a few gradually sloping shorelines.
Ice House	4.9	Lakeshore meadows	Wetlands scarce because of steep slopes and extensive areas of bedrock. Little or no supplemental hydrology.
Union Valley	140.0	Lakeshore meadows, and sloping meadows	Wetlands absent on steep slopes without supplemental hydrology (drainages) and in areas submerged for prolonged periods by deep water. Sloping wetlands all begin well above reservoir high water.

Wildlife

The UARP area comprises a mosaic of forests, shrublands, grasslands, wetlands, agriculture, and other vegetation cover types ranging in elevation from roughly 6,500 feet at Rubicon reservoir to less than 450 feet above sea level at Folsom Junction, the terminus of the UARP transmission line. These lands support a diverse terrestrial fauna with an estimated 337 terrestrial wildlife species known or believed to occur in the vicinity of the Project.

The proposed Iowa Hill development is located on the southeast slope of the Slab Creek reservoir, north of Iowa canyon. In 2003, SMUD conducted a focused study to map vegetation and characterize wildlife habitat at the site. SMUD identified and mapped nearly 520 acres of existing vegetation, with Sierran Mixed Conifer being predominant and with smaller amounts of Ponderosa Pine, Mixed Chaparral, and Montane Hardwood. Based on the type, size, and age-class of existing vegetation, SMUD used California Wildlife Habitat Relationship database software to predict the potential occurrence of 256 species of terrestrial vertebrates within or adjacent to the study area based on a low threshold of habitat suitability. Of the total, 209 species were primarily associated with Sierran Mixed Conifer or Ponderosa Pine forest, 26 were associated only with Mixed Chaparral, and 46 were associated with adjacent aquatic habitat found on Slab Creek reservoir, but not terrestrial habitats.

Reptiles and Amphibians

Twenty-three species of reptiles are known or believed to occur in the UARP area and 11 species were observed by biologists conducting relicensing studies during 2002–2005 including: western fence lizard, northern alligator lizard, gopher snake, western aquatic garter snake, and western rattlesnake. Eighteen amphibians and aquatic reptiles have the potential to occur in the vicinity of the UARP. Of these, four species—foothill yellow-legged frog, mountain yellow-legged frog, California red-legged frog, and western pond turtle—are special-status species.

Birds

An estimated 230 species of birds are known or believed to occur in the vicinity of the UARP. Biologists engaged in relicensing studies during 2002–2005 observed 150 of these species. Project reservoirs, streams, and shorelines provide potential foraging, resting, and breeding habitat for at least 50 species of waterbirds (i.e., loons, grebes, pelicans, cormorants, egrets, herons, geese, ducks, swans, rails, coots, shorebirds, and gulls). Of these, 36 species were observed during relicensing studies including: common loon, pied-billed grebe, eared grebe, American white pelican, great blue heron, Canada goose, wood duck, mallard, blue-winged teal, bufflehead, common merganser, ruddy duck, common moorhen, American coot, spotted sandpiper, and ring-billed gull.

The diverse vegetation types within the UARP area provide habitat for at least 29 species of raptors (i.e., vultures, hawks, eagles, falcons, owls). Of these, 18 species were observed in the Project area during 2002–2005 relicensing studies including: turkey vulture, osprey, white-tailed kite, bald eagle, northern goshawk, red-tailed hawk, American kestrel, barn owl, flammulated owl, great horned owl, and California spotted owl. In addition to waterbirds and raptors, the UARP area provides habitat for a diversity of upland game birds, pigeons and doves, swifts and hummingbirds, woodpeckers, passerines, and other avifauna.

The Chili Bar reservoir is in a steep canyon with no emergent wetland, herbaceous vegetation, or low shrub-land along the shoreline to serve as nesting habitat for waterfowl. There is no shallow-water wetland or upland grazing that would provide suitable foraging. A total of 5 species was observed during the boat surveys that were part of the bald eagle study: Canada goose, mallard, American wigeon, wood duck, and common merganser. None of these species was observed in large numbers.

Cavity Nesting Birds

Population status and trend were monitored by the breeding bird survey (BBS)[37] from 1966 to 2004 within the Sierra Nevada bioregion for four cavity nesting bird species: pileated woodpecker, red-breasted sapsucker, Williamson's sapsucker, and hairy woodpecker.

Pileated Woodpecker—The Sierra Nevada-wide BBS data classify pileated woodpecker as "possibly decreasing" (Siegel and DeSante, 1999), with a decrease of –1.8 percent (range –4.6 to 1 percent) per year in 21 routes. The Regional Credibility ranking is "Yellow," i.e., data with small sample size and low precision due to low abundance on routes.

Red-breasted Sapsucker—The Sierra Nevada-wide BBS data classify red-breasted sapsucker as "possibly decreasing" (Siegel and DeSante 1999), with a decrease of –3.18 percent (range –7.8 to 1.6 percent) per year in 24 routes. The Regional Credibility ranking is "Blue," i.e., data with larger sample size and at least moderate precision and moderate abundance on routes).

Williamson's Sapsucker—The Sierra Nevada-wide BBS data indicate an increase of 1.6 percent (range –12.8 to 15.9 percent) per year in 6 routes for Williamson's sapsucker. The Regional Credibility ranking is "Red," i.e., poor, due to small sample size. However, this trend is consistent with trends observed at the state and survey-wide scales.

Hairy Woodpecker—Sierra Nevada-wide BBS data classify hairy woodpecker as "definitely stable" (Siegel and DeSante, 1999), with a slight decrease of -0.1 percent (range –2.5 to 2.3 percent) per year in 624 routes. The Regional Credibility ranking is "Blue."

Mammals

An estimated 83 species of native and introduced terrestrial mammals are known or believed to occur in the UARP vicinity. Biologists engaged in relicensing studies during 2002–2005 observed 32 species. American marten, black bear, mountain lion,

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[37]The Breeding Bird Survey (BBS) is an annual, volunteer-based point count survey coordinated by the Biological Resources Division of the USGS and the Canadian Wildlife Service. The survey consists of a continent-wide array of roadside point count transects, or routes. Each route is 24.5 miles long, and comprises 50 point counts at 0.5-mile intervals. Expert volunteer observers conduct point counts once each year during the peak of the breeding season, recording numbers of every species detected within a quarter mile radius. BBS data provide the most extensive, long-term data set available on landbird population trends and are therefore tremendously valuable for conservation planning (Institute for Bird Populations, 2007).

and mule deer all occur within the Project area. In addition to bats, mesocarnivores, and large mammals, the UARP area provides habitat for a diversity of insectivores, rabbits and hares, chipmunks, tree squirrels, gophers, mice, weasels, skunks, and other mammalian species.

The Sierra Nevada provides roosting and foraging habitat for an estimated 17 species of bats. Bats can be found in all vegetation types and elevation zones present in the Project area, foraging extensively on insects taken in flight over aquatic and upland locations or gleaned from foliage. Suitable roosts vary by species and include a variety of natural (e.g., caves, trees, cliffs) and man-made (e.g., buildings, bridges, powerhouses, mines) structures. Five species of bats were captured around existing Project features: fringed myotis, Yuma myotis, California myotis, big brown bat, and Brazilian free-tailed bat.

Bat trapping and acoustic sampling was performed at the proposed Iowa Hill development in 2004. This effort resulted in the capture of two bat species, California myotis and big brown bat, and the acoustic detection of bats belonging to the 40 kHz Myotis group, which includes long-legged myotis, little brown bat, and small-footed myotis. Of these, only the long-legged myotis is a special-status species. Recorded sonograms also suggest the presence of either silver-haired bat or big brown bat, whose echolocation characteristics overlap, making exact species determination difficult.

During June and July of 2004, PG&E conducted bat surveys throughout the Chili Bar Project area. These surveys confirmed the presence of four bat species, Yuma myotis, big brown bat, silver-haired bat, and western pipestrelle and indicated the likely presence of two additional species, Mexican free-tailed bat and pallid bat within the Project area (see table 3-56). Of these, the Yuma myotis (*Myotis yumanensis*) is a special status bat species (a federal species of concern and a BLM sensitive species).

Special Status Wildlife

Eighty-eight of the wildlife species that may occur in the UARP and Chili Bar Project areas are special-status species (table 3-57). Two of these species, valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and California red-legged frog (*Rana aurora draytonii*), are federally listed species that are discussed in section 3.3.5, *Threatened and Endangered Species*. The western pond turtle (*Clemmys marmorata)* and Yuma myotis (*Myotis yumaensis)* are the only special status species located during relicensing studies conducted by PG&E within the Chili Bar Project boundary.

Bald Eagle—Bald eagles require habitat near large lakes, reservoirs, major rivers, or coastal areas that have adequate food, perching sites, and nesting or wintering habitat. Resident populations of suitably sized fish (>200 mm total length) are often required. In California, nest-sites are typically at or near the tops of ponderosa pines or sugar pines within 1 mile of key foraging habitat. Bald eagles tend to prefer secluded

Table 3-57. Special-status wildlife species known or with the potential to occur within the UARP and Chili Bar Project areas. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Common Name (*Scientific Name*)	**Status Designations**[a]
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT
California horned lizard (*Phrynosoma coronatum frontale*)	CSC, CP
Sage brush lizard (*Sceloperus graciolus)*	BLMS
Mountain yellow-legged frog (*Rana muscosa*)	FC, CSC, CP, FSS
California red-legged frog (*Rana aurora draytonii*)	FT, CSC, CP
Foothill yellow-legged frog (*Rana boylii*)[b]	CSC, CP, FSS
Western pond turtle (*Clemmys marmorata)*[b]	FSS, CSC, CP
Common loon (*Gavia immer*)[b]	CSC, MNBMC
American white pelican (*Pelecanus erythrorhynchos*)[b]	CSC
Double-crested cormorant (*Plalacrocorax auritus*) [b]	CSC
Great egret (*Ardea alba*)[b]	CDFS
Snowy egret (*Egretta thula*)	USBC
Great blue heron (*Ardea herodias*)[b]	CDFS
Black-crowned night heron (*Nyctiorax nycticorax)*	BLMS
Harlequin duck (*Histrionicus histrionicus*)	CSC, BLMS
Barrow's goldeneye (*Bucephala islandica*)	CSC
Osprey (*Pandion haliaetus*)[b]	CSC, CDFS
White-tailed kite (*Elanus leucurus*)[b]	FP, MNBMC
Bald eagle (*Haliaeetus leucocephalus*)[b]	FD, CE, MIS, FP, CDFS
Northern harrier (*Circus cyaneus*[b]	CSC
Sharp-shinned hawk (*Accipiter striatus*)[b]	CSC
Cooper's hawk (*Accipiter cooperi*)[b]	CSC
Northern goshawk (*Accipiter gentilis*)[b]	CSC, FSS, MIS, CDFS, MNBMC
Swainson's hawk (*Buteo swainsoni*)	CT, FSS, USBC, Audubon-Y

Common Name (*Scientific Name*)	Status Designations[a]
Ferruginous hawk (*Buteo regalis*)	CSC, MNBMC, BLMS, Audubon-Y
Golden eagle (*Aquila chrysaetos*)[b]	CSC, FP, BLMS, CDFS
Merlin (*Falco columbarius*)	CSC
American peregrine falcon (*Falco peregrinus anatum*)	FD, CE, FP, MNBMC, MIS, FSS, CDFS
Prairie falcon (*Falco mexicanus*)[b]	CSC
Mountain quail (*Oreortyx pictus*)[b]	MIS, Audubon-Y
Blue grouse (*Dendragapus obscurus*)[b]	Audubon-Y
Greater sandhill crane (*Grus canadensis tabida*)[b]	CT, FP, FSS
Mountain plover (*Charadrius montanus*)	CSC, MNBMC, USBC, Audubon-R
Long-billed curlew (*Numenius americanus*)	CSC, MNBMC, USBC, Audubon-R
California gull (*Larus californicus*)[b]	CSC
Black tern (*Chlidonias niger*)	CSC, MNBMC
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FC, CE, FSS, MNBMC
Band-tailed pigeon (*Columba fasciata*)[b]	Audubon-Y
Burrowing owl (*Athene cunicularia*)	CSC, BLMS, MNBMC
California spotted owl (*Strix occidentalis occidentalis*)[b]	CSC, FSS, MIS, MNBMC, BLMS, USBC, Audubon-R
Great gray owl (*Strix nebulosa*)	CE, FSS, CDFS
Flammulated owl (*Otus flammeolus*)[b]	Audubon-Y
Long-eared owl (*Asio otus*)	CSC
Short-eared owl (*Asio flammeus*)	CSC, MNBMC, USBC, Audubon-Y
Black swift (*Cypseloides niger*)	CSC, MNBMC, USBC, Audubon-Y
Vaux's swift (*Chaetura vauxi*)	CSC, MNBMC
White-throated swift (*Aeronautes saxatalis*)[b]	Audubon-Y
Rufous hummingbird (*Selasphorus rufus*)	MNBMC, Audubon-Y
Allen's hummingbird (*Selasphorus sasin*)	MNBMC, USBC, Audubon-Y
Calliope hummingbird (*Stellula calliope*)[b]	Audubon-Y
Lewis' woodpecker (*Melanerpes lewis*)[b]	USBC, MNBMC, Audubon-Y

Common Name (*Scientific Name*)	**Status Designations[a]**
Nuttal's woodpecker (*Picoides nuttallii*)[b]	Audubon-R
White-headed woodpecker (*Picoides alborlarvatus*)[b]	Audubon-Y
Red-breasted sapsucker (*Sphyrapicus rubber*)[b]	MNBMC
Williamson's sapsucker (*Sphyrapicus thyroides)*	BCC
Pileated woodpecker (*Dryocopus pileatus* [b]	MIS
Olive-sided flycatcher (*Contopus cooperi*)[b]	MNBMC, USBC, Audubon-Y
Little willow flycatcher (*Empidonax traillii brewsteri*)	CE, FSS, MIS, USBC, Audubon-Y
Pacific-slope flycatcher (*Empidonax difficilis*)[b]	MNBMC
Yellow-billed magpie (*Pica nuttalli*)[b]	Audubon-Y
Loggerhead shrike (*Lanius ludovicianus*)	CSC, MNBMC
Oak titmouse (*Baeolophus inornatus*)[b]	Audubon-Y
Wrentit (*Chamaea fasciata*)	Audubon-Y
California thrasher (*Toxostoma redivivum*)	Audubon-Y
California horned lark (*Eremophila alpestris actia*)[b]	CSC
Common yellowthroat (*Geothlypis trichas*)	CSC
Spotted towhee (*Pipilio maculates*)	CSC
Purple martin (*Progne subis*)	CSC
Bank swallow (*Riparia riparia*)	CT
Yellow warbler (*Dendroica petechia brewsteri*)	CSC
Hermit warbler (*Dendroica occidentalis*)[b]	Audubon-Y
Yellow-breasted chat (*Icteria virens*)	CSC, MNBMC
Tricolored blackbird (*Agelaius tricolor*)	CSC, MNBMC, USBC, BLMS, Audubon-Y
Lawrence's goldfinch (*Carduelis lawrencei*)	USBC, MNBMC, Audubon-R
Fringed Myotis (*Myotis thysanodes*)[b]	BLMS, WBWG
Yuma myotis (*Myotis yumaensis*)[b]	BLMS
Long-eared myotis (*Myotis evotis*)	BLMS
Long-legged myotis (*Myotis volans*)	BLMS, WBWG

Common Name (*Scientific Name*)	**Status Designations[a]**
Western small-footed myotis (*Myotis ciliolabrum*)	BLMS
Western red bat (*Lasiurus blossevillii*)	FSS, WBWG
Spotted bat (*Euderma maculatum*)	CSC, BLMS, WBWG,
Townsend's big-eared bat (*Corynorhinus townsendii*)	CSC, FSS, BLMS, WBWG
Pallid bat (*Antrozous pallidus*)	CSC, FSS, BLMS, WBWG
Western mastiff bat (*Eumops perotis*)	CSC, BLMS, WBWG
Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*)[b]	CSC
Sierra Nevada mountain beaver (*Aplodontia rufa californica*)	CSC
Sierra Nevada red fox (*Vulpes vulpes necator*)	CT, FSS
Ringtail (*Bassariscus astutus*)	FP
Black bear (*Ursus americanus*)[b]	MIS
California wolverine (*Gulo gulo luteus*)	CT, FSS, FP
American marten (*Martes americana*)[b]	FSS
Fisher (*Martes pennanti*)	FC, CSC, FSS, BLMS
Mountain lion (*Felis concolor*)[b]	CSPM
Mule deer (*Odocoileus hemionus*)[b]	MIS
Northern flying squirrel (*Glaucomys sabrinus*)	CSC

[a] Status: Audubon = Audubon Watch List species (R = Red List: Declining rapidly, have very small populations and face major conservation threats; Y = Yellow List: Declining but a slower rate than Red List species)

BLMS = U.S. Bureau of Land Management Sensitive Species

CDFS = California Division of Forestry Sensitive Species

CE = Listed as Endangered under the California Endangered Species Act

CP = Protected under CDFG sport fishing regulations

CSC = California Department of Fish and Game Species of Concern

CSPM = Specially protected mammal under the California Fish and Game Code

CT = Listed as Threatened under the California Endangered Species Act

FD = Federally delisted

FC = Federal Candidate Species

FE = Listed as Endangered under the Federal ESA

FP = Fully protected species under the California Fish and Game Code

FSS = U.S. Forest Service Sensitive Species

FT = Listed as Threatened under Federal ESA

MIS = U.S. Forest Service Management Indicator Species

MNBMC = FWS designated migratory nongame bird of management concern

USBC = United States Bird Conservation Watch List

WBWG = Western Bat Working Group designation for high priority bat species

[b] Species was observed during relicensing studies.

habitat away from human activities. During winter, relatively protected stands near diurnal activity areas are important communal roosting habitat. Within the Project areas, bald eagle nesting has been observed at two reservoirs, Loon Lake and Union Valley. Wintering bald eagles could sporadically be found at any of the Projects' reservoirs or reaches; however, no winter roost concentration areas have been identified. PG&E conducted bald eagle wintering and nesting surveys in 2003 and 2004, respectively; however, no wintering or breeding bald eagles were observed during surveys in the Chili Bar Project area.

Loon Lake Reservoir

During 2003–2004 surveys conducted by SMUD, adult, sub-adult, and juvenile bald eagles were seen frequently during both boat and ground-based surveys at Loon Lake reservoir. Eagles were sighted during seven of eight survey days in 2003 and during 20 of 23 survey days in 2004. Adults were the most commonly observed age class of bald eagles observed at Loon Lake reservoir (71.4 percent of all age classes), although no more than two adults were observed on the reservoir during a single survey. Sub-adults comprised a large segment of the population at Loon Lake reservoir (25 percent) relative to the number of subadults observed at Union Valley reservoir (8.5 percent). Favored perches at Loon Lake reservoir ranged from dominant trees and snags to saplings and shoreline boulders. Bald eagle nesting had not been observed at Loon Lake reservoir prior to relicensing surveys. In 2004, two eaglets hatched from this nest; however, they both later died. Nesting was not observed in 2005.

Union Valley Reservoir

From November 2002 through July 2005, up to four bald eagles were observed at Union Valley reservoir at one time; on most visits, the territorial pair were the only eagles observed. All age classes of eagles were observed at Union Valley reservoir with an age distribution of 83 percent adults, 8.5 percent sub-adults, and 8.5 percent juveniles. Numbers of sub-adult and juvenile eagles were highest in winter and fall months, corresponding with the expected seasonal influx of wintering bald eagles into the Crystal Basin. Table 3-58 shows the breeding productivity of bald eagles at Union Valley reservoir.

Table 3-58. Productivity summary for bald eagles nesting at Union Valley reservoir, 1986–2005. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Year	Status	Young Fledged	Location
1986	Successful	1	Wench Creek
1987	Successful	1	Wench Creek
1988	Occupied/Success Unknown	Unknown	Wench Creek
1989	Occupied/Unsuccessful	0	West Point
1990	Occupied/Unsuccessful	0	Wench Creek
1991	Occupied/Unsuccessful	0	Wench Creek
1992	Successful	2	Granlees Point nest #1
1993	Successful	2	Granlees Point nest #1
1994	Successful	2	Granlees Point nest #1
1995	Occupied/Unsuccessful	0	Granlees Point nest #1
1996	Occupied Unsuccessful	0	Granlees Point nest #1
1997	Successful	2	Granlees Point nest #1
1998	Occupied/Unsuccessful	0	Granlees Point nest #1
1999	Occupied/Unsuccessful	0	Granlees Point nest #1
2000	Successful	Unknown	Granlees Point nest #1
2001	Occupied/Unsuccessful	0	Granlees Point nest #1
2002	Occupied/Unsuccessful	0	Granlees Point nest #1
2003	Occupied/Unsuccessful	0	Granlees Point nest #2
2004	Successful	1	Granlees Point nest #1
Summary	Nesting attempts of known outcome (young fledged) at Union Valley reservoir = 18		
	Known young produced at Union Valley reservoir = 11		
	Young/known outcome at Union Valley reservoir = 0.61		

Perch structures commonly used at Union Valley reservoir included dominant and sub-dominant sugar pines, lodgepole pines, incense cedar, white fir, Jeffrey pine, ponderosa pine and various snags that border the reservoir, and occasionally in saplings and shoreline boulders. Most perch sites were on the south and east perimeter of the reservoir with only two observations of perched birds occurring on the north side of the reservoir between Yellowjacket and Wolf Creek campgrounds. Most habitually used foraging perches were located less than 20 meters from the shoreline along the west and south shores of the reservoir, in the forest stands adjacent to Union Valley dam, and in the stands on the Sunset/Fashoda Peninsula and Granlees Point. Night roosts of the territorial pair were primarily located on or near Granlees Point and occasionally on the Sunset/Fashoda Peninsula.

Osprey—SMUD determined during relicensing studies that ospreys are common in suitable habitat throughout the UARP area from early spring through late summer. The earliest calendar-year observation of an osprey during relicensing studies was a single bird flying over Big Hill on March 26, 2003. Seven active osprey nests with undetermined outcome were recorded in the study area in 2002 and four active nests were recorded in 2003. At Union Valley reservoir, these nests were located at the top of dominant snags, primarily along the south shore within the area burned by the Cleveland Fire in 1992, and in the SFSC arm of Junction reservoir. Several of these snags fell during the winter of 2002–2003, likely because of rotting combined with high winds and snow loading. Nesting was also confirmed at Ice House reservoir and suspected but not confirmed at Loon Lake reservoir.

Northern Goshawk—On the west slope of the Sierra Nevada, the northern goshawk breeds from about 2,500 feet in elevation in the ponderosa pine/mixed-conifer vegetation types up to approximately 10,000 feet in the red fir and lodgepole pine types. They are generally year-round residents in suitable habitat but some limited seasonal altitudinal movements may occur. Relicensing studies conducted by SMUD and monitoring conducted by the Eldorado National Forest indicate that northern goshawks nest in the vicinity of the Project and spatial analysis determined that three Protected Activity Centers (PACs) (G11_04; G11_06; and G22_12) are within 0.25-mile of existing Project facilities. PACs were assumed to be occupied and were excluded from the area surveyed during protocol surveys of the UARP. Broadcast calling surveys at 83 call points near existing Project facilities failed to elicit a response from any goshawks. However, goshawks were observed incidentally at two locations near Jaybird Springs Road and these birds may have been associated with PAC G22_09. In 2004-–2005, broadcast calling surveys at 78 call points associated with the Iowa Hill development failed to elicit any responses from goshawks. The nearest designated PAC to the development is G23_03, located approximately 0.93-mile southeast of the eastern end of the proposed transmission line that will service the development.

California Spotted Owl—The California spotted owl ranges from south of the Pit River in Shasta County, throughout the entire Sierra Nevada, and the south and central Coast Range as far north as Monterey. Relicensing studies conducted by SMUD and monitoring conducted by the Eldorado National Forest indicate that California spotted owl nests in the vicinity of the UARP and spatial analysis determined that 14 PACs have been designated within 0.25-mile of existing UARP facilities. PACs were assumed to be occupied and were excluded from the area surveyed during protocol surveys of the UARP. Broadcast calling surveys in 2002 yielded responses from two adults and one juvenile in the vicinity of Long Canyon, southeast of Slab Creek reservoir. In 2003, responses were obtained from two adults and two juveniles near

Union Valley dam. Also in 2003, four responses were obtained from adult owls presumed to be the pair recorded in 2002 in Long Canyon. All responding birds appear to be associated with known PACs. In 2004-2005, broadcast calling surveys at 27 call points within 1.5 miles of the Iowa Hill development elicited responses from two adults and one juvenile in the vicinity of Long Canyon near the eastern end of the proposed transmission line for the Iowa Hill development. This pair is presumed to be associated with PAC ED_034. Additional responses were obtained from adult owls (breeding status undetermined). One PAC is located within 0.25-mile of the Iowa Hill development footprint but no PACs have been designated within 0.25-mile of the proposed transmission line.

Bats—Yuma myotis were captured at the most locations and in the greatest number. A large night roost, used primarily by Brazilian free-tailed bats, was discovered at White Rock powerhouse. Smaller roosts were found under non-project bridges along Ice House Road at the crossings of Tells Creek, Big Silver Creek, and Jones Fork Silver Creek, which are located 0.26 to 0.48 mile upstream of the maximum surface elevation (high water line) of Union Valley reservoir. A fourth roost was found under the Ice House Road Bridge crossing of SFSC, approximately 0.82 mile downstream from Ice House reservoir.

Bat trapping and acoustic sampling was performed at the proposed Iowa Hill development in 2004. Acoustic detection identified bats belonging to the 40 kHz myotis group, which includes the long-legged myotis, as well as several other bat species without special status.

Black Bear—The black bear is widespread and relatively common throughout the Sierra Nevada, from foothill habitats to alpine zones. They generally occur in fairly dense, mature stands of many forest habitats, valley foothill riparian habitat, and wet meadow. The black bear is a legally hunted species in California with an estimated more than 2,200 animals taken in 1999. Suitable habitat for this species is distributed throughout most of the Project area and bears are known to be common and increasing in number in the region.

Mule Deer—Mule deer in the vicinity of the Project are considered to be part of the Pacific Deer Herd, with the exception of those deer in the westernmost portion of the Project area. The herd occupies approximately 353 square miles of public and private lands within El Dorado County and that portion of Placer County south of the Rubicon River. The Pacific Deer Herd has four significant habitat designations: critical summer range, fawning habitat, holding areas, and winter range. Based on the existing information provided by CDFG and the Eldorado National Forest, the critical summer ranges, fawning habitat, and holding areas of the herd occur from the mid to upper elevations of the Crystal Basin within the Eldorado National Forest, usually above 4,000 feet in elevation. These critical areas are found east of Ice House reservoir, north and east of Union Valley reservoir and north of Loon Lake reservoir. The known winter range of the herd lies mainly on south-facing slopes between 2,000 and 4,500 feet elevation and between the SFAR and Peavine Ridge Road from the town of Kyburz and westward to Highway 49. The Pacific Deer Herd uses the major east-west trending ridges (Poho, Telephone, and Peavine) of the Eldorado National Forest as primary migration corridors between high- and low-elevation habitats. The winter range lies mainly on south-facing slopes between 2,000 and 4,500 feet elevation. Intermediate range generally extends from 4,000 to about 6,000 feet elevation, and is used primarily during spring and fall migration. Most of this intermediate range consists of east-west parallel ridges used as migration routes, especially Peavine, Poho, and Telephone ridges. The summer range lies mainly above 5,000 feet.

Mountain Yellow-legged Frog—Mountain yellow-legged frogs are generally found from elevations of 4,500 feet to over 12,000 feet. In the Sierra Nevada, mountain yellow-legged frogs have been documented to occur in ponds, lakes, and small streams. Reproduction begins soon after water bodies are free of ice. Breeding and oviposition generally occurs in ponds or lakes from April through July, depending upon the elevation. Streams may be important to mountain yellow-legged frogs as dispersal corridors. Mountain yellow-legged frog tadpoles are likely to be present from June through September and adults can be found from June through October. Since water temperatures at higher elevations in the Sierra Nevada remain relatively cold throughout the year, mountain yellow-legged frog tadpoles overwinter 2 to 3 times before metamorphosing. The tadpoles spend the winter beneath the ice and do not metamorphose until their third or fourth year.

The nearest known populations of mountain yellow-legged frogs are in the headwaters of Highland Creek, at Highland Lake (Highland Creek flows into Rockbound Lake), and in Lake Zitella (on a tributary to the Rubicon River), which are about 2 miles from the UARP upper elevation reaches. In addition, large populations of mountain yellow-legged frogs are found in many of the smaller lakes and ponds in Desolation Wilderness, as well as in Lake Aloha (which is located in the higher elevation of the Desolation Wilderness northeast of the UARP).

SMUD and PG&E conducted an overlapping amphibian study within the proposed Project boundaries and stream reaches affected by the proposed Projects. The elevation of the Chili Bar Project is too low to support mountain yellow-legged frogs; therefore, it was not surveyed. SMUD identified 14 stream and 17 pond or reservoir margin sites on the UARP sites as potential mountain yellow-legged frog habitat, which were subsequently surveyed in 2003. No mountain yellow-legged frogs were found. The highest Project reservoir (Rubicon reservoir) is located at approximately 6,500-foot elevation, which is at the lower end of the mountain yellow-legged frog range, and may explain why no mountain yellow-legged frogs are found within Project reaches and reservoirs. The nearest known populations of mountain yellow-legged frogs are at elevations greater than 7,500 feet. Project reaches and reservoirs do support some habitat suitable for the mountain yellow-legged frog. However, most of the UARP reservoirs are too large, with much of the nearshore habitat comprised of bedrock. Because of this, suitable habitat is patchy in distribution. Mountain yellow-legged frog populations are typically found in water bodies (lakes or streams) that provide deep pools for overwintering, preferably without tadpole predators, such as trout. Although all of the reservoirs in the study area have deep pools, trout are present in all three of the upper elevation reservoirs (Rubicon, Rockbound, and Buck Island). Project stream reaches with high quality habitat occur within this elevation range, for example, in the upper reaches of Gerle Creek downstream of Loon Lake dam. This particular reach does not currently support mountain yellow-legged frog populations, which may be due, in part, to the presence of predatory brown trout in Gerle Creek.

Foothill Yellow-legged Frog—Foothill yellow-legged frogs occur in the Coast Ranges from the Oregon border south to the Transverse Mountains in Los Angeles County and in most of central and northern California along the west slopes of the Sierra Cascade crest. The elevation range of the foothill yellow-legged frog extends from sea level to 5,000 ft (1,525 m) in the Sierra Nevada Mountains. Egg deposition is generally initiated on the descending limb of the spring hydrograph when temperatures reach 12-15°C. Metamorphosis generally occurs within 3 to 4 months. Once breeding has occurred, adults and juveniles move upstream into nearby tributaries or to cooler microhabitats.

Foothill yellow-legged frogs have been found along the Upper American River, both on the SFAR and Silver Creek. Sightings along the mainstem SFAR extend as far upstream as Riverton, and downstream below Slab Creek reservoir.

SMUD and PG&E conducted an overlapping study within the proposed Project boundaries and stream reaches affected by Project operations. Studies identified a total of 22 stream sites within the UARP boundary with potentially suitable habitat for foothill yellow-legged frogs. SMUD conducted surveys at these sites in 2003 and 2004. Foothill yellow-legged frogs were documented at 4 sites in 2 reaches of the UARP: in the Camino dam reach, approximately 2 miles downstream of Camino dam and at the confluence of Silver Creek with SFAR; and in the SFAR reach, near Akin powerhouse (part of the El Dorado Project) and near Camino powerhouse. Foothill yellow-legged frogs were not found in three reaches (Ice House, Junction, and Slab Creek dam reaches) despite the availability of potentially suitable habitat, although there was a single foothill yellow-legged frog sighting in the Slab Creek dam reach by the Forest Service. Ice House dam reach is at the upper elevation limit of the foothill yellow-legged frog.

SMUD and PG&E surveyed the upper 2 miles and the lower 1 mile of Junction dam reach in mid-summer 2004. Water temperatures in the upper reaches were too cold (~8°C) for breeding. Although temperatures in the lower portion of Junction dam reach were suitable for breeding, large algal mats covering suitable egg attachment substrates may have prevented successful breeding. No adult frogs were observed in this reach. The Slab Creek dam reach is within the elevation range of the species, and water temperatures are suitable throughout the reach. Although the Forest Service has observed a single foothill yellow-legged frog in this reach, the presence of potential competitors and predators (e.g., bullfrogs, crayfish, bass) in this reach may limit foothill yellow-legged frog establishment.

Habitat associations of the foothill yellow-legged frog were similar at the four locations where foothill yellow-legged frogs were found. Based on site observations, bedrock seeps likely provide important refugia for adults, juveniles, and subadults. Evidence of foothill yellow-legged frog breeding was documented at all four sites. Successful breeding and subsequent life history stages were documented in Camino dam reach and the SFAR reach of UARP, which suggests habitat conditions currently exist in these reaches to support eggs, tadpoles, and adults of this species. An analysis of suitable habitat for egg deposition and tadpole rearing conducted by the applicants confirmed that suitable habitat for egg deposition and tadpole rearing occurs at both sites. The study found that egg deposition and tadpole rearing habitat were of moderate to high quality at flows of 20 and 50 cfs, but at 100 cfs the habitat had decreased to low quality habitat. Under current UARP operation, mean daily flows fall within typical reach values of approximately 40 cfs during breeding and rearing periods of May–July.

Eighteen sites were surveyed for the foothill yellow-legged frog in the reach downstream of Chili Bar dam, 15 of which were on a tributary of the SFAR or on the SFAR near a tributary. No foothill yellow-legged frogs were observed. Subsequent surveys conducted by PG&E in 2004 documented approximately 14 foothill yellow-legged frog tadpoles and one adult on Indian Creek, a tributary to SFAR near the town of Coloma, approximately 0.5 mile upstream from its confluence with SFAR.

Western Pond Turtle—Historically, the western pond turtle had a relatively continuous distribution throughout California. It is currently found throughout much of its historical range, principally west of the Sierra-Cascade crest, from western Washington south to northwest Baja California, though in population numbers that are a fraction of historical levels.

The western pond turtle inhabits a wide range of fresh or brackish water habitats including ponds, lakes, backwater and low flow regions of streams and rivers, ditches, pools remaining in intermittent streams. Sites for basking are an important element. Basking substrate includes rocks, logs, banks, emergent vegetation, root masses, and tree limbs. Although primarily an aquatic reptile, western pond turtles often spend time on land. Terrestrial activities include basking, overwintering, nesting, and moving between ephemeral sources of water.

Breeding activity peaks from June to July, but may occur year-round, when females begin to search for suitable nesting sites upslope from water. Egg-laying sites vary from sandy shoreline to forest soil types. Females excavate a nesting site at least four inches (10 cm) deep, and lay from three to eleven eggs. Incubation takes 73 to 80 days. Along major rivers western pond turtles are often concentrated in areas of optimal habitat, often in side channel and backwater areas. Turtles may move to off-channel habitats, such as oxbows, during periods of high flows.

Many of the stream sites surveyed by the applicants in the UARP for the California red-legged frog and the foothill yellow-legged frog contained suitable habitat for western pond turtle, including undercut banks, emergent vegetation, and basking sites, as well as suitable adjacent upslope areas for breeding. Western pond turtles were documented in the Slab Creek dam reach, approximately 0.5 mile upstream of White Rock powerhouse.

Within the Chili Bar Project area, western pond turtles were observed in 2003 along the west bank of Greenwood Creek, near the confluence with SFAR and in emergent vegetation in the side channel adjacent to a mid-channel island on the SFAR. Additionally, the western pond turtle was observed at two sties along the eastern edge of the Chili Bar reservoir in 2004.

3.3.4.2 Environmental Effects

Riparian Vegetation and Wetlands

Riparian vegetation and wetlands are subject to flow alterations and large water level fluctuations as a result of the proposed Projects' operations. Diverting flow and reducing the intensity of peak flows in Project reaches could potentially alter riparian vegetation composition, cause encroachment, or cause a decrease in riparian cover. Reservoir water fluctuations could potentially reduce wetland abundance and species diversity.

Under Proposed Articles 1-1 and 2-1, *Minimum Streamflows*, SMUD and PG&E would provide minimum streamflows to Project reaches. Additionally, under Proposed Article 1-2, *Pulse Flows*, SMUD would provide pulse flows in three river reaches. In order to maximize recreational resources, SMUD would operate the UARP to maintain the reservoir levels as described in Proposed Article 1-23, *Reservoir Levels*. These flows and reservoir levels are described in sections 3.3.2, *Water Resources*, and 3.3.3, *Aquatic Resources*. Under the Proposed Action, minimum flows would be released partly to provide benefits to riparian vegetation during spring flows. SMUD would release pulse flows in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and in SFSC below Ice House dam partly to maintain a properly functioning riparian community.

Under Proposed Articles 1-5 and 2-4, *Monitoring Program,* SMUD and PG&E would conduct a riparian vegetation monitoring program. They would develop and implement a riparian vegetation monitoring plan in consultation with the Agencies with monitoring beginning 5 years after license issuance and continuing in years 10, 15, and every 10 years thereafter for the length of the licenses. This monitoring program is intended to provide an index of changes in riparian conditions over that period of modified streamflow, to determine if riparian conditions are in proper functioning condition, and to determine if riparian areas are being maintained or are in need of restoration.

Our Analysis

Maintaining the health of riparian vegetation is important for a number of reasons, including promoting streambank stability, reducing erosion, preventing the establishment and spread of noxious weeds, improving water quality, and providing foraging, hiding, nesting, and denning habitat for a number of wildlife species. Wetlands, which are often concurrent with riparian vegetation, especially within Project reaches, provide many of the same functions. Under natural hydrologic conditions, high spring flows seasonally inundate stream margin habitats and floodplains. Additionally, peak storm flows would naturally occur at a frequency great enough to scour floodplain soils and redeposit sediment, which is needed to rejuvenate habitat for many riparian species. The Projects alter the natural hydrograph by diverting flows, reducing the frequency and magnitude of naturally occurring pulse flow events, and causing large fluctuations in reservoir water levels. Additionally, the locations and species diversity of reservoir wetlands are partially determined by reservoir fluctuations.

The overlapping applicants' study, *Riparian Vegetation and Wetlands Technical Report* (DTA, 2004a) found that riparian vegetation in the Project reaches meets the characteristics of "proper functioning condition". This is defined as having: a diverse age structure of vegetation; diverse composition of vegetation; species composition indicating maintenance of riparian soil moisture characteristics; streambank vegetation comprised of plants or plant communities that have root masses capable of withstanding high stream flow events; riparian plants with high vigor; adequate vegetative cover to protect banks and dissipate energy during high flows; and, plant communities in the riparian area providing an adequate source of coarse and/or large woody debris. Although the riparian vegetation in Project reaches meets the requirements to be characterized as being in proper functioning condition, there is evidence that Project operations have reduced the quality. Several UARP and Chile Bar Project reaches show signs of encroachment and reduced bank stability, including, within the UARP, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, SFAR below Slab Creek dam, and within the Chili Bar Project, SFAR below Chili Bar dam (CDFG, 2007).

Within the Gerle Creek reach below Loon Lake dam, the upland species lodgepole pine has increased over historic conditions. Additionally, the banks through much of the reach are exposed and undercut and there is a high level of fine sediment bedload. Within Gerle Creek downstream of Gerle dam, riparian vegetation on the upper banks is narrow and dependent upon seasonal seepage. Within the SFRR downstream of Robbs Peak dam, during the riparian vegetation study, dense woody vegetation colonizing alluvial bars occurred on both sides of the stream and herbaceous vegetation was rooted underwater, suggesting an absence of recent high scouring flows. In SFSC downstream of Ice House dam, signs of bank erosion were observed. In Silver Creek downstream of both Junction and Camino dams and in Brush Creek below Brush Creek dam, riparian vegetation is limited by natural geology and topography. In SFAR downstream of Slab Creek dam, riparian vegetation is narrow in the upper portion of the reach, even in areas of low-gradient banks.

Although spring flows are not being managed purely for the benefit of riparian vegetation in all reaches, the proposed minimum flows and pulse flows would be beneficial to the health of the riparian vegetation in all reaches by returning to a more natural hydrograph. The minimum flows would inundate the stream margins and upper streambanks, providing longer duration saturation than under existing conditions. Species that favor upland conditions, such as lodgepole pine, would likely die off in favor of hydrophytic species that are specially adapted to emerge with high spring flows. Additionally, in many cases, low banks would overflow, saturating floodplains and expanding the riparian species into a wider channel. In the reaches where SMUD proposes pulse flows (the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam), the pluse flows would mimic naturally occurring spring storm events, scouring floodplain soils, redistributing sediment, and reducing encroachment.

Because the effects of the proposed minimum flows and pulse flows on riparian vegetation are not definitively known, the proposed riparian monitoring program would monitor the changes in riparian condition, including species composition, percent cover, and length and width of riparian communities, to compare changes with the baseline established in the riparian vegetation study. Monitoring every 5 years for the first 15 years of a new license, followed by subsequent monitoring every 10 years, would allow enough time for riparian vegetation to respond to the proposed flow regimes without being confused by short-term changes based on one-time events. If the results of this monitoring identify on-going or new adverse effects on riparian functions, this information would be used in the proposed *Adaptive Management Program* (Proposed Article 1-6) to provide needed changes or restoration.

The largest areas of wetlands within the UARP boundary are located at Union Valley and Loon Lake reservoirs with smaller areas of wetland located Ice House, Gerle Creek, Rockbound, and Rubicon reservoirs. Wetlands at all Project reservoirs are influenced by Project operations; however, reservoir fluctuations are greatest at Loon Lake, Union Valley, and Ice House reservoirs. Wetlands at Loon Lake reservoir are located in and around shallow bays that are influenced by reservoir fluctuations. At Union Valley reservoir, wetland hydrology is influenced by reservoir water level from the point of annual high water to the point of annual low water. In 2003, the water level declined almost 34 feet during the growing season (DTA, 2004a). As reservoir elevations decline, wetland areas are exposed and become vegetated except at areas exposed during maximum drawdown, which tend to remain unvegetated. According to the overlapping applicants' riparian vegetation and wetland study (DTA, 2004a), species richness of wetlands seasonally inundated by the reservoirs was much lower than in wetlands that are never inundated.

Under Proposed Article 1-23, *Reservoir Levels*, SMUD would maintain reservoir levels during the summer months to maximize recreational use. Although reservoir fluctuations would continue under the Proposed Action, they would be reduced during portions of the growing season in Rubicon, Buck, Loon, Gerle Creek, Ice House, and Union reservoirs. We expect that the increased time of inundation in these locations could result in increased species diversity in the wetlands within this zone. Daily reservoir fluctuations at the Slab Creek reservoir would increase due to operation of the proposed Iowa Hill development but would be within the current weekly range of fluctuation (see section 3.5.3, *Water Resources*). Slab Creek reservoir has steep slopes that greatly limit wetland and riparian vegetation from developing. As a result, we conclude that increased reservoir fluctuations would have minimal effects on wetlands.

Like the UARP reaches, the conditions of the reach below Chili Bar dam meet the criteria for proper functioning condition (DTA, 2004a). The Freemont cottonwood population in the Coloma sub-reach, however, contains large, older trees only on high banks 8 to 10 feet above the river, with infrequent saplings and seedlings. This is indicates germination or recruitment is impaired by flow fluctuations because seedlings are cued to germinate too high on the banks when flows are high and then face moisture stress (and mortality) when flows recede (DTA, 2004a). Under existing conditions, flows within the Chili Bar reach fluctuate daily by up to 1,000 cfs because flows at the Chili Bar Project are dependant upon the upstream operation of SMUD's Slab Creek reservoir and White Rock powerhouse. PG&E proposes to increase the minimum streamflow, which would reduce daily fluctuations. Because large fluctuations would continue under the Proposed Action, the proposed riparian monitoring program would monitor any changes in riparian health and identify on-going or new adverse effects on riparian functions. This information would be used in the proposed adaptive management program (Proposed Article 1-6, *Adaptive Management Program*) to provide needed changes or restoration.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. With the exception of the Slab Creek reservoir, Project operations at all reaches and reservoirs would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on riparian vegetation and wetlands would be the same as those described under the Proposed Action except for Slab Creek.

Wildlife and Plant Protection Measures

Several special status plant and wildlife species occur within the UARP boundary, including several special status plants, northern goshawk, osprey, California spotted owl, special status bats, black bear, mountain quail, cavity nesting birds, and mule deer. Yuma myotis is also known to occur near the Chili Bar Project boundary. Project operations and maintenance could potentially affect these species, and other special status species that may be listed during the term of the license. SMUD and PG&E propose a number of measures designed to protect wildlife and plants in the Project areas.

The applicants propose to provide wildlife and sensitive plant protection measures in Proposed Articles 1-12 and 2-9, *Wildlife and Plant Protection Measures*. Under Proposed Article 1-12, SMUD would:

1. maintain and operate in working condition all devices and measures for wildlife along Project canals deemed necessary by the Forest Service, FWS, and CDFG. SMUD would provide the Agencies annual reports describing the date, location, and species found in Project canals. If annual wildlife mortality during any 3-year period exceeds three individuals, SMUD would develop and implement a Wildlife Exclusion Plan that is approved by the Forest Service, FWS, and CDFG;
2. complete a biological evaluation before commencing any new construction or maintenance (including new recreational developments) authorized by any new license on Forest Service lands if it may affect a Forest Service, FWS, or CDFG sensitive plant or wildlife species or its habitat. The biological evaluation would be approved by the Forest Service and mitigation measures developed in consultation with the Commission, the Forest Service, FWS, and CDFG may be required for the protection of the species;
3. immediately notify the Forest Service, FWS, and CDFG if any Forest Service, FWS, or CDFG sensitive plant or wildlife species is detected prior to or during ongoing Project construction, operation, or maintenance. If the agencies determine that the Project activities are adversely affecting the sensitive species, SMUD would develop and implement appropriate protection measures in consultation with the agencies;
4. review the current list of special status plant and wildlife species annually, in consultation with the Forest Service, FWS, and CDFG, that may occur on Forest Service lands in the Project area directly affected by Project operations. For each new species added to the list, SMUD would determine, in consultation with the agencies, if the species or its habitat is likely to occur on Forest Service lands in the Project area, and if so, develop and implement a study plan in consultation with the same agencies to assess the effects of the Project on the species. SMUD would then prepare and file a report on the study including recommended resource measures and an implementation schedule. The report would be reviewed and approved by the Forest Service, FWS, and CDFG and then filed with the Commission;

5. not undertake maintenance under transmission lines within the Pine Hill Rare Plant Preserve until consultation with BLM, FWS, and CDFG has been completed; and
6. develop an Avian Protection Plan within 1 year of license issuance, approved by FWS, that addresses retrofitting the problem Project transmission lines, to meet the design and siting standards established by APLIC standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994).

In addition, SMUD proposes, as part of Proposed Article 1-5, *Monitoring Program*, to develop and implement a bear management monitoring plan in consultation with the Agencies to monitor the effectiveness of measures relating to managing bear populations to keep them away from recreational sites, as described in section 3.3.6, *Recreational Resources*.

In Proposed Article 2-9, *Wildlife and Plant Protection Measures*, PG&E proposes measures similar to items 2, 3, and 4 above, except the BLM would be a consulting and approving agency for BLM lands instead of the Forest Service on Forest Service lands.

Our Analysis

Project canals and penstocks could potentially affect wildlife migration and cause drowning, particularly for mule deer. No deer mortalities have ever been recorded within the Gerle Canal, however. The canal walls are gradually sloped, with gunnite or natural rock walls and several shallow areas that can act as escape ramps. The vast majority of the Project penstocks are greater than 24 inches above ground, which is the height identified in the *Mule Deer Technical Report* (DTA, 2004b) as adequate for mule deer passage. Although it appears that Project facilities are not causing deer mortality or impeding migration, the proposed measure would monitor wildlife mortality and ensure that any fencing or crossing structures required by the Forest Service, FWS, or CDFG meet design requirements and are functional.

Proposed and future maintenance activities have the potential to adversely affect special-status plant species, particularly within the Pine Hill Preserve. The Pine Hill Preserve contains a high concentration of rare plant species because of the serpentine and/or gabbro soil formations. Three of these species, Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort, are federally listed species that are discussed in section 3.3.5, *Threatened and Endangered Species*. Project transmission lines, which require occasional maintenance clearing, cross through sections of the Pine Hill Preserve. Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with the BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species.

Additionally, the proposed measures to consult with the Forest Service, FWS, and CDFG prior to any new construction or maintenance, notify the agencies if any sensitive plant species are identified, and review the current list of sensitive species annually, while subsequently assessing the potential for Project effects on the species, would protect any special status species that occur either within the Pine Hill Preserve or elsewhere within the Project boundary. Special status wildlife species, such as special status bats, California spotted owls, and northern goshawk, which could be affected by Project powerhouse maintenance activities, road maintenance, or vegetation management, would also be protected by these proposed measures.

The Bird-Powerline Associations Technical Report (DTA, 2004c) identified several transmission lines that do not meet the design and siting standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994): (1) the Jones Fork-Union Valley 69 kV line has several structures having less than 36 inches of clearance between energized jumper wires and grounded cross-arms; (2) the Brush Creek 12-kV tap line has inadequate phase-to-phase and phase-to-ground spacing; and (3) high elevation segments of the transmission line from Loon Lake powerhouse to just west of Camino powerhouse, including the Jones Fork-Union Valley transmission line segment and an isolated segment near White Rock powerhouse, have overhead groundwires. The risk of bird electrocution increases when transmission lines do not have adequate spacing between conductors or between the lines and the ground. This is especially true for highly susceptible raptors such as the special status osprey and northern goshawk and bald eagle. Additionally, these species are at risk for collision with transmission lines with overhead groundwires because their small diameter makes them less visible to birds. The proposed measure to prepare an avian protection plan would address retrofitting transmission lines to have them meet APLIC standards. Once all transmission lines meet these standards, the potential for avian electrocution or collision would be minimized.

Although the Black Bear Technical Report (DTA, 2004d) determined that the Project is not affecting black bear denning or harvest, it did identify a concern relating to human-bear interactions at recreational sites. As a result, SMUD Proposed Article 1-19, *Specific Recreation Measures,* includes improvements at several recreational areas to provide bear proof food lockers and bear proof trash bins (see section 3.3.6, *Recreation Resources,* for further discussion). In Proposed Article 1-5, *Monitoring Program*, SMUD proposes a bear management monitoring plan. This plan would determine if the proposed human-bear interaction measures are successfully keeping bears away from campgrounds or if additional measures would be needed.

Iowa Hill Development

A biological evaluation has been completed to assess effects of the proposed Iowa Hill development on Forest Service sensitive terrestrial species (Lipton, 2007a).

Although no rare plants are known to exist in the Iowa Hill development area, due to the anticipated length of the time between the rare plant surveys and the actual undertaking of construction on the Iowa Hill development, it is possible rare plants could become established in the construction areas. Additionally, Forest Service survey guidelines require Project areas to be resurveyed after a 5-year period. If new surveys for sensitive plants are completed prior to the beginning of construction, the surveys would locate any new populations of rare plants or any new rare plants species that may be added to the current rare plant lists by the time construction begins. If any new rare plant locations or habitat information changes as a result of these surveys, the Forest Service's biological evaluation may be amended prior to the beginning of construction (Taylor, 2007).

The proposed Iowa Hill development could directly affect California spotted owls through removal of habitat. The Project would eliminate up to 141 acres of suitable habitat, a portion of which occurs on National Forest System lands. The habitat that would be removed is approximately 1 mile from the nearest known spotted owl activity center; however, the incomplete survey visits conducted in 2004 indicated that an additional spotted owl nest or roost site may occur closer to the Project, since an individual spotted owl was detected within 0.25 mile of the Project boundary.

If spotted owl nesting is occurring near the Project (within 0.25 mile), noise associated with construction activities could cause abandonment of a spotted owl nest site or could affect nesting success. Removal of vegetation could eliminate occupied or potential nesting habitat and would reduce foraging habitat for two spotted owl sites (PACs ED 123 and ED034) with activity centers within about 1.5 miles of the Project area.

At present, the spotted owl population on the Eldorado National Forest is estimated to be stationary (FWS, 2006). Given this fact and the findings of the FWS on the magnitude of threats to the species (FWS, 2006), the biological evaluation contains a determination that the direct and cumulative effects of the Project may affect spotted owl individuals but are not expected to result in a loss of viability or lead to a trend toward federal listing for the California spotted owl (Lipton, 2007a).

The proposed Iowa Hill development could directly affect northern goshawks through removal of habitat. The Project would eliminate up to 141 acres of suitable habitat, about half of which occurs on National Forest System lands. The habitat that would be removed is not known to be used for nesting but protocol-level surveys have not been completed. If goshawks are nesting near the Project (within 0.25 mile), noise associated with construction activities could cause abandonment of a nest site or affect nesting success. Loss of habitat could also eliminate use of the area by a goshawk pair.

In a status review conducted in 1998, FWS concluded that goshawks remain widely distributed throughout their historic range in the western United States and found no evidence that goshawk habitat is limiting the population, or that a significant curtailment of the species' habitat is occurring. For this reason, the biological evaluation contains a determination that the magnitude of effects associated with the Iowa Hill development may affect goshawk individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk (Lipton, 2007a).

The proposed Iowa Hill development would directly affect sensitive bat species through removal of potential roosts on 141 acres of land proposed to be cleared for Project developments. Project construction noise would be likely to affect roosting bats over a larger area. Open water created by the upper reservoir could improve foraging opportunities for bats along the forested edge of this habitat. Based on the information above, the biological evaluation contains a determination that the Iowa Hill development may affect individual pallid bats, Western red bats, and/or Townsend's big-eared bats, but is not likely to result in a trend toward federal listing or loss of viability for these species (Lipton, 2007a).

The proposed Iowa Hill development would directly affect unoccupied but potentially suitable Pacific fisher habitat through removal of 141 acres of land proposed to be cleared for Project developments. This would have no direct or indirect effect upon the species unless it was to recolonize habitat on the Eldorado National Forest. Based on this information, the biological evaluation contains a determination that the Iowa Hill development would have no effect upon the Pacific fisher, though updating the biological evaluation is recommended prior to construction to ensure this determination is still valid (Lipton, 2007a).

Proposed Article 1-12, *Wildlife and Plant Protection Measures*, would require SMUD to complete a biological evaluation before commencing any new construction or maintenance authorized by a new license. This requirement is necessary for evaluating the effects of the Iowa Hill development on California spotted owls, northern goshawks, sensitive bats, and Pacific fisher. Because the existing spotted owl and northern goshawk surveys do not meet survey protocols and because these surveys would also be out of date by the time construction of the Iowa Hill development begins, additional spotted owl and goshawk surveys would be necessary prior to project construction in order to fully evaluate potential Project effects. If new spotted owl nest or daytime roost locations or new goshawk nest locations are identified within 0.25 mile of Project activities prior to the beginning of construction, SMUD would develop appropriate mitigation measures under the proposed measure.

Proposed Article 1-41, *Terrestrial Resources*, requires that prior to initiating construction of Iowa Hill, SMUD would purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license to mitigate the loss of wildlife habitat associated with the Iowa Hill development. The Forest Service and CDFG would determine the in-kind value of lands proposed for this purpose. The purchase of an equivalent acreage of land may help to offset effects on California spotted owl, northern goshawk, sensitive bats, and Pacific fisher habitat if the acquired lands provide similar habitat and/or are occupied by these species. This cannot be evaluated further, however, without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals would be applied to the property.

An MIS analysis has been completed to assess the effects of the Iowa Hill development on Eldorado National Forest MIS (Lipton, 2007b). The analysis contains the following conclusions with respect to mule deer, black bear, mountain quail, California spotted owl, northern goshawk, and cavity nesting birds.

Mule Deer—Deer foraging habitat on the Eldorado National Forest is estimated to have increased between 1991 and 1997. Project-level effects would contribute to a decline in the amount of deer habitat unless habitat acquired by SMUD as mitigation replaces habitat lost through Project effects. Project-level effects are not expected to alter deer population trends because the Project area is not identified as important winter or summer range for migratory deer and the area represents a very small portion of available deer habitat (Lipton, 2007b).

Black Bear—The amount of black bear denning/cover habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to the declining habitat trend on the Forest. The black bear data imply an increasing trend for black bear on the Eldorado National Forest, based on CDFG population estimates (CDFG, 2004). Project-level effects are unlikely to influence the black bear population trend (Lipton, 2007b).

Mountain Quail—The amount of mountain quail habitat on the Eldorado National Forest increased between 1991 and 1997. Project-level effects would not contribute to the increasing habitat trend on the Eldorado National Forest. From mountain quail survey data, a stable population trend has been estimated for the Sierra Nevada bioregion (Forest Service, 2007). Project-level effects are unlikely to affect mountain quail population trends (Lipton, 2007b).

California Spotted Owl—As discussed above, the amount of spotted owl habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to declining habitat trends on the Forest. The spotted owl population trend on the Eldorado National Forest is estimated to be stable. Project-level effects would reduce nesting and foraging habitat that may contribute habitat for one or two spotted owl sites (Lipton, 2007b).

Northern Goshawk—As discussed above, the amount of northern goshawk habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to declining habitat trends on the Forest. Goshawk population trends on the Eldorado National Forest remain unknown (Lipton, 2007b).

Cavity Nesting Birds—Population status and trend is monitored within the Sierra Nevada Bioregion for the following four cavity nesting bird species: Pileated woodpecker, red-breasted sapsucker, Williamson's sapsucker, and hairy woodpecker. Project-level effects would contribute to decreasing snag habitat trends on the Eldorado National Forest (Lipton, 2007b).

The only special status plant or wildlife species that is known to occur near the Chili Bar Project boundary is the Yuma myotis. The Yuma myotis has a night roost within the UARP White Rock powerhouse, but is expected to occur within the Chili Bar Project boundary. Although no special status plant or wildlife would be affected by the proposed Project, the measures proposed by PG&E would protect any special status plant or wildlife species that either currently occur or could occur in the future within the Project boundary from Project maintenance activities on powerhouses, road maintenance, vegetation management, or any new ground-breaking activities.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The effects of the proposed Project without the Iowa Hill development would be the same as with the Iowa Hill development because no special-status plant species are known to occur within the Iowa Hill development, no Project canals or penstocks that would adversely affect wildlife are proposed for the Iowa Hill development, and the proposed Iowa Hill transmission line, if constructed, would be built to meet APLIC standards.

Vegetation and Noxious Weed Management

Noxious weeds occur throughout the Project boundaries. Project operations and maintenance activities create dispersal pathways and conditions that are favorable to the spread of noxious weeds. Vegetation management and noxious weed control methods could control existing populations and prevent new populations from forming.

SMUD proposes, as specified in Proposed Article 1-13, *Vegetation and Invasive Weed Management Plan*, to file with the Commission, within 2 years of license issuance, an Invasive Weed Management Plan developed in consultation with the Forest Service, FWS, the appropriate County Agricultural Commissioner, and the California Department of Food and Agriculture. Invasive weeds would be those weeds defined in the California Food and Agriculture code, and other species identified by the Forest Service. The plan would address both aquatic and terrestrial weeds and vegetation within the UARP boundary and adjacent to UARP features directly affecting National Forest System lands including roads and distribution and transmission lines. Monitoring as part of the plan will be done in conjunction with other UARP maintenance and resource surveys, so as not to require separate travel and personnel. SMUD would conduct monitoring as part of the plan in conjunction with other UARP maintenance and resource surveys, so as not to require separate travel and personnel. SMUD would provide monitoring information to the Forest Service as part of the annual consultation on affected Forest Service resources described in Proposed Article 1-14, *Annual Review of Ecological Conditions*. To assist with this monitoring requirement, training in invasive plant identification would be provided to UARP employees and contractors by the Forest Service. SMUD also proposes, as specified in the same article to file with the Commission and thereafter implement a Vegetation

Management Plan. The plan would include, among other elements, hazard tree removal and trimming, revegetation of disturbed sites, and soil protection and erosion control.

PG&E proposes similar invasive weed and vegetation management plans, as specified in Proposed Article 2-10, *Invasive Weed and Vegetation Management Plans*. The difference in the PG&E proposed plan is that it is intended for BLM lands, with consultation with the BLM, instead of Forest Service lands and consultation with the Forest Service, as proposed by SMUD.

Our Analysis

Ten species of noxious weeds occur within the UARP boundary, five of which are in close proximity to UARP facilities. Noxious weeds have the potential to out-compete special status plant species, if they move into special status plant habitat. Project maintenance and operations can aid the proliferation of noxious weeds. Project roads can act as a method of seed dispersal into areas previously not infested and vegetation management within transmission lines can cause disturbance which allows noxious weeds to move in. The construction of the Iowa Hill development would also act as new disturbance that would create conditions favorable to the establishment of noxious weeds if appropriate control measures are not implemented. Finally, Project-related recreation acts both as a means of dispersal from one Project area to another and as a source of disturbance, which creates conditions favorable to noxious weed establishment.

Implementing the proposed invasive weed and vegetation management plans would control current populations and future infestations of noxious weeds within the Project boundary on Forest Service lands. We interpret the proposed Invasive Weed Management Plan to be intended for lands within the Project boundary that are adjacent to Project features directly affecting National Forest System lands. Because not all Project-related noxious weed infestations occur on Project lands that affect National Forest System lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary that are affected by Project operations or maintenance would result in more complete control of noxious weeds that are affected by the proposed Project. Currently, there are only small areas of noxious weeds located on the proposed Iowa Hill development site, concentrated on currently disturbed areas. Construction of the proposed upper reservoir and transmission line would create disturbance that would create conditions favorable to the establishment of noxious weeds. The proposed vegetation management plan would ensure the areas of disturbance that are not permanently lost to Project facilities would be revegetated with native species and noxious weeds would be controlled.

Within the Chili Bar Project, significant populations of the noxious weeds Scotch broom and Himalayan blackberry occur on the Chili Bar reservoir shoreline and along roadsides. Project operations and maintenance activities create conditions that are favorable to the existence of noxious weeds. Implementing the proposed invasive weed and vegetation management plans would control current populations and future infestations of noxious weeds within the Project boundary on BLM lands. Because not all Project-related noxious weed infestations occur on BLM lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary would result in more complete control of noxious weeds that are affected by Project operations and maintenance. The proposed vegetation management plan would establish practices that would minimize conditions favorable to the establishment of noxious weeds.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. The Project effects on noxious weed proliferation would remain the same as for the Proposed Action, except the Iowa Hill development sites would remain undisturbed and conditions favorable for noxious weed establishment would not occur.

Special Status Amphibians and Reptiles

Minimum Flows

Foothill yellow-legged frog habitat is found in several Project reaches. The mountain yellow-legged frog has not been found in Project-affected reaches or reservoirs during recent surveys, although suitable habitat may be available in higher elevations. Western pond turtle occur in the Slab Creek and Chili Bar dam reaches. Minimum flows have the potential to affect foothill yellow-legged frog, MLYF, and western pond turtle habitat. There is a tradeoff between the potential benefits of higher minimum flows creating more foothill yellow-legged frog habitat and the negative effects of cooler water during May through September delaying breeding, egg development, and tadpole metamorphosis (Kupferberg, 2006). Maintaining the water temperatures below 20°C during the summer months (to benefit coldwater fisheries) could potentially slow down foothill yellow-legged frog egg and tadpole development because it is outside the range of natural conditions for the foothill yellow-legged frog. Mountain yellow-legged frogs require stable, coldwater habitats as tadpoles develop over a period of 2 to 3years. Additionally, Project operations potentially create warm edgewater conditions favorable to bullfrogs, a predator of foothill yellow-legged frogs and young western pond turtles.

The applicants propose to provide minimum streamflows to Project reaches as specified in Proposed Articles 1-1 and 2-1, *Minimum Streamflows*.

Our Analysis

Foothill yellow-legged frogs evolved with wet winters and dry summers, and their life cycle is adapted to these predictable, seasonal cycles of peak flow and base flow (Mount et al., 2006). Studies from other Sierran rivers have demonstrated that foothill yellow-legged frog egg masses may be negatively affected by flow fluctuations associated with spills, channel maintenance pulse flows, ramping rates, whitewater recreational flows, and other operations. Flow fluctuations during the foothill yellow-legged frog breeding season can desiccate egg masses if they are laid during prolonged spills and then water levels drop quickly prior to hatching (Mount et al., 2006; Kupferberg, 2006). Additionally, egg masses can be scoured by high flows. Tadpole stranding, particularly during the late summer-early fall, is also a concern related to flow fluctuations. Stable, increased minimum flows may benefit tadpoles during the low-flow summer months by providing additional habitat.

Continuity and connectivity of foothill yellow-legged frog habitat is critical to long-term survival of frog populations. Foothill yellow-legged frogs could be adversely affected by thermal conditions that create barriers to migration and result in small, isolated breeding populations with low resiliency to perturbations. Project-affected reaches that are too cold or too warm and Project reservoirs may represent dispersal barriers and create reproductive isolation. Minimum flows in Project reaches affect instream temperatures. SMUD proposes minimum flows in the Camino dam reach, SFAR reach, Ice House reach, Junction dam reach, and Slab Creek dam reach that could decrease instream temperatures, affecting foothill yellow-legged frog populations. Additionally, altered flow regimes may also create aquatic habitat conditions that favor introduced coldwater species such as brown trout or warmwater species such as smallmouth bass and bullfrog that prey on foothill yellow-legged frogs, western pond turtles, and/or mountain yellow-legged frogs.

Although there are no known populations of mountain yellow-legged frogs within the Project reaches, suitable habitat may be available in higher elevations (e.g., upper reaches of Gerle Creek below Loon Lake dam). Mountain yellow-legged frogs occur mostly within ponds or lakes, but could potentially breed and disperse in coldwater Project reaches. Trout prey on mountain yellow-legged frog tadpoles, therefore managing high-elevation reaches with potential mountain yellow-legged frog habitat (Rubicon dam reach, Buck Island dam reach, Loon Lake dam reach, Gerle Creek dam reach, and Robbs Peak dam reach) for trout population growth would reduce the likelihood of successful mountain yellow-legged frog breeding. Higher minimum flows in these reaches, however, are expected to maintain coldwater conditions, which is favorable to mountain yellow-legged frog habitat.

Rubicon and Buck Island Dam Reaches—The mountain yellow-legged frog has not been found in these reaches, although Rubicon reservoir is within the range of the mountain yellow-legged frog (6,500-foot elevation), and there is potential habitat. The nearest known populations of mountain yellow-legged frogs are at elevations greater than 7,500 feet, in Highland Creek that flows into Rockbound Lake.

Under the Settlement Agreement, the primary objectives for the Rubicon dam reach and the Buck Island dam reach are to provide cold freshwater habitat for healthy rainbow trout and mountain yellow-legged frog populations, and less conducive conditions for California roach, speckled dace, and golden shiners. Increased minimum streamflow releases in both reaches would slightly lower May and June water temperatures in both reaches providing cooler and more stable conditions and increasing potential habitat for mountain yellow-legged frogs.

Loon Lake Dam Reach—All of Loon Lake dam reach (8.5 miles) is currently considered coldwater habitat. The mountain yellow-legged frog has not been found in the Loon Lake dam reach, although the upper end of the reach is within the elevational range and there is potential habitat. The absence of mountain yellow-legged frogs may be due, in part, to the predatory brown trout population.

Under the Settlement Agreement, the primary objectives for the Loon Lake dam reach are to provide cold freshwater habitat for healthy rainbow trout, non-native brown trout, and mountain yellow-legged frog populations, and make the flows more closely resemble the natural hydrograph. Increased minimum streamflows during May through September, with the largest increases occurring in May and June, would slightly lower May and August water temperatures, and moderately lower water temperatures during June and July (see section 3.3.2.2, *Water Resources*), providing cooler and more stable conditions and increasing potential habitat for mountain yellow-legged frogs, but also for predatory trout.

Gerle Creek Dam and Robbs Peak Dam Reaches—Mountain yellow-legged frogs and foothill yellow-legged frogs have not been found in these reaches, although there is potential habitat (CDFG, 2007). Predatory brown trout occur in Gerle Creek dam and Robbs Peak dam reaches because the upstream Loon Lake dam reach is managed for this non-native sportfish.

Under the Settlement Agreement, the objectives include providing cold freshwater habitat for healthy mountain yellow-legged frog populations in the Gerle Creek dam reach, and providing cold freshwater habitat for healthy mountain yellow-legged frog and foothill yellow-legged frog populations in the Robbs Peak dam reach. Increased minimum streamflow releases from both Gerle Creek dam and Robbs Peak dam during May through September, with the largest increases occurring in May and June, would somewhat lower May through mid-August water temperatures, and slightly increase September water temperatures. We anticipate that the largest reduction in temperatures would occur in the Robbs Peak dam reach due to the proposed minimum streamflow releases that are more than four times the current requirements in May and June. Therefore, the proposed minimum flows may provide potential habitat for the mountain yellow-legged frog that is cooler and more stable than current conditions, particularly in upper Robbs Creek dam reach, where optimal temperatures for the mountain yellow-legged frog are currently exceeded in the summer months. The proposed minimum flows may also provide potential habitat for the foothill yellow-legged frog in the lower end of the reaches. However, these reaches are not within the optimal elevation ranges for these species (too low for the mountain yellow-legged frog, too high for the foothill yellow-legged frog), and the proposed minimum flows would also provide more habitat for predatory trout.

Ice House Dam Reach—Ice House dam reach is at the upper elevation range for the foothill yellow-legged frog, and the upper 7 miles of the 11.5-mile long reach is considered coldwater habitat. Extant foothill yellow-legged frog populations were not found in this reach during relicensing surveys. There are no temperature objectives for Ice House dam reach, although under the Settlement Agreement, primary objectives for this reach are to provide temperatures that allow for management of native coldwater fishes and to not preclude foothill yellow-legged frog breeding if they recolonize the reach.

Increased minimum streamflow releases during May through July of all years, and August and September of CD and Dry years (see section 3.3.2.2, *Water Resources*) would further reduce water temperatures and maintain temperatures less than 20°C throughout the reach in BN water years. The proposed minimum flows may create water temperatures that are too cool to provide potential foothill yellow-legged frog breeding and rearing habitat throughout most of the reach. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Junction Dam Reach—The entire 8.3-mile-long Junction dam reach is considered coldwater habitat. Extant populations of the foothill yellow-legged frog were not found in this reach during relicensing surveys. Primary objectives of the Settlement Agreement are to provide temperatures that allow for management of native fishes, provide habitat for healthy foothill yellow-legged frog populations, and provide habitat for healthy macroinvertebrate populations in the entire reach. Water temperatures in upper 2 miles were too cold to support foothill yellow-legged frog reproduction (~8°C) during 2004 amphibian surveys.

Increased minimum streamflows during May through July of all water year types, in August of Dry and CD years, and September of CD years would substantially reduce temperatures in the reach, and the proposed reduction of minimum streamflow releases for August and September of AN and Wet years would increase temperatures in the reach slightly. Mean daily temperatures under the proposed minimum streamflow releases are expected to remain below 20°C and may further decrease the amount of potential foothill yellow-legged frog habitat. Warmer temperatures are expected in low velocity, edgewater habitat that may be used by the foothill yellow-legged frog.

There are no specified temperature objectives for the Junction dam reach except during Wet water years, when SMUD would release water blocks to maintain mean daily temperatures of less than or equal to 20°C, as measured at the lower end of the reach, just upstream from Camino reservoir. In Wet water years, the temperature in the lower end of the reach could also be less than optimal for foothill yellow-legged frogs because of the water block release could further decrease the amount of potential foothill yellow-legged frog habitat. If the water temperature in the Junction dam reach is exceeded prior to release of the Wet year water block, SMUD would monitor for the presence of foothill yellow-legged frogs prior to and after the release of a block of water. The monitoring would allow SMUD and the Agencies to implement adaptive management measures, discussed below, as needed, to protect foothill yellow-legged frogs during water block releases.

Although surveyors found temperatures suitable for foothill yellow-legged frog breeding in lower Junction dam reach in 2004, large algal mats cover the substrate and probably prevent successful reproduction. The algal mats are indicative of elevated water temperature, nitrate, or other water quality issues and their decomposition reduces DO in the water column. The proposed minimum flows may improve water quality in the lower end of the reach, and SMUD would develop an algal species identification and monitoring plan for the Junction dam, Camino dam, Ice House dam, and Slab Creek dam reaches to assess the distribution and possible adverse affects of alga(e) in the Project-affected reaches. Identification of the alga(e) and changing Project operations, as needed, to improved water quality could create potential foothill yellow-legged frog habitat in lower Junction dam reach if water temperatures are suitable (see section 3.3.2.2, *Water Resources*).

We also considered continuity and connectivity of appropriate thermal habitat to potential breeding populations of frogs. An objective of the Settlement Agreement is to provide connectivity of flows in the SFSC below Ice House reservoir dam through Silver Creek below Junction and Camino dams. If the upper reaches are too cold, this may increase the migratory barrier between the two reaches. The reservoirs may also be a migratory barrier to foothill yellow-legged frog dispersal. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Camino Dam and SFAR Reaches—The 6.2-mile-long Camino dam reach and the 2.6-mile-long SFAR reach down to Camino powerhouse would be potentially affected by the increased flows. The upper 3 miles of the Camino dam reach is currently coldwater habitat; all of the SFAR reach is currently warmwater habitat. SMUD surveys in 2003 and 2004 documented breeding populations of foothill yellow-legged frog in the Camino dam reach and the SFAR reach.

Primary objectives of Proposed Article 1-1, *Minimum Streamflows*, are to increase minimum flows in the Camino dam reach to benefit native fishes, improve habitat conditions for healthy foothill yellow-legged frog populations, and provide habitat for healthy macroinvertebrate populations in the entire reach. There are no specified water temperature objectives for the SFAR reach except during Wet water years. Within 2 years of license issuance, a telemetry system would be installed to provide hourly temperature monitoring data (see section 3.3.2.2, *Water Resources*). Micro-thermographs would be used to monitor the stream margin, edgewater habitats that are known or suitable foothill yellow-legged frog breeding sites.

Increased minimum streamflows during May through July of all water year types, in August of Dry and CD years, and September of CD years would reduce mean daily temperatures in Silver Creek upstream of the confluence with the SFAR May through July, but still remain above 12°C from mid-May through September. It appears that mean daily temperatures at the lower end of the Camino dam reach would seldom exceed 20°C in May though July of BN years, and would occasionally exceed 20°C in August. In Dry years, the increased minimum streamflow releases would reduce temperatures in lower Camino dam reach although it is not evident whether these reductions would lower temperatures to less than 20°C, particularly in July and August (see section 3.3.2.2, *Water Resources*). Therefore, it appears there may be less warmwater habitat for foothill yellow-legged frogs in lower Camino dam reach during some water years (e.g., BN) after implementation of the new minimum flow, than under the current conditions. The SFAR reach would continue to provide warmwater habitat for the foothill yellow-legged frog during all water year types because implementation of the Camino dam reach minimum flows would have little influence on water temperature in this reach due to the relatively large contributions of inflow from the SFAR (see section 3.3.2.2, *Water Resources).*

The proposed minimum flows in the Camino dam reach during the foothill yellow-legged frog reproductive season (May through September) would generally be less than 50 cfs, except in May of BN, AN, and Wet years (68 cfs) and June of AN and Wet years (59 cfs). DTA and Stillwater (2004c) concluded that flows of 20 to 50 cfs provided moderate to high quality habitat for foothill yellow-legged frog egg deposition and tadpole rearing in the Camino dam and SFAR reaches. They also concluded foothill yellow-legged frog breeding and rearing habitat in these reaches decreased to low quality at 100 cfs; however, further monitoring may be needed to definitively reach this conclusion. For example, in the North Fork Feather River, initial studies (2003–2004) lead to conclusions that optimal foothill yellow-legged frog breeding and tadpole rearing habitat would decrease as instream flows increased above 150 cfs, and that 150 cfs provided the greatest amount of suitable habitat (GANDA, 2004). Later monitoring results (2005–2006) indicated that initial conclusions regarding the relationship of foothill yellow-legged frog habitat and flow were not correct, and that at current (depressed) population levels habitat did not appear to be a limiting factor at higher flows. Foothill yellow-legged frog populations are also depressed in the Camino dam reach, and the proposed minimum flows would be expected to provide more foothill yellow-legged frog breeding and rearing habitat during all water year types than current conditions as long as water temperatures are suitable.

Low flows have the potential to be over-topped by spill events, turbine trips, or fluctuations caused by upstream projects. Higher minimum flows would reduce the difference between operational flow fluctuations and normal operating conditions and reduce the risk of egg mass desiccation and tadpole stranding from any flow perturbations. The proposed minimum flows would also provide a more natural hydrograph to initiate timely foothill yellow-legged frog breeding triggers.

During Wet water years, SMUD would also be required to release blocks of water into Camino dam reach during July, August, and/or September to maintain temperatures less than or equal to 20°C below Camino dam. The water block releases may create unseasonal temperature and flow fluctuations that could adversely affect developing tadpoles and metamorphs (tadpoles becoming frogs) in both reaches during Wet water year types. If the water temperature in the Camino dam reach is exceeded prior to release of the Wet year water block, SMUD may be required to monitor for the presence of foothill yellow-legged frogs prior to and after the release of a block of water. The monitoring would allow SMUD and the agencies to implement adaptive management measures, discussed below, as needed, to protect foothill yellow-legged frogs during water block releases.

Brush Creek Dam Reach—All of the Brush Creek dam reach (2.2 miles) is considered coldwater habitat. There is potential foothill yellow-legged frog habitat in the reach. The primary Settlement Agreement objectives for the reach include providing habitat for healthy foothill yellow-legged frogs and macroinvertebrates. Under Proposed Article 1-1, *Minimum Streamflows*, minimum streamflow releases would be increased to a range of 3 to 9 cfs or natural flow, or 1 cfs if natural inflow is less than 1 cfs. The proposed minimum streamflows would provide more cool water at the upper end of the bypassed reach, and are expected to result in somewhat cooler temperatures throughout the reach. Providing minimum streamflow releases of 1 cfs when the natural flow is less than 1 cfs is expected to somewhat reduce temperatures, at least in the uppermost part of the upper bypassed reach (see section 3.3.2.2, *Water Resources*). The proposed minimum flows would provide more stable flows for foothill yellow-legged frogs during the reproductive season, if water temperatures are suitable. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for foothill yellow-legged frogs.

Slab Creek Dam Reach—Currently, the upper 4 miles of the 8-mile-long Slab Creek dam reach are considered coldwater habitat. This reach has the most extreme temperature fluctuations of all the reaches in the Project, and does not provide appropriate magnitude or timing of flows to trigger foothill yellow-legged frog breeding (CDFG, 2007). Slab Creek dam reach is designated both cold and warm freshwater beneficial uses and should support a transitional community between cold and warm water species. Regarding western pond turtle sightings, two young western pond turtles were seen in 2003 by Forest Service surveyors downstream from Slab Creek reservoir in the SFAR between Rock Creek and Chili Bar reservoir. There is also an unconfirmed report of a single foothill yellow-legged frog in Slab Creek dam reach. Additionally, the Forest Service observed western pond turtle approximately 0.5 mile upstream of the White Rock powerhouse.

There are no specified temperature objectives for the Slab Creek dam reach; however, primary objectives for the reach include providing temperatures that improve habitat conditions for healthy populations of foothill yellow-legged frogs and hardhead; allow management of native fish; and reduce non-native species such as bullfrogs and bass. Micro-thermographs would be used to monitor the stream margin, edgewater habitats that are known or suitable foothill yellow-legged frog breeding sites. As discussed below under *Monitoring and Adaptive Management Programs*, under Proposed Article 1-6(9), *Adaptive Management Program*, the Agencies would have the opportunity to use the temperature monitoring results to determine whether the water temperature that is currently used is an indicator of breeding initiation (12°C mean daily temperature for a 7-day running average), should be increased or decreased.

Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Slab Creek dam during May through September of all water year types. Modeling indicates that the proposed minimum flows would substantially reduce mean daily temperatures at the lower end of the Slab Creek dam reach in BN water years to approximately 10-15°C in May, 14-21°C in June, 19-22°C in July, 17-21°C in August, and 13-19°C in September. These simulations suggest that mean daily temperatures could exceed 20°C in the lower one-third of the reach in June and July, and the lowest mile in August during BN water years. The proposed minimum streamflow releases would probably reduce warming in other water year types although there is insufficient information to quantify these reductions or determine the areas where mean daily temperatures would still exceed 20°C (see section 3.3.2.2, *Water Resources*).

The proposed minimum flows would provide a more natural hydrograph and would reduce the difference between operational flow fluctuations and normal operating conditions. Therefore, the proposed minimum flows during the foothill yellow-legged frog reproductive season would reduce the risk of egg mass desiccation and tadpole stranding from any flow perturbations and maintain suitable temperatures in the lower reach to provide potential foothill yellow-legged frog habitat.

Current conditions in lower Slab Creek dam reach, including warmwater and perennial flow during the summer and early fall favor potential competitors and predators such as bullfrogs, crayfish, and bass that prey on foothill yellow-legged frog and western pond turtle hatchlings. Increased minimum streamflows in the spring could benefit foothill yellow-legged frogs and western pond turtles by dislodging second year bullfrog tadpoles from pools. If higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

We also considered continuity and connectivity of appropriate thermal habitat to potential breeding populations of frogs. An objective of the Settlement Agreement is to provide connectivity of flows in the SFAR above Slab Creek reservoir and below the Slab Creek dam. It currently appears that the foothill yellow-legged frog population is more robust upstream in the Camino dam reach where July maximum water temperatures were approximately 24ºC in 2001, 22ºC in 2002, and 21ºC in 2003. If the upper portion of the Slab Creek dam reach is too cold after implementation of the proposed minimum flows, this would increase the migratory barrier between the two reaches (Kupferberg, 2006). Slab Creek reservoir may also be a migratory barrier to foothill yellow-legged frog dispersal. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Operation of the proposed Iowa Hill development has the potential to affect the water temperature of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam. Simulated mean water column temperatures for Slab Creek reservoir near the dam were as much as 0.87°C cooler and averaged 0.39°C cooler, and streamflow releases from Slab Creek dam also were slightly cooler for the heavy use scenario than the without Iowa Hill development scenario (see section 3.3.2.2, *Water Resources*). It is unlikely that these small changes would affect the quality of potential foothill yellow-legged frog habitat.

Iowa Hill Development—Downstream of Slab Creek reservoir only one foothill yellow-legged frog was observed in the SFAR in 2004, at a distance of 6 miles downstream of Slab Creek dam. Effects on foothill yellow-legged frogs would occur primarily in their habitat downstream because the reservoir itself is not habitat for foothill yellow-legged frogs, but acts as a barrier to habitat connectivity. Operation of the proposed Iowa Hill development has the potential to affect the water temperature of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam, although simulated flows from modeling show these water temperature changes are minor. Article 140 proposes protective measures that ensure fluctuating flows would not dislodge egg masses or tadpoles of any reproductive foothill yellow-legged frogs occurring below Mosquito Bridge, and water temperatures would not affect foothill yellow-legged frogs by being too cool for their normal development. Implementing best management practices, obtaining all necessary permits and authorizations, and implementing a storm water pollution prevention plan would provide reasonable assurances that SMUD would protect water quality for foothill yellow-legged frogs. Assuming all of these measures are implemented, there should not be adverse effects to any possible foothill yellow-legged frog populations downstream, although it is unknown whether these measures would be effective since the Iowa Hill development has not been implemented. Based on this information, the biological evaluation prepared by the Forest Service contains a determination that the Iowa Hill development may affect individual foothill yellow-legged frogs but is not likely to result in a trend toward federal listing or a loss of viability for the foothill yellow-legged frog (Williams, 2007b).

Due to the anticipated length of time between the existing foothill yellow-legged frog surveys and the actual undertaking of construction on the Iowa Hill development, conducting new surveys for foothill yellow-legged frogs prior to beginning of construction would provide up-to-date foothill yellow-legged frog location information. If information analyzed in the biological evaluation changes as a result of these surveys, the Forest Service may amend the biological evaluation prior to the beginning of construction (Williams, 2007b).

Chili Bar Dam Reach—PG&E surveys in 2004 documented tadpoles and an adult frog on Indian Creek, a tributary to SFAR downstream of Chili Bar dam. Western pond turtles were found on the mainstem SFAR near Coloma and in Greenwood Creek, a tributary. There are no specific water temperature objectives set for the Chili Bar reach; however, the primary objectives in the Settlement Agreement include providing habitat for healthy foothill yellow-legged frog, western pond turtle, and hardhead populations; increasing wetted perimeter to provide more suitable habitat for benthic invertebrates; and reducing or eliminating water quality conditions that encourage algae growth.

Proposed Article 2-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Chili Bar dam during May through September of all water year types. The proposed minimum streamflows would slightly lower water temperatures in the Chili Bar dam reach in May through September. We anticipate that this would reduce mean daily temperatures so that they no longer exceed 20°C and may decrease the amount of potential foothill yellow-legged frog habitat (see section 3.3.2.2, *Water Resources*).

Currently, flow fluctuations in the Chili Bar dam reach reduce habitat stability and consistency, which is necessary for foothill yellow-legged frog egg and tadpole development. In the span of 24-hours, flow fluctuations can inundate habitat creating depths and flows that are too deep and fast for foothill yellow-legged frogs or suitable habitat that is present at high flows becomes dewatered as flows recede. Although flow fluctuations under the proposed minimum flows would continue, providing higher minimum flows would reduce the difference between daily base and peak flows, which would result in more stable foothill yellow-legged frog habitat conditions and a lower probability that egg mass desiccation or tadpole stranding would occur.

During amphibian and reptile surveys, bullfrogs were observed at 7 of the 21 sites surveyed, including the Chili Bar dam reach near Scott Road. Current conditions in the reach, including warmwater and perennial flow during the summer and early fall, favors potential competitors and predators such as bullfrogs, crayfish, and bass that may prevent the successful establishment of the foothill yellow-legged frog and western pond turtle. Increased minimum streamflows in the spring could benefit the foothill yellow-legged frog and western pond turtle by dislodging second year bullfrog tadpoles from pools. If higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. With the exception of Slab Creek reservoir, Project operations at all reaches and reservoirs would remain unchanged from those described in the Proposed Action. No special status amphibians or reptiles occur within the Iowa Hill site. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Pulse Flows

Immobile foothill yellow-legged frog egg masses and developing tadpoles and metamorphs with limited mobility are particularly vulnerable to changes in flow. Proposed Article 1-2, *Pulse Flows*, would require SMUD to provide annual channel maintenance pulse flows in the Rubicon dam, Loon Lake dam, and Ice House dam reaches within three months after license issuance but not prior to implementation of the new minimum flows. Pulse flows would not be implemented in water years when natural spills provide flows of equivalent magnitude and duration during spring snowmelt runoff or a natural storm that occurs in the months of January through May in the specified watershed (for more specific information see sections 3.3.2, *Water Resources*, and 3.3.3, *Aquatic Resources*.

Our Analysis

The Ice House dam reach is the only reach with potential foothill yellow-legged frog habitat that may be affected by the proposed channel maintenance pulse flows. Studies in other California rivers have found that foothill yellow-legged frogs spend the winter months on smaller tributary streams, and migrate to large rivers during the spring-fall reproductive season. If in fact foothill yellow-legged frogs occupy this section of SFSC, we assume they would not be in the river when the pulse flows are scheduled to coincide with winter storms (December 15 to April 10) because foothill yellow-legged frogs occupy tributary stream habitat during the winter months.

Pulse flows that are scheduled to coincide with spring snowmelt runoff after April 10 could occur during the foothill yellow-legged frog reproductive migration, breeding, and egg laying periods. However, the proposed pulse flows are within the range of natural conditions (450 to 780 cfs; duration 5 days), and to date, the foothill yellow-legged frog has not been found in the Ice House dam reach. Foothill yellow-legged frog monitoring would be implemented, and if foothill yellow-legged frogs are found in the reach, adaptive management measures would be implemented in consultation with the agencies.

The mountain yellow-legged frog is not known to occur in the Rubicon dam, Loon Lake dam, and Ice House dam reaches. Therefore, the proposed pulse flows would have no effect on the mountain yellow-legged frog.

There are no pulse flows proposed in the Chili Bar dam reach.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Pulse flows at all reaches would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Ramping Rates

Immobile foothill yellow-legged frog egg masses and developing tadpoles and metamorphs with limited mobility are particularly vulnerable to changes in flow. Under Proposed Articles 1-3 and 2-2, *Ramping Rates*, SMUD and PG&E would implement the ramping rates described in section 3.3.3.2, *Aquatic Resources, Ramping Rates*.

Our Analysis

The proposed ramping rates for pulse flows, minimum instream flow releases, and/or whitewater recreational releases have the potential to affect foothill yellow-legged frogs or their potential habitat in the Ice House dam, Junction dam, Camino dam, and Slab Creek dam reaches. The proposed minimum flows in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in these reaches to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal, to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. Successful implementation of the ramping rates would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement.

The mountain yellow-legged frog is not known to occur within the Project-affected reaches. Therefore, the proposed ramping rates would have no effect on mountain yellow-legged frogs.

The proposed minimum flows in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in the Chili Bar dam reach to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal, to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. When the controlled ramping rates are successfully implemented, they would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Ramping rates at all reaches would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Recreational Streamflows

The whitewater recreation streamflow releases proposed in Slab Creek dam reach and Ice House dam reach (Proposed Article 1-24, *Recreation Streamflows*) and Chili Bar dam reach (Proposed Article 2-15, *Recreational Streamflows*) may affect foothill yellow-legged frogs or their potential habitat. The mountain yellow-legged frog is not known to occur in the Project reaches. Therefore, the proposed recreational streamflows would have no effect on mountain yellow-legged frogs. The proposed recreational streamflows below Slab Creek dam and Ice House dam are described in section 3.3.6.2, *Recreational Resources.*

Our Analysis

Other studies in northern California rivers have found foothill yellow-legged frog egg masses are deposited on the declining limb of the hydrograph (GANDA, 2006). This is a natural adaptation to California river systems that experienced predictable cycles of high spring run-off followed by low summer base flows prior to hydropower developments (Mount et al., 2006). Therefore, uncontrollable and/or untimely whitewater recreation streamflows may initiate foothill yellow-legged frog egg deposition or site selection that may result in desiccation when the flows recede, or detachment of existing egg masses. Developing tadpoles and metamorphs with limited mobility are also vulnerable to changes in flow.

Preliminary research in experimental conditions indicates that the critical velocity that tadpoles are flushed out of the substrate is probably between 20 to 40 centimeters/second (Mount et al., 2006). During the experiments, less than 50 percent of the tadpoles that were flushed into higher velocity habitat (10 to 15 centimeters/second) were able to find low-flow refugia in the substrate or swim cross-current to lower velocity areas. Tadpoles that have been flushed out of the substrate or stranded in isolated pools are at higher risk of predation from aquatic and terrestrial predators, as well as desiccation as isolated pools recede.

The magnitude of the recreational flow releases proposed for mid-March through May 31 are within the range of natural conditions; however, the short-durations of these flows are outside the range of natural conditions and may adversely affect foothill yellow-legged frog egg masses. Effective implementation of the proposed ramping rates when the recreational flow releases occur would be essential to the protection of egg masses. If foothill yellow-legged frogs are found in the SFSC and water temperatures at SFSC 1 rise above 12°C mean daily temperature for a 7-day running average at USGS gage 11441500 (the temperature assumed to initiate foothill yellow-legged frog breeding), or if water temperatures in the Slab Creek dam reach rise above 12°C mean daily temperature for a 7-day running average at SFAR 6, SMUD would cancel the recreational flows unless the Agencies determine that such events are compatible with protection of foothill yellow-legged frogs and other biological resources. SMUD would provide notice to the Commission, the Forest Service, the

Water Board, and CDFG within 10 days of determining that the above temperature trigger has been met in either of these scenarios, causing cancellation of the recreational streamflows in either of these reaches. SMUD would provide notice to the Commission if the Forest Service, the Water Board, and CDFG approve a modification to the water temperature trigger.

SMUD would attempt to avoid spilling at Slab Creek dam and Camino dam once foothill yellow-legged frog breeding has been initiated. If a spill does occur, the licensee would make a good faith effort to manage the spill to minimize flow fluctuations in the SFAR. If the Agencies determine that spills below Slab Creek dam and/or Camino dam are resulting in unacceptable environmental impacts based on aquatic species and temperature monitoring, appropriate mitigation measures would be developed and implemented upon approval of the Agencies.

Larger/later developmental stage tadpoles appear less able to withstand increasing water velocities than mid-developmental stage tadpoles, and late summer pulse flows may have greater negative effects than previously expected (Mount et. al, 2006). No recreational flow releases are proposed from June 1 through September 30 to protect foothill yellow-legged frog tadpoles and metamorphs.

Studies also indicate that fall recreational flow releases may cause large numbers of benthic macroinvertebrates to enter the drift and be exported downstream (Kupferberg, 2006). As a result, less insect food may be available for foothill yellow-legged frog metamorphs in the fall, prior to the on-set of winter. If the Agencies determine that unacceptable environmental impacts are occurring in the Slab Creek dam reach due to October recreational streamflows based on amphibian monitoring, adaptive management measures may include but are not limited to cancellation of the October recreational streamflows.

Therefore, implementation of the proposed timelines, ramping rates, monitoring, and adaptive management measures would be important to determine if any adverse impacts on foothill yellow-legged frogs are occurring as a result of recreational flow releases.

Recreational streamflows within the reach downstream of Chili Bar dam have the potential to affect foothill yellow-legged frog egg masses, tadpoles, and metamorphs, as described above. No foothill yellow-legged frogs were located during relicensing surveys on the mainstem SFAR within this reach and habitat was classified as low to moderate. If foothill yellow-legged frogs inhabit this reach in the future, amphibian monitoring discussed below would identify any adverse effects occurring as the result of streamflow modifications. Subsequently, the adaptive management program proposed in Proposed Article 2-5, *Adaptive Management Program*, would provide a mechanism to alter recreational flows in the future if it’s determined to be necessary.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Therefore, recreational streamflows would not increase after year 15, and the potential recreational streamflow effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action up until year 15.

Monitoring and Adaptive Management Programs

The effects of the proposed minimum flows, decreased water temperature, pulse flows, ramping rates, and recreational streamflows on all life history stages of the foothill yellow-legged frog, mountain yellow-legged frog, and western pond turtle are unknown. Therefore, monitoring the response of all life stages of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles over time would be necessary to evaluate potential effects of the proposed flow changes, along with effective adaptive management changes, as needed.

Within 1 year of license issuance SMUD proposes to develop an amphibian and reptile habitat evaluation and species presence monitoring plan in consultation with the Agencies and would implement it following review and approval. SMUD would conduct protocol-level surveys for the foothill yellow-legged frog in a sub-sample of appropriate habitat types to document species presence and distribution and identify amphibian breeding and larval periods in Project-affected reaches. The first year of the surveys would determine the timing and success of egg laying, tadpole rearing, metamorphosis, and size/condition of metamorphs. SMUD would also place micro-hydrothermographs for future monitoring within the stream margins in the Camino and Slab Creek dam reaches. Monitoring sites would include: (1) Junction dam reach; (2) Camino dam reach; (3) Slab Creek dam reach; and, (4) Rock Creek, a SFAR tributary located upstream of the White Rock powerhouse, from the confluence with SFAR to a point 1 mile upstream. Monitoring would occur in the Rock Creek and Camino dam reach during spill flows that happen after water temperatures rise above 12°C mean daily temperature for a 7-day running average in the SFAR. This monitoring would determine effects on amphibians, fish, and aquatic reptiles as soon as possible after the decline of the spill.

SMUD proposes monitoring frequency as follows: (1) years 2, 3, 5, 10, 15 and thereafter for every 5 years for the term of the license in Junction dam reach; (2) as soon as possible after the decline of spill flows in Slab Creek and Camino dam reaches; (3) years 1, 2, 3, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 5 years for the term of the license in the Camino dam reach; (4) years 1, 2, 3, 4, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 5 years for the term of the new license in Slab Creek dam reach; and, (5) years 1, 2, 3 in Rock Creek.

SMUD also proposes to develop, within 1 year of license issuance, an amphibian flow fluctuation monitoring plan in consultation with the Agencies and implement it upon approval in order to determine if flow fluctuations are displacing egg masses or tadpoles. SMUD would conduct visual surveys for the foothill yellow-legged frog in the Camino dam reach at any time between June and September when streamflows are 100 cfs or less and the flows fluctuate more than 40 cfs or more over 1 week's time. SMUD would record water velocities and discharge. If possible, SMUD would provide advance notice to the Agencies if such fluctuations are going to occur and conduct visual surveys before and after the fluctuations. These surveys could be discontinued if the Agencies determine that the flow fluctuations could occur without egg mass or tadpole displacement.

Proposed Article 1-5, *Monitoring Program*, would also require SMUD to develop a mountain yellow-legged frog monitoring plan in consultation with the Agencies within 2 years of license issuance. Protocol surveys for sensitive species, using the procedures of CDFG (2001), would be conducted in a subsample of appropriate habitat types to document the presence/absence and distribution of mountain yellow-legged frogs. Surveys would focus on the presence/absence of larval stages by periodically surveying reaches with known populations during the spring/summer. Rubicon reservoir, Rockbound Lake, and Buck Island reservoir would be monitored for the mountain yellow-legged frog during years 5, 10, 15, and every 10 years thereafter for the term of the license.

SMUD would also implement an *Adaptive Management Program* (Proposed Article 1-6) within 3 months of license issuance. The program would generally consists of: (a) implementation of a monitoring program; and (b) specific adaptive management measures that would be implemented if the Monitoring Program and other information indicate that the applicable resource objectives identified in the Rationale Report (CDFG, 2007) would likely not be met without adjustment of the initial conditions. For purposes of the Adaptive Management and Monitoring Programs, each year is a calendar year, January through December. Year 1 is the first year that all initial streamflows required by the license are implemented by May 1. Specific components of the Adaptive Management Program which are associated with special status amphibians and reptiles include: (1) cancellation of pulse and recreational streamflows in SFSC due to water temperature; (2) cancellation of recreational streamflows in SFAR due to water temperatures; (3) avoiding untimely spill events in the Slab Creek and Camino dam reaches; (4) cancellation of October recreational streamflows in the Slab Creek dam reach if monitoring determines there are unacceptable environmental effects; and (5) alteration of the water temperature used as the trigger for foothill yellow-legged frog breeding.

The Chili Bar Monitoring Program (Proposed Article 2-4, *Monitoring Program*) would require PG&E to consult and coordinate with SMUD and the Agencies to implement a monitoring program through the term of the new license. Within 1 year of license issuance, PG&E proposes to conduct protocol surveys for special status, sensitive (foothill yellow-legged frog and western pond turtle), and listed amphibians (California red-legged frog), to determine the presence and distribution of special status amphibians and reptiles and to evaluate the potential effects resulting from streamflow modifications. The other Chili Bar survey parameters would be the same as the protocol surveys described for the foothill yellow-legged frog, above. The survey area would be both banks of the entire reach downstream of Chili Bar dam (from CB-A15 to Ponderosa Campground). Monitoring would be conducted in years 2, 3, 5, 6, 10, 11, 15, 16, and 2 consecutive years during every 5 years for the term of the license. PG&E also proposes to implement an *Adaptive Management Program* (Proposed Article 2-5) which would implement the monitoring program and specific adaptive management measures if the monitoring program and other information indicate that resource objectives identified in the Rationale Report are not being met.

Our Analysis

Mountain yellow-legged frogs have not been found in the Project-affected reaches or reservoirs despite suitable habitat, perhaps due to populations of predatory fishes and bullfrogs. However, mountain yellow-legged frogs may use Project-affected reaches as migratory corridors. Monitoring would determine the presence/absence and distribution of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles in Project-affected reaches, and help identify potential migration/dispersal barriers. The proposed monitoring would also identify the potential effects of the proposed changes in minimum flows, operational spills, channel maintenance pulse flows, ramping rates, and the recreational streamflow releases on all foothill yellow-legged frog life stages.

Studies on the North Fork Feather River in northern California (GANDA, 2006) concluded that the river water temperatures must meet a strict temperature threshold before foothill yellow-legged frogs initiate breeding, and that the absolute flow level was not as important to the initiation of egg deposition as the location of the flow on the declining hydrograph. Researchers suspect that suitable water temperatures to initiate foothill yellow-legged frog breeding may be site-specific, and water temperatures that initiate breeding on one river cannot be extrapolated to another (Kupferberg, 2006). Monitoring in the stream margin habitats associated with known or suitable breeding sites in the Camino dam reach and the Slab Creek dam reach in years 1 to 5 would establish the mean water temperature trigger for foothill yellow-legged frog breeding in these reaches.

It is difficult to predict how higher minimum flows and lower water temperatures would influence the rate of tadpole development (Kupferberg, 2006). Although cool temperatures are required for foothill yellow-legged frog breeding, foothill yellow-legged frogs evolved in relatively low elevation systems with warm summer temperatures that facilitate the rapid maturation of young of the year. Cooler temperatures during the foothill yellow-legged frog rearing period may slow development of foothill yellow-legged frog eggs, tadpoles, and metamorphs to some unknown degree. Possible effects include increased risk of predation or displacement due to longer periods of immobility or low mobility. The water temperature monitoring data and the visual survey data would be used to determine how the proposed minimum flows would affect other foothill yellow-legged frog life stages.

If the foothill yellow-legged frog or mountain yellow-legged frog populations are negatively affected by changes in flows and ramping rates specified in a new license and subsequent water temperature changes, then monitoring could identify these factors and could provide a timely adaptive management mechanism(s). The adaptive management measures would be implemented as needed, based on monitoring and streamflow gaging results, to protect foothill yellow-legged frogs, mountain yellow-legged frogs, and other amphibians and reptiles from detrimental flow releases in the Project-affected reaches.

To detect the effects of new license conditions on amphibian populations, lag times need to be incorporated into the design and interpretation of monitoring because the response of breeding populations may not be detected for years after the new discharge regimes have changed conditions for spawning and tadpole rearing (Kupferberg, 2006). This is a common problem because many amphibian species have greater than 2 years until sexual maturity. The proposed monitoring would provide an index of long-term changes in amphibian populations, following sufficient response time to streamflow modifications and other potential impacts.

As discussed previously, PG&E proposes changes in Project operations, such as minimum flows and recreational flows which could affect special status reptiles and amphibians in the Chili Bar reach. Monitoring would determine the presence and distribution of these special status species throughout the term of the license. As a result, monitoring would identify the effects of changes in streamflow on various life stages of special status reptile or amphibian and allow changes to take place through the Adaptive Management Program. Because monitoring would occur for 2 years every 5 years, it would provide index of long-term changes in amphibian populations, following sufficient response time to streamflow modifications.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Monitoring and adaptive management requirements would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs, western pond turtles, and mountain yellow-legged frogs would be the same as those described under the Proposed Action.

Large Woody Debris

Large woody debris is a critical component of functional and productive aquatic ecosystems and creates habitat for amphibians and macroinvertebrates. The Project reservoirs trap large woody debris and prevent downstream transport. Currently the large woody debris that accumulates in Project reservoirs is stockpiled and burned.

In Proposed Articles 1-9 and 2-7, *Large Woody Debris*, SMUD and PG&E, respectively, propose to allow mobile instream large woody debris equal to or greater than both 20-centimeters wide by 12-meters long (~8 inches by 39.5 feet) to continue downstream of the dams, provided conditions are safe and there is reasonable access and working conditions to do so. Smaller sizes may also be moved but SMUD would not be required to do so.

In Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes, in cooperation with the Forest Service, CDFG, and the Consultation Group, to identify all the large woody debris that is considered hazardous to boaters. The large woody debris would be relocated within the channel, with the Forest Service approval.

Our Analysis

The measures to pass large woody debris downstream of the dams would benefit foothill yellow-legged frogs and other amphibians and reptiles by providing substrate for macroinvertebrates, trapping organic material and sediment, creating pools, and slowing water velocity during peakflows.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Large woody debris management would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs and other amphibians would be the same as those described under the Proposed Action.

Secondary Effects of Wildlife and Plant Protection Measures

Project-related construction, operations, and maintenance activities that occur in riparian and aquatic habitats or migratory corridors may directly or indirectly affect foothill yellow-legged frogs and mountain yellow-legged frogs. The following measures to protect wildlife in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, are applicable to foothill yellow-legged frogs and other Forest Service Region 5 sensitive amphibians in Project-affected areas.

SMUD would complete a biological evaluation, including any necessary surveys, prior to new construction or maintenance authorized by the license on National Forest System lands that may affect Forest Service sensitive plant or wildlife species or its habitat. SMUD would include the Forest Service recommendations and ansy mitigation measures for the protection of sensitive species and/or their habitats in the biological evaluation.

If occurrences of Forest Service sensitive plant or wildlife species are detected prior to or during on-going construction, operation, or maintenance of the Project or during Project operations, the licensee(s) would immediately notify the Forest Service and FWS. If the Forest Service determines that the Project-related activities are adversely affecting the sensitive species, SMUD would, in consultation with the Forest Service and FWS, develop and implement appropriate protection measures.

Our Analysis

The wildlife protective measures in Proposed Article 1-12 and 2-9, *Wildlife and Plant Protection Measures*, would protect foothill yellow-legged frogs and other Forest Service sensitive amphibians from Project construction, operation, and maintenance activities that occur on National Forest System lands and have the potential to affect individuals, populations, and/or their habitats. Biological evaluations, surveys, and mitigations to protect these species would be developed in consultation with the FWS.

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The wildlife protection measures would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs and other amphibians would be the same as those described under the Proposed Action.

Secondary Effects of Recreational Measures

Project facilities and modifications proposed for recreational resources have the potential to affect terrestrial resources. Construction, expansion, and improvement of recreational facilities could result in the disturbance and loss of vegetation. Recreational fish stocking may increase the abundance and distribution of foothill yellow-legged frog and mountain yellow-legged frog predators.

The applicants both propose recreational enhancements, as specified in Proposed Articles 1-19, *Specific Recreation Measures* and 2-13, *BLM Recreation Improvements*. The specific recreational measures are described in greater detail in section 3.3.6, *Recreation Resources*. Specific measures proposed by SMUD that would result in vegetation disturbance include: (1) improvement or relocation of an existing trail on the west shoreline of Buck Island reservoir; (2) reconstruction or relocation of two trails in the high country near Rubicon development; (3) expansion of the Northshore Recreational Vehicle campground in the Loon Lake development; (4) construction of a new campground on the south shore of Loon Lake; (5) hardening an additional area of the Airport Flat campground within the Gerle Creek reservoir area; (6) extension of the Angel Creek trail within the Gerle Creek reservoir area; (7) additional parking area near the Azalea Cove campground within the Union Valley reservoir area; (8) expansion the West Point campground within the Union Valley reservoir area; (9) completion the Union Valley bike trail; (10) construction of access trails from North Union Valley Road; (11) construction of access trails from Icehouse Reservoir Lakeshore Road; (12) construction and development of the Highland Point day use area within the Ice

House reservoir area; (13) construction and development of the Upper Silver Creek Ice House day use area; (14) extension of the Ice House Mountain bike trail; (15) construction of boat launch sites at Slab Creek reservoir at Forebay Road; and, (16) construction of boat launch sites near the Slab Creek dam.

Under Proposed Article 1-26, *Fish Stocking*, SMUD would match the amount of fish stocked by CDFG, up to a total of 50,000 pounds for either CDFG or SMUD, of fish per year. SMUD would provide a minimum of 25,000 pounds of fish per year. The stocked fish would be distributed in Loon Lake, Union Valley, and Ice House reservoirs, as directed by CDFG.

Specific measures proposed by PG&E which would result in vegetation disturbance includes a gravel parking area off of Rock Creek Road and a new trail from the parking area to Chili Bar reservoir.

Our Analysis

Construction and improvements on new and existing recreational areas would cause the loss of some vegetation and wildlife habitat and create conditions favorable for the spread of noxious weeds. The special status plant, wooly violet occurs in numerous places around Union Valley reservoir, including near campgrounds. Additionally, increased recreational use could potentially increase human disturbance to wildlife. One of the goals of the proposed recreational improvements, however, would be to minimize dispersed recreation, which can affect vegetation and wildlife susceptible to human disturbance such as California spotted owl and nesting waterfowl. The loss of large areas of vegetation would likely have minor effects on wildlife from loss of habitat and displacement. The vegetation lost at the remaining areas is minimal and would be unlikely to affect wildlife. The proposed wildlife and plant protection measures and the noxious weed and vegetation management plans, discussed above, would limit potential effects of recreational improvements on special status species and the spread of noxious weeds. Recreational fish stocking may adversely affect mountain yellow-legged frogs in Loon Lake (elevation 6,410 feet). Union Valley and Ice House reservoirs are probably too low in the watershed for fish stocking to affect mountain yellow-legged frogs (5,450-foot and 4,870-foot elevation, respectively). Fish stocking may also adversely affect foothill yellow-legged frogs in the reaches downstream of these reservoirs, particularly Ice House dam reach, due to escapement.

The expansion of recreational facilities at the Chili Bar Project would result in the loss of some vegetation and wildlife habitat and create conditions favorable for the spread of noxious weeds. The vegetation lost would be minimal and would be unlikely to affect wildlife. The proposed wildlife and plant protection measures and the noxious weed and vegetation management plans, discussed above, would limit potential effects of recreational improvements on special status species and the spread of noxious weeds. Fish stocking is not proposed for the Chili Bar dam reach.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be built. Because no recreational developments are planned for Iowa Hill, the effects would be the same as for the Proposed Action.

Bald Eagle

The state endangered bald eagle currently nests at Loon Lake and Union Valley reservoirs. In addition to nesting bald eagles at Union Valley and Loon Lake reservoirs, wintering bald eagles can be found throughout the UARP area. No nesting or wintering bald eagles were observed during relicensing surveys within the Chili Bar Project boundary or the Iowa Hill development. Project operations, maintenance, and recreation all have the potential to disturb nesting bald eagles, decreasing their productivity. Additionally, electrocution or collisions with Project transmission lines could injure or kill bald eagles.

SMUD proposes, as specified in Proposed Article 1-5, *Monitoring Program*, to develop and implement a bald eagle monitoring plan within 6 months of license issuance in consultation with the Agencies. The plan would require SMUD to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS to ensure that bald eagle nesting is not being affected by Project-related activities. Additionally, SMUD proposes, as specified in 1-12, *Wildlife and Plant Protection Measures,* to develop an Avian Protection Plan within 1 year of license issuance, approved by FWS, that addresses retrofitting the problem Project transmission lines, to meet the design and siting standards established by APLIC standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994).

Our Analysis

Although bald eagles were federally delisted from the ESA on June 28, 2007, they continue to be federally protected by both the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Bald eagles are sensitive to a variety of human activities, especially during the nesting season. If bald eagles are disturbed during nesting or foraging, they have to expend additional energy and time being flushed from their nest or locating a different foraging area. If the disturbance is great enough, bald eagles may abandon their nests, reducing the productivity of that nest territory. Project activities that could disturb bald eagles include helicopter flights for inspection and maintenance and Project recreation, such as boating, fishing, hiking, camping, etc. Each individual nesting bald eagle pair has a different sensitivity to disturbance, based on such factors as acclimation and nest tree screening.

SMUD uses helicopters to access remote locations, primarily at the Loon Lake, Rubicon, and Buck Island reservoirs, although SMUD may occasionally fly over the Union Valley reservoir. The Loon Lake bald eagle nest was first observed in 2003. Prior to confirmation of bald eagle nesting, helicopter flights often flew near this location; however, since then SMUD observes a 0.5-mile buffer around the nest site. As long as 0.5-mile helicopter flight buffers are maintained around all nest sites, it is unlikely helicopter flights would adversely affect the bald eagle.

Extensive recreational facilities are located on Union Valley reservoir, including 11 campgrounds, three public boat launching ramps, and a paved bike/pedestrian path along the east side of the reservoir that passes directly through the nest area at Granlees Point. The Forest Service also manages a number of recreational facilities at Loon Lake reservoir, including developed and undeveloped campgrounds, boat launches, day use facilities, OHV areas, and numerous hiking trails including the Rubicon hiking trail that passes within 100 meters of the nest tree used in 2004. Several reconstructed, expanded, or new recreational facilities are proposed for both Union Valley and Loon Lake reservoirs (see section 3.3.6, *Recreation Resources*), including: (1) expansion of the Northshore Recreational Vehicle campground in the Loon Lake development; (2) construction of a new campground on the south shore of Loon Lake; (3) additional parking area near the Azalea Cove campground within the Union Valley reservoir area; (4) expansion the West Point campground within the Union Valley reservoir area; (5) completion the Union Valley bike trail; and (6) construction of access trails from North Union Valley Road.

Between 1986 and 2005, the Union Valley bald eagle nest territory produced 0.61 young/active breeding pair, which is below the Pacific Bald Eagle Recovery Plan (FWS, 1986) goal of 1 young/active breeding pair. Successful hatching was only observed in 2004 at the Loon Lake nesting territory; however, both bald eagle hatchlings died when they fell from the nest. The Bald Eagle and Osprey Technical Report (DTA, 2004f) suggests that late spring storms with unseasonable freezing temperatures and precipitation alternating between rain and snow during nesting season is the cause of the low productivity. Although it is likely the nesting bald eagles are accustomed to the current level of recreation at Union Valley and Loon Lake reservoirs, the Proposed Action would increase recreational facilities and therefore use. Although most Project recreation occurs during summer months, winter recreation also occurs with camping, cross-country skiing, snowshoeing, and snowmobiling.

Electrocution and/or collision with Project transmission lines also can adversely affect bald eagles. As discussed in section 3.3.4.2, *Terrestrial Resources*, the Bird-Powerline Associations Technical Report (DTA, 2004c) identified three transmission lines that do not met the design and siting standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994): (1) the Jones Fork-Union Valley 69-kV line; (2) the Brush Creek 12-kV tap line; and (3) high-elevation segments of the transmission line from Loon Lake powerhouse to just west of Camino powerhouse, including the Jones Fork-Union Valley transmission line segment, and an isolated segment near White Rock powerhouse that have overhead groundwires. The risk of bird electrocution increases when transmission lines do not have adequate spacing between conductors or the lines and the ground. This is especially true for highly susceptible raptors with large wing spans, like the bald eagle. Additionally, bald eagles are at risk for collision with transmission lines with overhead groundwires because their small size makes them less visible to birds. The proposed measure to prepare an avian protection plan would address retrofitting transmission lines to have them meet APLIC standards. Once all transmission lines meet these standards, the potential for avian electrocution or collision would be minimized.

SMUD's proposal to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS would allow nest productivity numbers to be assessed to determine if Project recreation is adversely affecting bald eagle fledging success. If monitoring shows Project activities are adversely affecting bald eagles, the adaptive management program proposed in Proposed Article 1-6, *Adaptive Management Program*, would allow Project activities to be changed. The monitoring, combined with making the 0.5-mile helicopter nest buffer official and preparing an avian protection plan, would minimize adverse effects on bald eagles and would be consistent with federal Bald Eagle Management Guidelines (FWS, 2007); however, in all, the UARP would be likely to adversely affect bald eagles.

Bald eagles are not known to occur in the vicinity of the Chili Bar Project. Therefore, the Chili Bar Project would not affect bald eagles.

Habitat Loss and Temporary Disturbance

The habitat within and adjacent to the proposed Iowa Hill development contains habitat for a number of plant and wildlife species, including species such as mule deer, California spotted owls, and myotis bats. Construction of the proposed development would clear approximately 141.5 acres of land. The loss of this habitat, as well as temporary disturbance during construction, could affect wildlife.

SMUD proposes to mitigate for the loss of wildlife habitat, as specified in Proposed Article 1-41, *Terrestrial Resources*, by purchasing lands prior to construction with an equivalent habitat value (or a conservation easement for an equivalent habitat value) to be managed as wildlife habitat over the term of the license. The Forest Service, FWS, and CDFG would determine the in-kind value of lands proposed to be purchased or obtained.

Our Analysis

Iowa Hill Development

Construction of the Iowa Hill development would require the clearing of approximately 141.5 acres of land, including approximately 95.4 acres for the upper reservoir, berm, and switchyard, 22.3 acres for the transmission line, 3.4 acres for the new road, and 20.4 acres of temporary use areas. The upper reservoir, berm, and switchyard would result in the loss of upland mixed-conifer forest and the transmission line would result in the conversion of mixed conifer forest to non-forested montane shrubland habitat. The temporary construction area would be revegetated. No riparian vegetation or wetlands would be affected by construction of the proposed development. The only wetland located within the Iowa Hill development is a small riverine wetland within the proposed transmission line corridor. SMUD would not place structures in this wetland; therefore, construction of the Iowa Hill development would not require wetland fill.

Special status species that would lose habitat as the result of Iowa Hill construction include the mule deer and California spotted owl. Construction of the Iowa Hill development would generally result in the loss of mule deer thermal cover, generally fair hiding cover, and localized areas of good quality forage habitat. However, construction of the proposed transmission line would eventually provide valuable foraging habitat and hiding cover for mule deer. The upper reservoir would cause some habitat fragmentation and hindrance to migrating mule deer. Additionally, during construction, noise and activity associated with site construction would temporarily cause mule deer to avoid the area surrounding construction. Suitable California spotted owl habitat exists within the Iowa Hill development habitat; however, there are no known nests within the development boundary. Construction of the Iowa Hill development would result in the loss of potential foraging and nesting habitat and temporary avoidance of the area during construction due to noise and activity.

Additional species that would lose habitat include the northern goshawk and various bat species. No northern goshawks were located within the Project during relicensing surveys and the closest Protected Activity Center is almost 1 mile away. The site does contain potential nesting and foraging habitat; however, which would be lost as a result of Project construction. Although no special status bats were located during relicensing surveys, habitat is suitable for bats utilizing snags, tree bark and man-made structures as roosts. Tree-roosting bat species would lose foraging habitat, whereas open water foraging species may benefit from the creation of new habitat.

SMUD proposes to mitigate for the loss in habitat by purchasing or acquiring a conservation easement of equivalent habitat value and managing it as wildlife habitat. Although we concur with the proposed measure, we are unable to analyze whether or not the proposed measure would adequately mitigate for the lost habitat without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals would be applied to the property. Once the property is purchased or obtained, we could assess its value at that time and ensure that appropriate wildlife management goals are met to mitigate for the loss of upland mixed-coniferous forest.

In addition to the proposed land purchase, SMUD proposes several other measures that would protect terrestrial resources during Iowa Hill construction. A measure contained within Proposed Article 1-12, *Wildlife and Plant Protection Measures*, discussed above, would require SMUD to conduct a biological evaluation, including necessary surveys prior to any new construction or maintenance on National Forest System lands. Conducting a biological evaluation and nest surveys prior to the proposed construction for rare species such as the California spotted owl and northern goshawk would ensure that breeding spotted owls or goshawks have not begun nesting in close proximity to the Project. The standard Forest Service 4(e) condition no. 3-24 prescribes SMUD to prepare and implement an erosion control plan which includes a requirement to revegetate disturbed areas with native plants. Additionally, SMUD proposes an invasive weed and vegetation management plan which also would implement sediment and erosion control and revegetation efforts, all of which would minimize the effects of Iowa Hill construction on wildlife habitat.

3.3.4.3 Cumulative Effects

Private land development, public land use, and hydropower development have cumulatively affected foothill yellow-legged frogs and mountain yellow-legged frogs in the American River Basin due to construction of roads, multiple land use practices, facilities and operations, and other development that fragment breeding populations.

Flow releases to benefit coldwater fisheries during the summer and early fall, and Project reservoirs may isolate foothill yellow-legged frog breeding populations. For example, it is likely that foothill yellow-legged frogs located in lower Slab Creek dam reach and lower Camino dam reach are reproductively isolated by coldwater water releases in upper Slab Creek dam reach and the Slab Creek reservoir (Kupferberg, 2006). The proposed minimum flow releases would not increase or decrease the current population fragmentation.

Previous management activities on National Forest System lands have reduced the amount and suitability of California spotted owl, northern goshawk, sensitive bat tree roosting, and Pacific fisher habitat in the Iowa Hill area. These include the Independence Cable Timber Sale, vegetation removal for the PG&E transmission line, and the Slab Creek Insect Salvage Sale. These Projects have reduced interior forest habitat and increased fragmentation of existing spotted owl, goshawk, and fisher habitat. These Projects have not substantially altered habitat availability for sensitive bat species, however, and, by increasing edge habitats may have improved foraging opportunities in some areas. Based on the Eldorado National Forest Schedule of Proposed Actions, there are no additional habitat altering activities currently being planned within or adjacent to the analysis area. Timber harvest on intermixed private timber lands within the area have contributed to a reduction of habitat. These effects, combined with the direct and indirect effects of the Iowa Hill development on up to 141 acres of habitat, would cumulatively reduce the ability of the area to support spotted owls, goshawks, and fisher, and would cumulatively affect the amount of foraging habitat available for owl site ED123. These effects also would cumulatively reduce the amount of bat roosting habitat available; however, as previously described, the presence of additional habitat edge and open water could improve foraging conditions for bats. Assuming that the Project is unlikely to affect maternal roost sites for pallid bats or Townsend's big-eared bats, the Project is unlikely to result in substantial cumulative effects on sensitive bat species.

3.3.4.4 Unavoidable Adverse Effects

The construction of the Iowa Hill development would result in the permanent alteration of 121.5 acres of wildlife habitat, of which 94.5 acres would be permanently lost to Project facilities.

3.3.5 Threatened and Endangered Species

3.3.5.1 Affected Environment

Five plant and animal species federally listed as threatened or endangered could be affected by the proposed Projects. These include the endangered Pine Hill ceanothus (*Ceanothus roderickii*) and Pine Hill flannelbush (*Fremontodendron decumbens*) and the threatened Layne's butterweed (*Seneco layneae*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and California red-legged frog (*Rana aurora draytonii*).

Pine Hill Endemic Plants

The Pine Hill formation, located in the western-most part of the UARP area, occurs on a formation of gabbro soils which support a number of rare plants, including three federally listed plants: Pine Hill ceanothus, Pine Hill flannelbush, and Layne's butterweed. Two additional species, the endangered El Dorado bedstraw (*Galium californicum*) and Stebbin's morning glory (*Calystegia stebbinsii*) have the potential to occur within the Pine Hill formation; however, they were not located during special-status plant surveys conducted by SMUD, and therefore are assumed to not occur within the Project boundary. A UARP transmission line crosses the Pine Hill Preserve, which comprises the Pine Hill and Penny Lane preserve units identified in the 2002 FWS recovery plan for gabbro soil endemics in the Central Sierra Nevada foothills.

Pine Hill ceanothus is a low-statured shrub that flowers during May–June. It is restricted to chaparral in open rocky areas on gabbroic soils of the Pine Hill formation. Potential habitat in the UARP area totals approximately 247.5 acres. It occurs primarily as a low shrub layer underneath taller native chaparral vegetation, but dense, tall stands of older chaparral appear to be less suitable for the species. Pine Hill ceanothus also occurs at the edges of road corridors and other periodically disturbed areas, including the middle of infrequently used transmission line access roads, and under transmission towers. However, it does not appear to tolerate frequently recurring or severe disturbance (e.g., OHV use or development). All known occurrences are within the bounds of the Pine Hill formation of El Dorado County; they are distributed among the northern, central, and southern parts of the formation.

SMUD conducted a detailed study of special-status plants within the Project boundary, including comprehensive field surveys during 2003 along the UARP transmission line near the Pine Hill Preserve. Survey methods followed California Native Plant Society guidelines for rare plant surveys. The UARP transmission line corridor runs approximately northeast-southwest, traversing private lands proposed for inclusion in the Pine Hill and Penny Lane units of the Pine Hill Preserve, but not currently protected. One large occurrence of Pine Hill ceanothus, consisting of thousands of stems, was located in the transmission line corridor within and near the proposed Pine Hill Unit. The plants form a vigorous understory in sparse to dense chaparral within the transmission line corridor, and also occur near roads and in clearings, including those created for transmission towers and associated vehicular access. Because Pine Hill ceanothus is a multi-stemmed plant and roots at the nodes (a form of asexual reproduction), it is unclear how many individual plants are present in this occurrence.

Pine Hill flannelbush is a perennial shrub that flowers from late April to early July. It is restricted to gabbroic soils of the Pine Hill formation in El Dorado County, California. It occurs in chaparral and cismontane woodland communities at elevations ranging from approximately 1,400 to 2,500 feet. Potential habitat identified in the UARP area totals approximately 247.5 acres. Of these, less than 1 acre is currently occupied by Pine Hill flannelbush. It most often occurs at the edges of road corridors or other periodically disturbed areas.

The special-status plant surveys located four populations of Pine Hill flannelbush within the Pine Hill Unit; these populations appear to be comprised of fewer than 15 plants, although the number of genetically distinct plants was unclear because the species often reproduces asexually. The plants were clustered near roads or in clearings, including clearings created for transmission line towers and access roads, and the occurrences had not been previously reported in the California Natural Diversity DataBase.

Layne's butterweed is a perennial herb that flowers from April to July. It occurs in chaparral in open rocky areas on gabbroic soils, including disturbed areas, or less frequently on serpentine. Potential habitat identified in the UARP area totals approximately 247.5 acres. The species most often occurs at the edges of road corridors or other periodically disturbed areas, although it does not tolerate frequently recurring or severe disturbance (e.g., OHV use or development). Most known occurrences occur within and adjacent to the Pine Hill formation of El Dorado County; there are occurrences in the northern, central, and southern parts of the formation. There are also a small number of records from elsewhere in El Dorado County, Tuolumne County, and Yuba County. Known occurrences range in elevation from approximately 650 to 3,300 feet and primarily occur on privately owned lands.

The special-status plant surveys located two large, diffuse occurrences of Layne's butterweed within the transmission line corridor, estimated to support several hundred to several thousand plants. The plants were clustered near roads and clearings, including those created for transmission towers and associated access roads.

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle habitat consists of elderberry thickets located in riparian woodlands, oak woodlands, or grasslands within the Central Valley watershed below 3,000 feet elevation. Adult valley elderberry longhorn beetles deposit their eggs in the bark of living elderberry plants and larvae bore into the pith of stems. The beetles' use of elderberries is not readily apparent; often the only exterior evidence is an exit-hole created by the larva just prior to pupation. A variety of branch sizes are used for larval development and pupation; although, stems 2-4 inches in diameter at the exit hole have been reported to be used most often. Infrequently, exit holes have been found in smaller branches less than 1.5 inches in diameter, but generally not in branches less than 1.0 inch in diameter. Thus, larvae appear to be distributed primarily in large, mature plants with stems greater than 1.0 inch in diameter near ground level.

SMUD conducted searches for elderberry plants (not valley elderberry longhorn beetle presence or exit holes) in the Project area via helicopter, automobiles, and on foot and included all areas where SMUD had legal access (e.g., ownership/easement rights, public lands) within 100 feet (as per FWS protocols for buffer zones) of Project features below 3,000 feet elevation where valley elderberry longhorn beetles could be directly or indirectly affected by Project construction (e.g., facility development or expansion, road construction), operation (e.g., recreational developments), and maintenance (e.g., vegetation clearing). The search area along the transmission line corridor included the area within approximately 200 feet of the transmission line centerline (i.e., 400-foot total width; this includes the 200-foot defined right-of-way plus the 100-foot-wide buffer on each side of the right-of-way). Elderberry shrubs or clumps were located at eight sites within the 400-foot-wide search area along the Project transmission line corridor during 2002 and 2003 surveys. Plants found at these locations were located directly beneath the transmission line or immediately adjacent to the line, and in one location a large plant was growing entirely within the steel lattice cage of the support tower.

With the exception of the plants found along the UARP transmission line corridor, no elderberry plants were found adjacent to existing Project facilities (i.e., dams, powerhouses, switchyards, appurtenant facilities) below 3,000 feet. Similarly, no elderberry plants were found at the site of the proposed Iowa Hill development or within the Chili Bar Project boundary. Stream reaches below UARP facilities were not included in the study area because elderberry plants growing along foothill streams generally occur above the high water mark unlike willow and cottonwood. As a result, elderberry plants that support the valley elderberry longhorn beetle are not likely to occur in stream fluctuation zones.

California Red-legged Frog

The historical range of the California red-legged frog extended through Pacific slope drainages from at least as far north as Sonoma County, California along the coast (possibly as far north as Mendocino County, if analyses by Shaffer et al. 2004 are valid) and inland from the vicinity of Redding, Shasta County south to Baja California, Mexico, including the Coast Range, Transverse Ranges, Central Valley, and west slope of the Sierra Nevada Range. Nearly all occurrences were at elevations below 3,500 feet. Biologists estimate that the California red-legged frog has been extirpated from at least 70 percent of its historical range, including an estimated 99 percent of known occurrences in the western foothills of the Sierra Nevada. Most of the known remaining populations are located in coastal counties from Ventura County north. In the Sierra Nevada foothills, very few populations are known to be extant, but there are recent records from each of the following counties: El Dorado, Placer, Nevada, Yuba, and Butte.

The California red-legged frog lays eggs from late November to late April in quiet water of stream pools, backwaters, ponds, and marshes. Emergent vegetation (often cattails or bulrushes) serves as attachment sites or braces for the egg masses. Larvae remain in these aquatic habitats until metamorphosis, which typically occurs between July and September, although over-wintering larvae have been found at some sites. The California red-legged frog requires still or slow-moving water for breeding and tends to remain in proximity (within 200 feet) of aquatic habitats except when dispersing. Occupied sites typically have dense riparian or shoreline vegetation, presumably because these are good foraging habitats and afford hiding cover from predators. The types of vegetation that seem to provide the most suitable structure are willows, cattails, and bulrushes. Hiding cover may also be afforded by partially submerged woody debris and undercut banks. Occupied sites also usually include areas of deep water (greater than 2.3 feet) and generally do not support populations of introduced fishes (such as sunfish, bass, or trout) or bullfrogs.

Seasonal dispersal of the California red-legged frog may occur upstream, downstream, or upslope of breeding habitats. Seasonal movements as far as 1 mile between aquatic habitats have been documented, and California red-legged frogs have been found in streams more than 2 miles from any possible breeding site. At various times, including during summer drought, frogs may use perennial seeps, springs, or deep pools in intermittent streams when other aquatic habitat are dry, or may seek shelter in existing burrows or the cracks at the bottoms of dry pools.

SMUD, in collaboration with PG&E, conducted a detailed study identifying potential California red-legged frog habitat within 1 mile of the proposed Projects' reservoirs and reaches, up to 5,000 feet in elevation. Potential habitat was initially identified at 12 sites (see table 3-59); however, field examinations further refined the areas of potential habitat. Following the potential habitat identification, Stillwater Sciences conducted protocol-level visual encounter surveys (VES) in areas identified as high or moderate habitat quality. No California red-legged frogs were located during these surveys within either the UARP or Chili Bar Project area; however, two areas of potential habitat were not surveyed due to lack of access.

Table 3-59. Description of sites and survey results at sites with potential habitat for California red-legged frog.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
UARP					
GC-8: SF Rubicon River	4,987	5 (3 day, 2 night)	High	Mainly pool with some low-gradient riffle and a minimal amount of run/glide. Boulder substrate with some silt, cobble, sand, gravel and bedrock. Ample margin vegetation and a large amount of aquatic and terrestrial cover.	No frogs of any species were found.
UV-1: Jones Fork Silver Creek	4,902	5 (3 day, 2 night)	High	Mainly run/glide with some pool. Sand substrate with small amounts of gravel. Several side/split channels, multiple lateral/point sand bars, and a small tributary that entered on the left bank near the top of the site. Margin vegetation (mostly grasses) in a majority of the reach	No frogs of any species were found.
UV-2: Big Silver Creek at Ice House Road	4,919	None	Moderate	Some side channel pool habitat. Large boulders in channel. Water velocity high near margins of channel	Site exhibited less habitat complexity than UV-1, and water velocity was unfavorably high.
UV-3: Tells Creek downstream of Ice House Road	5,065	None	High	Step-pool, moderate to high gradient morphology. Large boulders, some backwater pools. Downed wood	Lower suitability then UV-1
SC-3: SFAR at Mosquito Road Bridge	1,352	None	Moderate	Large substrates, shallow pools. High Gradient. Little vegetation along margin of channel	Site exhibits lower suitability than expected because of high stream gradient and limited vegetation cover.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
Chili Bar					
CB-2: Weber Creek	522	4 (2 day, 2 night)	Moderate	Perennial creek. Primarily pool and low-gradient riffle. The substrate was mainly bedrock, boulder and cobble. Abundant margin vegetation, grasses and overhanging vegetation. Aquatic vegetation (especially algae) was very thick in some parts.	California red-legged frogs not found. Bullfrogs abundant.
CB-4.1: Stock Ponds (A)	900	4 (2 day, 2 night)	Moderate	The larger of the two ponds, substrate is primarily silt with some sand. Some margin vegetation and grasses, some overhanging vegetation. Maximum water depth is 15 feet; water is very turbid and discolored.	California red-legged frogs not found. Bullfrogs present.
CB-4.2: Stock Ponds (B)	900	4(2 day, 2 night)	Moderate	The smaller of the two ponds. Substrate is predominantly silt with some sand. Abundant margin vegetation, mostly forbs, some emergent and submerged vegetation, ample aquatic vegetation and large woody debris. Shallower than Pond A.	California red-legged frogs not found. Bullfrogs present.
CB-7B: Hastings Creek	650	5 (3 day, 2 night)	Moderate	Small, perennial creek with split channels. Primarily run/glide with some low gradient riffle and pool. Substrates are mainly cobble and gravel. Margin grasses and forbs present in all of reach, ample willow and alder canopying stream.	California red-legged frogs not found. Bullfrogs present.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
CB-8B Greenwood Creek	672	5 (3 day, 2 night)	Low	Small, perennial creek with split channels. Mainly pool, run/glide and low-gradient riffle. Substrates are mainly cobble, gravel, and boulder. Margin vegetation, terrestrial cover, and overhanging vegetation are prominent. Willow and grasses appear dominant.	California red-legged frogs not found. Bullfrogs present.
CB11: Stock Ponds	824	None	Moderate	Stock ponds with emergent vegetation around the edges.	VES were planned but access was not granted.
CB13: Five Stock Ponds	832	None	Moderate	Stock ponds with emergent vegetation (cattails) around the edges.	The site is on private property and was not accessible.

Note: Visual encounter survey.

[a] Original habitat suitability rating of stream sites also reflected suitability for other target species: the foothill yellow-legged frog and/or mountain yellow-legged frog.

3.3.5.2 Environmental Effects

Pine Hill Endemic Plants

SMUD proposes, as specified in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, to not undertake maintenance under transmission lines within the Pine Hill Rare Plant Preserve until consultation with the BLM, FWS, and CDFG has been completed. Additionally, they propose to ensure a biological assessment is prepared prior to beginning any activities to construct, operate, or maintain, the UARP that may affect a species proposed for listing or listed under the federal ESA or its critical habitat to evaluate potential effects of the action on the species or its habitat, in consultation with the appropriate federal agency.

Our Analysis

The Pine Hill Preserve contains a high concentration of rare plant species because of the serpentine and/or gabbro soil formations. Three of these species, Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort are federally listed species. Project transmission lines cross through sections of the Pine Hill Preserve. SMUD maintenance on Project transmission line right-of-ways includes vehicle use to access towers on existing roads, mechanical removal of trees, and other vegetation clearing for fire control and to facilitate access. According to SMUD (letter from D. Hanson, Project Manager, Hydro Relicensing, SMUD, Sacramento, CA, to Kimberly D. Bose, Secretary, FERC, Washington, D.C., dated November 30, 2007), within the BLM land in the Pine Hill Preserve, SMUD consults with agency representatives prior to conducting vegetation maintenance. The last time SMUD performed vegetation management in the preserve was in 2002 when select pine trees were pruned or removed to avoid contact with the transmission line wires. Outside of the preserve, SMUD removes pine trees and some oak trees roughly every 3 years. Within the gabbro soils area, SMUD does not use heavy equipment, mowing, or herbicides to manage vegetation.

Vegetation clearing could result in the direct loss of the listed plants. Additionally, transmission line right-of-way maintenance that facilitates access to the right-of-way could increase noxious weed dispersal within the rare plant habitat by providing a vector. Noxious weeds could outcompete the rare plants, decreasing their available habitat. All three of the federally listed species located within the Pine Hill Preserve, however, are currently found in open habitats such as transmission lines and road clearings within the UARP area. Transmission line right-of-way maintenance maintains this habitat, which could be beneficial to the three plant species.

Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with the BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species. Additionally, SMUD proposes vegetation and invasive weed management plans, in Proposed Article 1-13, *Vegetation and Invasive Weed Management* Plan, which are described in detail in section 3.3.4.2, *Vegetation and Invasive Weed Management*. The invasive weed management plan would attempt to control current populations of noxious weeds and prevent future populations from being established. The vegetation management plan would address transmission line right-of-way-clearing. Although SMUD's proposal only includes Forest Service land influenced by Project activities, as discussed in section 3.3.4, *Terrestrial Resources*, expanding this plan to cover all land within the Project boundary affected by Project activities would be appropriate. As a result, this plan would protect the Pine Hill endemic plants from noxious weed infestation. The consultation proposed in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, would establish agency-approved maintenance activities to maintain the preferred habitat minimizing effects on the federally listed plants. Although the Proposed Action would minimize possible effects on these species, maintenance activities could still result in the occasional loss of individual plants. As such, the UARP is likely to adversely affect the Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort.

The Chili Bar Project would have no effect on the Pine Hill endemic plants because they do not occur within the Project boundary.

UARP-Only Alternative

Because these species are endemic to the Pine Hill Preserve area which, is outside the Iowa Hill development area, relicensing the Project without the Iowa Hill development would have the same effect on Pine Hill endemic plants as discussed for the Proposed Action.

Valley Elderberry Longhorn Beetle

The federally threatened valley elderberry longhorn beetle's host plant, elderberry, is found within the UARP transmission line. If the valley elderberry longhorn beetle occurs within these shrubs, it could be affected by right-of-way maintenance. SMUD does not proposed any measures specifically designed for the valley elderberry longhorn beetle; however, it does propose, as specified in Proposed Article 1-12, *Wildlife and Plant Protection Measures,* to ensure a biological assessment is prepared prior to beginning any activities to construct, operate, or maintain, the UARP that may affect a species proposed for listing or listed under the federal ESA or its critical habitat to evaluate potential effects of the action on the species or its habitat, in consultation with the appropriate federal agency.

Our Analysis

SMUD observed elderberry, the host species for the valley elderberry longhorn beetle, at 8 locations during 2002–2003 surveys within the UARP area (DTA, 2004e), all either directly underneath or immediately adjacent to the UARP transmission line. Although full protocol valley elderberry longhorn beetle surveys were not conducted, UARP assumed that the elderberry shrubs found within the Project boundary are occupied by valley elderberry longhorn beetles. Maintenance activities on the UARP transmission line and its right-of-way include tree and vegetation clearing, facility inspections, facility replacement, and access road maintenance. All of these activities could potentially result in disturbance to elderberry bushes within the right-of-way, and, therefore, the valley elderberry longhorn beetle. Vegetation management typically does not need to clear low-growing trees or shrubs if they are not a safety hazard to the line.

As part of its draft biological assessment, SMUD proposed to comply with FWS's Valley Elderberry Longhorn Beetle Conservation Guidelines (FWS, 1999), prior to conducting any ground or vegetation disturbing activities within the proposed Project boundary. These guidelines call for protocol level surveys of the area to be disturbed for the presence of the valley elderberry longhorn beetle and its elderberry host plant, protection measures such as fencing and otherwise identifying elderberry plants, and compensation requirements for elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level that may be directly or indirectly affected. Additionally they proposed to provide annual employee environmental awareness program workshops to educate employees and key personnel about the known locations of special status species and habitats. Although these measures were not included in the Proposed Action, implementing them as part of the vegetation management plan proposed in Proposed Article 1-13, *Vegetation and Invasive Weed Management Plan*, would effectively protect elderberry shrubs and any valley elderberry longhorn beetles located within them within the Project boundary from any transmission line maintenance activities by clearly delineating them as areas to be excluded from maintenance. Additionally, valley elderberry longhorn beetle surveys prior to vegetation disturbing activities that comply with the conservation guidelines would further protect the valley elderberry longhorn beetle. Even with implementation of the compliance with conservation guidelines and employee training, adverse effects could still occur. Therefore, the UARP would be likely to adversely affect the valley elderberry longhorn beetle.

The Chili Bar Project would have no effect on the valley elderberry longhorn beetle because elderberry shrubs do not occur within the Project boundary.

UARP-Only Alternative

Because no elderberry plants are found in the Iowa Hill development area, relicensing the Project without the Iowa Hill development would have the same effect on valley elderberry longhorn beetles as discussed for the Proposed Action.

California Red-legged Frog

The Proposed Actions that would affect the foothill yellow-legged frog and the mountain yellow-legged frog described in section 3.3.4.2, *Terrestrial Resources,* also have the potential to affect the California red-legged frog.

Our Analysis

A recovery plan for the California red-legged frog was issued by FWS in 2002. Eight recovery units and core areas in the recovery units were identified for focused recovery actions. The Action Area is within the largest recovery unit, the Sierra Nevada Foothills and Central Valley Recovery Unit, and is between two core areas: Cosumnes River to the south, and Traverse Creek/Middle Fork American River/Rubicon River to the north. FWS designated critical habitat on April 13, 2006. The nearest designated critical habitat is located at Spivey Pond, south of Highway 50, in El Dorado County approximately 3.5 miles from the nearest Project facility.

Much of the Project area is located at elevations above that which is typical for the California red-legged frog and probably not within the historical range of the species. At lower elevations suitable habitat exists, but is limited in extent and is almost entirely associated with tributaries of Project-affected stream reaches, not mainstem reaches, and stock ponds outside of the Project boundary. None of the UARP reservoirs contain suitable habitat for the California red-legged frog.

The closest known extant occurrence is at Spivey Pond, southwest of the town of Pollock Pines, which is approximately 3.5 miles from the nearest Project facility or affected stream reach, none of which contain suitable habitat for the California red-legged frog. Spivey Pond and other historical occurrences in the Weber Creek drainage are also separated from these Project facilities and reaches by a highway (U.S. 50) and by urban and agricultural areas that may constitute barriers to California red-legged frog dispersal. South-north dispersal may also be unlikely because the SFAR lies within a relatively deep, steep-sided valley. The mainstem SFAR reach does not constitute suitable habitat for the California red-legged frog, although three tributaries of the reach might be suitable if bullfrogs were not present. Bullfrogs are also well established in stock ponds that were surveyed within the evaluation area.

The UARP transmission lines span Weber Creek more than 14 miles downstream of Spivey Pond. The towers for the lines are located high on the steep valley slopes on either side of the creek (more than 200 vertical feet above the creek). Therefore, the transmission line has no foreseeable effect on aquatic or riparian habitats along Weber Creek. Areas with extant, documented California red-legged frog occurrences north of the Project on Skunk Canyon Creek, and Brushy Canyon Creek are located more than 25 miles from the action area where Project operations have no effect on hydrology or habitats.

As previously discussed in section 3.3.4.2, predators such as bullfrogs have the potential to keep the California red-legged frog from becoming established. Flow regulation may benefit introduced predatory fishes and bullfrogs, by maintaining flow in areas that would otherwise dry up seasonally. The California red-legged frog is known to persist in areas where ponds or streams dry up seasonally by dispersing to springs or other sources of water, or by aestivating in burrows or in cracks at the bottom of dried pools. Minimum streamflows would ensure that naturally intermittent or ephemeral streams do not dry in summer and could thus benefit predatory species that are unable to survive dry periods (fish and bullfrogs). Predatory bass, crayfish, and bullfrogs were found in lower Slab Creek dam reach and are well established in off-channel stock ponds and tributaries in the Chili Bar Project area, downstream of UARP. The Slab Creek reach is unlikely to dry up even without regulated minimum flows and higher proposed minimum flows in the spring could potentially reduce bullfrog populations by washing the tadpoles downstream.

Although California red-legged frogs are not currently known to occur within the UARP boundary, if they do become established the proposed amphibian monitoring and adaptive management plans (see section 3.3.4.2) would minimize any potential adverse effects on California red-legged frogs, and a biological assessment would be required prior to any ground-disturbing activities that would potentially affect California red-legged frogs. Therefore, because the California red-legged frog is not known to occur within the Project boundary, suitable habitat is limited, and monitoring and adaptive management would minimize any potential effects should it become established, we conclude that the UARP is not likely to adversely affect California red-legged frogs.

No California red-legged frogs were found within the Chili Bar Project area, including tributaries and side stock ponds, during relicensing surveys. The Chili Bar dam reach does not contain suitable for California red-legged frog breeding habitat. Bullfrogs, a California red-legged frog predator, were found to be abundant in potential California red-legged frog habitat (tributaries and stock ponds) during surveys. Flow regulation may benefit introduced predatory fishes and bullfrogs, by maintaining flow in areas that would otherwise dry up seasonally. The Chili Bar reach, however, is a relatively large reach that is unlikely to dry up even without regulated minimum flows and tributaries and stock ponds are not subject to Project-regulated flows. Additionally bullfrogs are well established in off-channel stock ponds and in tributaries. Higher proposed minimum flows in the spring could potentially reduce bullfrog populations by washing the tadpoles downstream. Therefore, it is unlikely the proposed Project would contribute to the proliferation of California red-legged frog predators.

Although California red-legged frogs are not currently known to occur within the Chili Bar Project boundary, if they do become established the proposed amphibian monitoring and adaptive management plans (see section 3.3.4.2) would minimize any potential adverse effects on California red-legged frogs and a biological assessment would be required prior to any ground disturbing activities that would potentially affect California red-legged frogs. Therefore, because the California red-legged frog is not known to occur within the Project boundary, suitable habitat is limited, and monitoring and adaptive management would minimize any potential effects should it become established, the Proposed Action is not likely to adversely affect the California red-legged frog.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The Settlement Agreement Articles and other measures that would potentially affect California red-legged frogs would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the California red-legged frog would be the same as those described under the Proposed Action.

3.3.5.3 Cumulative Effects

Private land development, public land use, and hydropower development have cumulatively affected the California red-legged frog in the American River Basin due to roading, multiple land use practices, facilities and operations, and other development that fragment breeding populations.

Flow releases to benefit coldwater fisheries during the summer and early fall, and Project reservoirs may isolate California red-legged frog breeding populations. The proposed minimum flow releases would not increase or decrease the current population fragmentation.

3.3.5.4 Unavoidable Adverse Effects

None.

3.3.6 Recreational Resources

3.3.6.1 Affected Environment

Regional Setting

Recreational resources in the region provide for a full range of activities, from tourist-based recreation associated with the historical mining towns in the region, to rural and wilderness activities, such as hiking, fishing and boating. The primary recreational sites in the American River drainage include the Forest Service lands, the towns of Coloma and Placerville, and Folsom Lake.

The numerous lakes and reservoirs in the eastern part of the region, which includes the Project reservoirs, provide a variety of recreational opportunities and varying levels of developed facilities for camping and day-use activities. Paved roads and boat launches at the larger water bodies in the area provide opportunities for motorized boating use. Off-highway vehicle (OHV) use is also popular in the region. There are 12 designated routes or areas for OHV use in the region, most of which are on National Forest System lands or state lands.

Whitewater recreation is another popular recreational activity in the region. Within the American and Rubicon river drainages alone, there are at least 20 whitewater boating runs, most of which are rated class IV and V and provide high quality whitewater recreational opportunities in the spring. The most important whitewater recreation resource in the region occurs on the 19.1-mile reach of the SFAR downstream of the Chili Bar dam. This section of river is the most popular whitewater recreational run in California, with approximately 3,000 to 4,000 visitors per day on summer weekends.

Recreational Resources within the Projects' Boundaries

Recreation at the Projects can be separated into three geographic areas: High Country, Crystal Basin, and Canyonlands. The High Country consists of the area north and east of Loon Lake reservoir. The Crystal Basin includes the area bounded by Loon Lake reservoir on the north to Highway 50 on the south, and Union Valley dam to the west and Wrights Lake on the east. The Canyonlands geographical area extends along the Silver Creek and SFAR drainages from Union Valley dam on the east to Chili Bar Project boundary on the west.

Nearly all shoreline lands surrounding the Project reservoirs within the Project boundary are federal lands managed by the Forest Service and are available for public use. Figures 3-32 to 3-35 show the locations of these facilities.

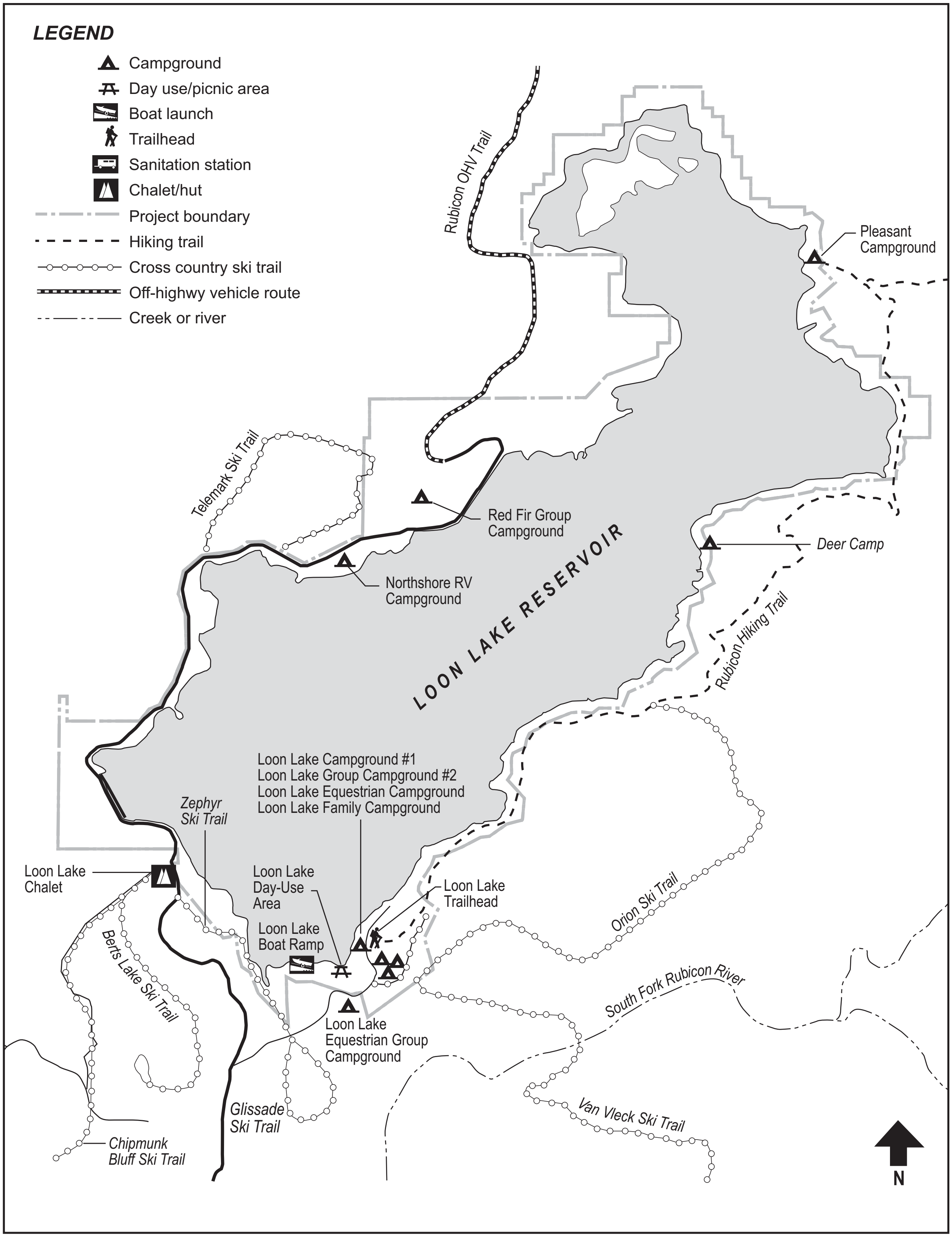

Figure 3-32. Recreational facilities at Loon Lake reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

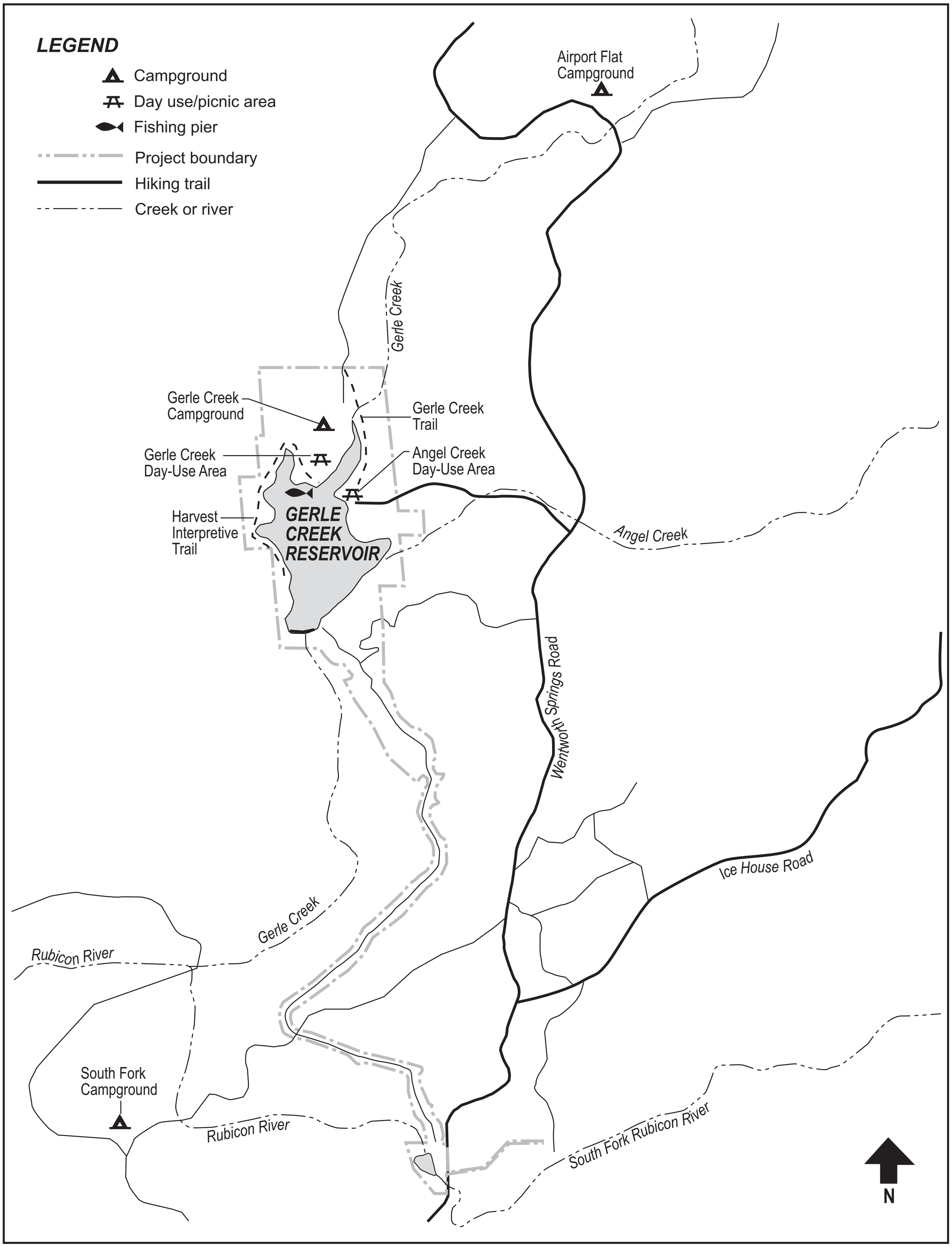

Figure 3-33. Recreational facilities at Gerle Creek reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

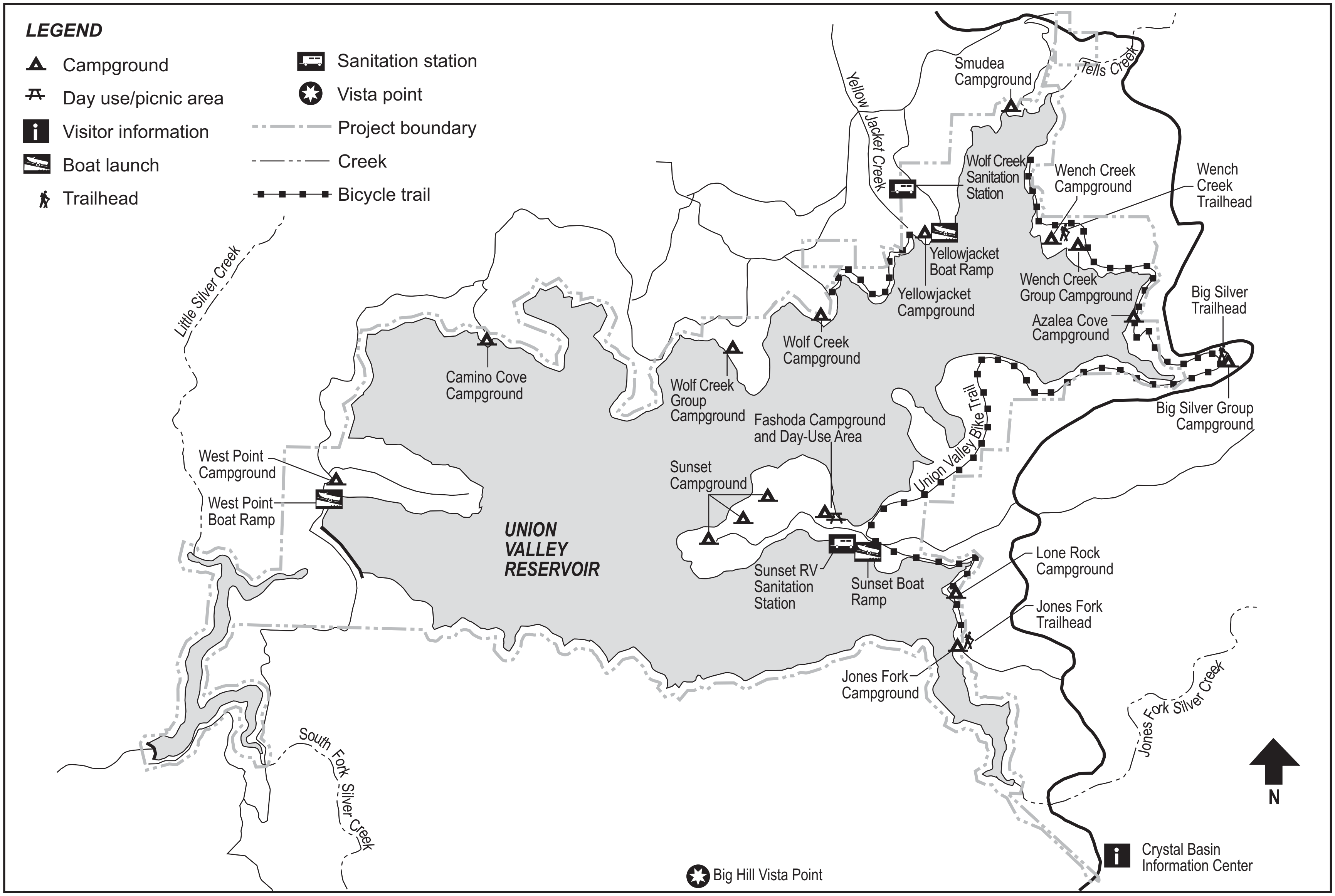

Figure 3-34. Recreational facilities at Union Valley reservoir. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

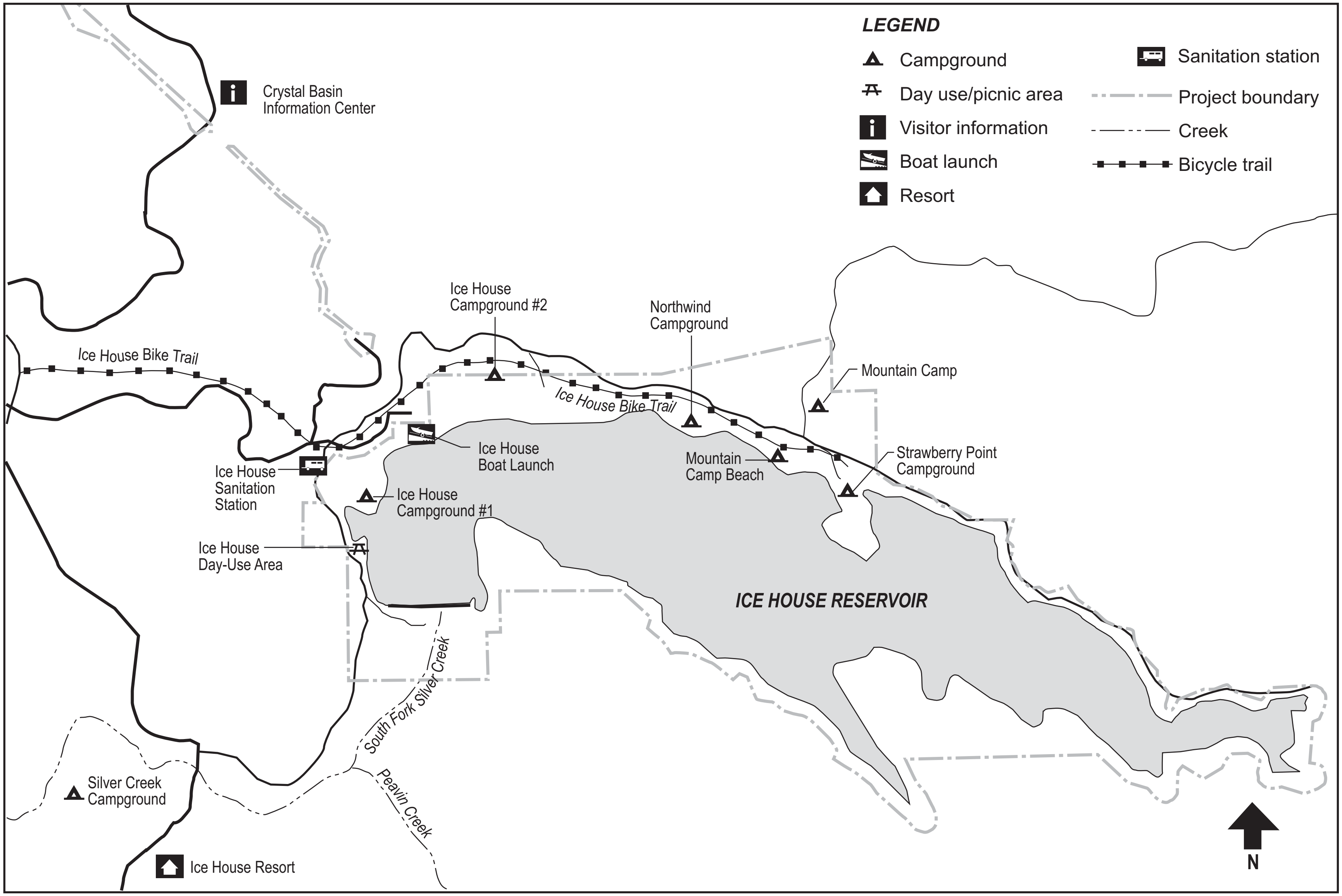

Figure 3-35. Recreational facilities at Ice House reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

High Country

The High Country geographical area (elevation 6,400 feet and above) includes Buck Island and Rubicon reservoirs. There are no developed recreational facilities at either reservoir because these are remote, hike-in reservoirs. Depending on the timing of snowfall and snowmelt, this area is usually accessible to hiking between Memorial Day and November 1.

At Rubicon reservoir, which is located within the Desolation Wilderness boundary, motorized public access and campfires are not allowed. The main route of access is by way of the Rubicon Hiking Trail from the Loon Lake. Overnight use requires a wilderness permit and there are quotas on the number of permits issued. At least nine dispersed campsites are present at Rubicon reservoir.

Buck Island reservoir is located adjacent to and outside of the Desolation Wilderness. The Rubicon OHV Route passes through the Project boundary. Many OHV visitors camp overnight along the Buck Island reservoir shoreline; there are as many as 17 user developed campsites, most of which are close to the water's edge or riparian areas.

Crystal Basin

The Crystal Basin area is in the mid-elevation range of the Project at approximately 4,800 to 6,400 feet. Routes of access to the Crystal Basin include Ice House Road from Highway 50 and Wentworth Springs Road from Georgetown, both county roads. Crystal Basin includes four Project reservoirs, which collectively provide most of the reservoir-based recreational use and opportunities at the Projects. Three of these four are the primary storage reservoirs of the UARP, including Loon Lake, Union Valley and Ice House; the fourth is Gerle Creek reservoir.

There are 47 Project recreational facilities in Crystal Basin, including campgrounds, day use areas, boat launches, trails (biking, hiking, and interpretive), a scenic overlook, and a chalet. These facilities provide a full spectrum of recreational opportunities for overnight and day use activities. All of these facilities are on Forest Service-managed lands adjacent to or within the Project. The total developed overnight capacity in the Crystal Basin is 5,325 people-at-one-time (PAOT).

The Loon Lake Chalet is the only Project recreational facility available for rental year-round. The chalet is heavily used, to near-capacity, in winter by visitors who hunt, ski, camp and hike in Crystal Basin during the winter.

Dispersed recreation occurs throughout Crystal Basin. Dispersed day use activities typically include hiking swimming, fishing, and some whitewater boating, all of which are allowed by the Forest Service. Dispersed overnight camping outside of designated areas is generally prohibited immediately along the Project reservoirs, but occurs throughout the Crystal Basin. The Forest Service has closed some unauthorized roads in the area in an attempt to discourage prohibited use where it is causing resource damage. Visitors continue to access the shoreline areas, such as at the southern shoreline of Ice House Reservoir, through locked gates, to gain access and camp along the shoreline.

Canyonlands

The Canyonlands area includes five reservoirs: Junction, Camino, Brush Creek, and Slab Creek and Chili Bar. The Canyonlands area is in the lowest elevation range of the Project at approximately 1,800 to 4,400 feet. The terrain in this geographical area above PG&E's Chili Bar reservoir is typically steep which makes access difficult and there are few roads. The shorelines of the Project reservoirs are also typically steep and not well suited for recreational use; however, the reservoirs provide angling and some boating opportunities. The Canyonlands reservoirs are generally accessible year-round.

There are no developed recreational facilities at the Canyonlands reservoirs. However, small, informal boat launch sites exist at all but Camino reservoir. These sites consist of single-lane paved and unpaved routes leading to the reservoir.

Recreational Use within the Project Boundary

SMUD estimates that summer use at the Project recreational facilities in the Crystal Basin is between 206,500 and 235,000 recreation-days (table 3-60). There are approximately 24,000 recreation-days at the Project recreational facilities during the shoulder season.

Table 3-60. Estimated recreation days at dispersed recreational sites, 2002–2003. (Source: DTA and Louis Berger, 2004a)

	Summer			Winter		
Location	**Day Use**	**Overnight Use**	**Total**	**Day Use**	**Overnight Use**	**Total**
Ice House	2,329	0	2,329			
Union Valley	2,760	2,226	4,986			
Gerle Creek	377	2,416	2,793			
Loon Lake	1,648	15,217	16,865			
Crystal Basin				11,403	2,908	14,311
SMUD Canyonlands reservoir	4,785	938	5,723	1,911	7,29	2,640
Chili Bar reservoir	1,313		1,313			

SMUD estimates the annual dispersed use that occurred generally within 0.25 mile of Project reservoirs between April 1, 2002, and March 31, 2003, in the Crystal Basin was 43,406 recreation-days. Approximately one-third of this dispersed use occurred at Loon Lake reservoir during the summer months, and about one-third of the total use in the Crystal Basin occurred during the winter season.

Campgrounds, day-use areas, boat launches, and trailhead parking areas are usually filled to capacity during peak times on holidays and some weekends during the summer; during the weekdays, occupancy at the recreational facilities is low.

The reservoirs in the Canyonlands and the High Country are either small in size or difficult to access. The visitation to several of the Canyonlands and High Country reservoirs is substantial, though less than the reservoirs in the Crystal Basin.

At Project recreational facilities, between 49 and 61 percent of the visitors surveyed in 2002–2003 identified changes or improvements they would like to see at the facility where they were interviewed. The most common suggestion by far was related to restrooms or the need for showers (47 percent). There were also several comments from visitors regarding bears raiding campsites and damaging vehicles.

Recreational Facilities Management

SMUD operates the Project to maintain water surfaces in Project reservoirs at as high an elevation as practicable and with a minimum of fluctuation, from May 1 to September 10 of each year, as is consistent with power generation needs. Priority is given to water retention in Rubicon and Buck Island reservoirs. In addition, SMUD removes and disposes of floating debris in the Project reservoirs prior to July 15 of each year and removes any trees that may die along the shorelines of the reservoirs.

UARP boat ramps are available for use at each of the three storage reservoirs between Memorial Day and Labor Day under most water year types. During low water years or extraordinary circumstances, the storage reservoir levels may render some of the boat launches unusable at certain times.

The Forest Service operates and maintains some of the UARP-related recreational facilities through a Special Use Permit issued to a third party (concessionaire). Under the terms of the permit, the concessionaire agrees to collect fees for operating and maintaining government-owned facilities and returns a portion of the gross receipts to the federal government. The concessionaire is responsible for all tenant types of maintenance, such as broken infrastructure, utilities, grounds maintenance, and enforcing campground/facility rules. In effect, the cost of daily operation and maintenance of the facilities is an operating expense borne by the concessionaire. The concessionaire can either pay the fees due to the federal government under the permit or the concessionaire can provide work-in-lieu of fees. Under the latter, the Forest Service coordinates with the concessionaire to accomplish facility replacement or improvements at facilities operated under the permit, e.g., modifications necessary to comply with the ADA. This allows a portion of the fees collected at the site to be used for replacement of and improvements to the facilities, though these fees cover only a portion of the costs for replacement and improvements needed to the facilities.

The Forest Service operates the remaining recreational facilities under the Fee Demonstration Project. Under this program, the Forest Service collects the fees at the facilities, performs operation and maintenance, and uses the fees to offset its costs for operation, maintenance and replacement of the facilities.

PG&E owns most of the land around Chili Bar reservoir, with the exception of a few small private parcels and a large tract of BLM-managed by lands. PG&E manages the informal public boat ramp at the Chili Bar dam, which is the only site on the reservoir that is easily accessible. BLM allows public use of its lands and visitors access the reservoir along two steep trails from the north.

Angling

All Project reservoirs are available to the public for angling. The CDFG carries out a stocking program at the UARP storage reservoirs, including Loon Lake, Ice House, and Union Valley. The survey data collected by SMUD indicates a high level of participation in reservoir angling. The boat launches provide access for boating so anglers have access to the reservoir surfaces as well as the shorelines. Winter access provided by SMUD's snow removal allows access to boat launches at Ice House and Union Valley reservoirs.

The reaches below Project dams do not receive much angling use, due to the steep and rugged terrain, which limits access. The river sections downstream of the Canyonlands reservoirs, with the exception of Chili Bar reservoir, lie in deep canyons. Access to the river in the canyons is limited to roads leading to Project facilities (e.g., Jaybird powerhouse) or to a few hiking trails. Access is also restricted along the river by the presence of large boulders, steep bedrock banks, or cliffs. Access to the upper Project reach streams is also limited due to the lack of roads, although a popular OHV road (the Rubicon Trail) and a system of trails leading into the Desolation Wilderness area provide a greater degree of access than the Canyonland Project reaches.

In general, stream angling in the Sierra Nevada is constrained on unregulated reaches by flows that are too high for angling during snowmelt runoff and too low (or even dry streambeds) during the late summer. This general condition exists in the Project area streams where many of the background stream segments upstream of Project reaches experience very low flows (less than 1 cfs) or dry up during late summer/early fall.

Whitewater Boating

There are considerable opportunities for class III-V whitewater boating[38] in the region, as shown in table 3-61, including the SFAR, one of the most popular whitewater runs in the state.

Table 3-61. Regional whitewater recreational opportunities. (Source: DTA and Louis Berger, 2004b)

Name of Run	Put-In & Take Out	Length (miles)	Gradient (feet per mile)	Class	Boating Range and (Optimum Flow)	Boating Season
North Fork American River						
Generation Gap	Tadpole Creek to Colfax-Foresthill Rd.	12.3	75	IV to V 0 portages	600–2,000 (1,200)	Spring
Giant Gap	Euchre Bar to Colfax-Iowa Hill Rd.	14.5	54	IV to V 0 portages	600–2,500 (1,000)	Winter, spring
Chamberlain Falls	Colfax-Iowa Hill Rd. to Colfax-Foresthill Rd.	4.8	44	III to IV+ 0 portages	800–2,500 (1,500)	Winter, spring
Ponderosa Way	Colfax-Foresthill Bridge to Ponderosa Way Bridge	5	21	II+ to III 0 portages	500–1,500 > 1,500 (1,200)	Spring
Middle Fork American River						
No. Middle Fork American River	Last Chance Bridge to Middle Fork American	12.9	129	V 7 portages	600–800 (600)	Winter, spring

[38]The American Whitewater Scale of River Difficulty: Class I, Easy: Fast moving water with riffles and small waves; Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed or very violent rapids which expose a boater to added risk; Class VI, Extreme and Exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

Name of Run	Put-In & Take Out	Length (miles)	Gradient (feet per mile)	Class	Boating Range and (Optimum Flow)	Boating Season
Tunnel Run	Ralston Afterbay to Spring Garden Road	17	23	IV 1 portage	800–1,500 (1,200)	Spring, summer
Rubicon River						
Lower Run	Ellicott Bridge to Ralston Afterbay	20.3	108	V- to V 2 portages	500–1,000 1,000–2,000 (1,200)	Spring
SFAR						
Lovers Leap	Strawberry to Kyburz	9.6	171	V 3 portages	500–1,200 (1,000)	Spring
Dugald Bremner	Upper Bridge to Girard Cr.	3.5	191	V 1 portage	30–800 (500)	Winter, spring
Lower Run	China Flat to South Fork American	3.3	236	V+ 2 portages	350–550 (400)	Spring, summer
Kyburz to Riverton	Kyburz to Route 50 Bridge	9.6	90	III to IV+ IV to V 2 portages	700–1,200 1,200–1,300 (1,200)	Spring
Riverton to Peavine	Route 50 Bridge to Peavine Ridge Rd.	3.5	69	III to IV 0 portages	700–4,000 (1,500)	Spring
Golden Gate	Peavine Ridge Rd. to Forebay Rd.	9.4	117	V+ 5 portages	700–1,500 (1,000)	Spring
Silver Creek	Near Road 12N25 to Ice House reservoir	1.75	481	V	50–3002 (150-200)	Spring
Silver Creek	Camino reservoir to SFAR	9.2	119	V 8 portages	600–800 (600)	Spring
Slab Creek	Slab Cr. dam to White Rock powerhouse	7	89	V 1 portage	500–2,000 (1,500)	Spring
Rock Creek	Near Dutch Canyon to Rock Creek Road	6.3	110	IV+ 2 portages	300–800 (600)	Winter, spring
Chili Bar	Route 193 to Coloma	5.8	31	III+ III to IV 0 portages	700–1,500 1,500–10,000 (2,000)	Year-round

SMUD found that whitewater boating is feasible on the Slab Creek, Camino, and Ice House dam reaches. The other Project reaches have low whitewater recreation potential due to various attributes such as remoteness, physical barriers or excessive or insufficient gradient. During periods when there is sufficient flow resulting from spill events, there are days when flows in the boatable range exist on the Slab Creek and Camino dam reaches, but this rarely occurs on the Ice House Reach. Boating has been documented on the Slab Creek dam reach during past spill events and this dam is known to spill in AN and Wet water year types.

The 19.1-mile reach downstream of Chili Bar dam is the most popular whitewater boating run in California, with use levels of approximately 3,000 to 4,000 users per day on summer weekends. The reach provides a unique whitewater opportunity because of relatively predictable year-round boatable flows and its close proximity to major population centers, including Sacramento and the San Francisco Bay Area. The reach also provides opportunities for other recreational activities, including fishing, swimming, and gold panning and dredging.

Inflow to Chili Bar Project during regulated flow periods is controlled predominantly by the UARP's upstream storage and water use. UARP controls the major storage and water use in the river system upstream of Chili Bar Project, with a storage capacity of more than 425,000 acre-feet. Chili Bar Project encompasses approximately three river-miles of the SFAR and operates on a water-available, peaking basis. Therefore, flows in the reach downstream of Chili Bar dam typically fluctuate on a daily basis.

3.3.6.2 Environmental Effects

Recreation Implementation Plan

The Projects include some of the most important recreational resources in the region, and they act as a gateway to Forest Service managed lands, including designated wilderness. As part of the relicensing process, SMUD and PG&E found that, in general, the quality of existing recreational facilities associated with the Project is good, with some sites showing deterioration as a result of insufficient capital investment, increased use, and deferred maintenance.

As part of the Settlement (Proposed Article 1-15, *Recreation Implementation Plan)*, SMUD would develop and execute a recreation implementation plan for the Project in coordination with the Forest Service within 6 months of license issuance. The implementation plan would include a construction schedule for recreational facilities as defined in Proposed Article 1-19, *Specific Recreation Measures*, as well as other details including, but not limited to, signage and sign placement, public information dissemination and a schedule for design of facilities to be reconstructed.

The implementation plan would be maintained and updated in conjunction with the review of recreational developments as described in Proposed Article 1-18, *Review of Recreation Developments*. SMUD proposes to meet with the Forest Service at least every 6 years to consider the condition and needs of all Project recreational facilities on Forest Service lands, and to agree upon necessary maintenance, rehabilitation, construction, and reconstruction work needed. The criteria for Project selection would depend on the amount and type of use, current recreational facility policy, the condition of facilities, effects on surrounding areas. Following the review, the licensee would develop a 6-year schedule for maintenance, rehabilitation, and reconstruction, in consultation with the Forest Service prior to being filed with the Commission.

Our Analysis

The proposed recreation implementation plan would increase and formalize SMUD's responsibilities to provide and update recreational resources throughout the Project area, including those formal and dispersed recreational sites that provide public access to the Project. The plan would provide a framework for the licensees to implement the recreational site improvements and coordinate management of recreational resources with the land managers that have jurisdiction over Project lands, as well as monitor recreational use and needs over the term of any new license. These measures would provide improvements to the management and delivery of recreational resources and would expand recreational opportunities within the Project.

The proposed plan reflects the unique character and management responsibilities of public recreational sites around the Projects. The plan would recognize that, while SMUD has no legal authority to redevelop public access sites owned or managed by others, they do have some responsibility to ensure reasonable public access to Project lands and waters for those portions of the recreational sites currently within the Project boundary or proposed to be within the Project boundary. The assistance and funding included in the plan would improve delivery of recreational services by streamlining implementation of the improvement measures, while simultaneously minimizing jurisdictional conflicts between the Commission and the various land management agencies, and providing a mechanism for earmarking licensees' funds to specific Project-related improvements.

PG&E does not propose to develop a recreation plan. PG&E proposes a few specific recreational measures (discussed below) to improve recreational access to the Project. In its license application, PG&E contends that recreational use is low, safe public access is best achieved at the upstream end of the reservoir, and Project operations limit recreational opportunities near Chili Bar dam. In subsequent sections, we generally agree with this assessment. However, we expect that recreational use and needs would change over the term of any new license issued for the Chili Bar Project. Development of a recreation plan for the Project, based on periodic monitoring, would help the licensee manage these changes in recreational demand and provide a structure to evaluate the adequacy of Project recreational facilities to meet future recreational demand. Such a plan would be designed to achieve the following objectives: (1) promote public safety and increase public awareness of recreational opportunities at the Chili Bar Project; (2) maintain reasonable health and safety standards through a litter and sanitation management; (3) provide safe and reasonable access to the Project reservoir; (4) address congestion and conflicts among visitors and resources related to recreational activities, if any; (5) provide reasonable recreational facilities for a range of recreational opportunities; (6) reduce recreational effects on cultural, terrestrial, and aquatic resources; and (7) provide a forum for public and agency input into recreational facility needs at the Project.

Specific Recreational Site Improvements

Developed and informal recreational sites provide primary public access to the UARP and Chili Bar Project. Many of the facilities were constructed as part of the current license in the 1960s to meet visitor demand. Much of the infrastructure at these recreational sites is old, some of which is in disrepair from deferred maintenance and some of which has reached its useful life. As visitor demographics and use patterns change over the term of any new license, recreational amenities at these sites may no longer serve the type of recreational uses that visitors expect.

Under Proposed Article 1-19, *Specific Recreation Measures*, SMUD would implement numerous and substantial improvements to many recreational sites, as well as upgrade and expansion of some informal recreational facilities to provide an improved level of service. These proposed measures, summarized in table 3-62, would be developed within or immediately adjacent to the Project boundary on Forest Service lands and all improvements would become Forest Service property upon completion and acceptance by the Forest Service. Proposed Article 1-19 calls for the SMUD to improve recreational sites within the Project boundary including, survey; design; contract preparation and administration; environmental analysis and documentation necessary for construction of proposed facilities, including any permits; and preparation of "as-built" drawings for those facilities on federal lands. SMUD would be responsible for funding the actual capital costs of the improvements, but all capital investment would become the property of the Forest Service when they are completed.

SMUD would also develop a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities due to the lack of such equipment as identified in the recreational use surveys within 2 years of new license issuance. The plan would include a schedule for installing the bear-proof equipment within five years of plan approval by the Forest Service and CDFG.

Proposed Article 1-18, *Review of Recreation Developments*, also calls for SMUD to include the specific recreational facilities listed in Proposed Article 1-19, *Specific Recreation Measures*, within the Project boundary. If these facilities are not currently within the license boundary, the boundary would be adjusted to include them as detail in the Forest Service Preliminary Terms and Conditions, Attachment 1, filed January, 29, 2007.

Table 3-62. SMUD's proposed recreational site improvements. (Source: SMUD and PG&E, 2007, Proposed Article 1-19, *Specific Recreation Measures*)

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
High Country			
Buck Island Reservoir Area: North Shoreline	Inventory areas affected by dispersed recreation to the northwest and northeast of the dam, and develop a dispersed motorized camping area (Development Level 2) in these areas. Also construct new vault toilet, to be maintained by helicopter; identify and mark designated campsites; restrict vehicle access to motorized trail and designated camping areas only through the use of barrier rocks and other natural materials, and restore impacted areas; and reroute a portion of the Rubicon OHV route away from sensitive areas and rehabilitate existing route.		2 years
Rubicon OHV Trail System–Ellis Creek Tie to Rubicon Trail	Provide improvements at the Ellis Creek staging area: trailhead parking, sanitation, and improved information (Loon Lake spillway) where uncontrolled parking currently occurs; implement measures to confine OHVs to this designated route using barrier rocks and other natural materials; and close and restore user-created routes adjacent to Loon Lake shoreline.		2 years
Crystal Basin			
Loon Lake Area	Prepare a Loon Lake Recreation Plan to be approved by the Forest Service that addresses impacts on the lakeshore zone and islands from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in the plan within 5 years of license issuance. Detailed elements required, as well as additional specific areas to be evaluated, are included in Proposed Article 1-19.		2 years
Loon Lake: Pleasant Campground	Redesign and reconstruct the 10-unit boat-in campground, retaining existing capacity on existing footprint.	●	10 years
Loon Lake: Northshore Recreational Vehicle Campground	Upgrade the existing 15-unit campground and expand to the east and west to take in areas heavily affected by dispersed camping. Target capacity will be 35 units.	●	5 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Loon Lake Campground (including Equestrian Loop)	Redesign and reconstruct the 62-unit campground, retaining existing capacity on existing footprint.	●	8 years
Loon Lake (Group) Campgrounds	Upgrade Loon Lake Group Site 1 (30 PAOT) and 2 (50 PAOT). See Proposed Article 1-19 for detailed elements.	●	8 years
Loon Lake Group Equestrian Campground	Redesign and reconstruct 5-unit (30 PAOT) group campground; retain existing capacity on existing footprint.	●	8 years
Loon Lake Boat Launch (and Day Use Area)		●	8 years
Loon Lake: Red Fir Group Campground		●	20 years
Loon Lake Chalet		●	8 years
Loon Lake (Schlein) Sanitation Station	Remove part of the concrete island in front of the water tower to reach the control valve from the turn out. Lower the control valve, and replace it with a lever type control.	●	20 years
Loon Lake Trailhead	Opened in 1992, facility components are in good condition and not in immediate need of replacement.	●	8 years
Loon Lake: South Shore	Develop a new campground (500 PAOT) on the South Shore of Loon Lake between the LL Hiking Trail Facility and Deer Camp. Construct new paved two-lane access road from the existing Loon Lake campground to new campground site, including new trailhead parking for the Loon Lake and Desolation area. This site was previously identified as proposed Red Fir campground in the "Recreation Plan for Crystal Basin, Project 2101, November 1973."		20 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Gerle Creek Reservoir Area	Prepare development plan, to be approved by the Forest Service, that addresses effects on the Gerle Creek and Airport Flat areas from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in this plan within 15 years of license issuance. Address sanitation, user conflicts, carrying capacity, day-use versus overnight camping, vehicle control, boating access, and emergency resource protection measures.		2 years
Gerle Creek Campground	Redesign and reconstruct the 50-unit campground, retaining existing capacity on existing footprint.	●	5 years
Gerle Creek Day Use Area	Site has an accessible fishing pier. See Proposed Article 1-19 for specific elements.	●	5 years
Angel Creek Day Use Area	See Proposed Article 1-19 for specific elements.	●	5 years
Airport Flat Campground	Harden adjacent dispersed area on the south side of Gerle Creek.	●	10 years
Union Valley Reservoir Area	Prepare development plan, to be approved by the Forest Service, that addresses effects on the Union Valley area from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in this plan within 10 years of license issuance.		2 years
Union Valley Reservoir	Develop and implement a plan approved by the Forest Service and CDFG that addresses reservoir surface use and hazards.		2 years
Azalea Cove Campground	Provide paved off-site parking area for 10 vehicles at the intersection of the existing service road and the bike trail; develop a potable water source and distribution system; improve shoreline adjacent to facility to enhance boating access; and provide vegetative screening, and use natural materials to restrict indiscriminate pedestrian and bicycle traffic within and between campsites and use areas.		5 years
Big Silver Group Campground	Upgrade existing facilities offered at this 50 PAOT group campground.		20 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Camino Cove Campground		●	15 years
Fashoda Campground and Day Use Area, Jones Fork and Lone Rock Campgrounds		●	5, 5, 20, and 20 years
Sunset Campground	Redesign and reconstruct the 131-unit campground, retaining existing family unit capacity on existing footprint, and add a group site.	●	5 years
Sunset Boat Launch		●	5 years
Wench Creek Campground and Group Campground	Redesign and reconstruct the 100-unit campground and the two, 50 PAOT group sites, retaining existing capacity on existing footprint.	●	15 years
West Point Campground	Design and construct expansion of the existing family campground by 25 units, and add a group campground (30 PAOT) adjacent to the facility, across the road to meet current Forest Service standards.	●	8 years
West Point Boat Launch and Wolf Creek Campground/ Group Campground		●	5 and 15 years
Yellowjacket Campground	Redesign and reconstruct the 40-unit campground, retaining existing capacity on existing footprint.	●	8 years
Yellowjacket Boat Launch		●	5 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Ice House Reservoir Area	Prepare development plan, to be approved by the Forest Service that addresses impacts on the Ice House area from unmanaged recreation, and the need for additional day-use opportunities. Plan also would address the whitewater recreational opportunities in SFSC, above and below Ice House reservoir. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		2 years
Ice House Campground and Day Use Area	Redesign and reconstruct the 83-unit campground and existing 10-unit day-use area, retaining existing capacity on existing footprint.	●	5 years
Northwind Campground	Upgrade facilities at this existing 9-unit campground, provide potable water, and address needs for lakeshore access.	●	15 years
Strawberry Point Campground	Upgrade facilities at this existing 10-unit campground, provide potable water, and address needs for lakeshore access.	●	15 years
Ice House Boat Launch	Upgrade facilities and repair damage to boat launch parking lot upgrade and pavement.	●	5 years
Ice House Sanitation Station	Redesign and reconstruct the facility, on existing footprint.	●	5 years
Highland Point Day Use Area	Develop Highland Point for fishing access and day use. Land acquisition may be required. Construct new 10-unit picnic area to include detailed elements included in Proposed Article 1-19.		5 years
Upper Silver Creek Ice House Day Use	Develop parking and day-use facilities to accommodate existing unmanaged dispersed day use associated with Ice House reservoir and Silver Creek. Land acquisition and/or easements may be necessary.		5 years
Crystal Basin Work Center and Information Station	Upgrade existing facilities, including existing water storage facilities, and construct EPA approved fueling station.		15 years
Big Hill Vista	Provide visitor amenities including installation of two accessible tables and picnic pads, and purchase or retrofit refuse containers for accessibility and bear resistance.	●	15 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Silver Creek Campground	When whitewater flows are provided by SMUD, redesign and reconstruct the 12-unit Silver Creek campground, and provide access on adjacent land for whitewater access parking and staging.		
Canyonlands			
Junction Reservoir Boat Launch	Improve boat launch (for day use only).		10 years
Dispersed Area–Bryant Springs Road and SFSC Bridge	Improve access trail (construction road) between Bryant Springs Road and stream. Provide turnouts for parking at take-out site for whitewater boating on SFSC.		10 years
Brush Creek Reservoir Boat Launch	Prepare development plan, approved by the Forest Service, that addresses reservoir access, day use opportunities, and facility needs or improvements. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		5 years
Boat Launch at Slab Creek Reservoir at Forebay Road	Prepare development plan, approved by the Forest Service, that addresses safe and reasonable boating access, impacts from unmanaged recreation, and the need for additional day-use and overnight facilities. Develop sites and/or implement measures identified in this plan within 5 years of license issuance.		2 years
Boat Launch at Slab Creek Reservoir near Dam	Prepare development plan, approved by the Forest Service, that addresses safe and reasonable boating access, impacts from unmanaged recreation, and the need for additional day-use facilities. Develop sites and/or implement measures identified in this plan within 5 years of license issuance.		2 years
Slab Creek Dam Reach, including Slab Creek Reach Take-Out Upstream of Chili Bar Reservoir	Prepare recreation management plan, approved by the Forest Service and BLM, to address whitewater recreation needs in the Slab Creek dam to Chili Bar reservoir reach. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		5 years

[a] Site will be redesigned or upgraded to meet current Forest Service design standards and requirements of the ADA.

PG&E proposes facility enhancements that would be downstream and within the Project boundary. Specifically, under Proposed Article 2-13, *BLM Recreation Improvements*, PG&E would construct (1) a gravel parking area for three to four vehicles off Rock Creek Road; (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir; (3) a kiosk sign along the trail near the beginning of the trailing, explaining the rules of the area; and (4) one picnic table of coated wire mesh material in a leveled out area that is outside of the Chili Bar reservoir floodplain.

Our Analysis

Existing recreational facilities within the Project include numerous formal or semi-formal public-access sites that have some level of recreational infrastructure ranging from minor to substantial, including camping areas and boat launches, trails, beaches and many undeveloped, dispersed, or informal sites (see figures 3-33 to 3-35). These facilities provide the primary public access to Projects' land and waters. The current conditions of the Project recreational facilities range from poor to excellent. Examples of poor facility conditions include cracked pavement and broken traffic control barriers, short campsite parking spurs, and worn and dated campsite components and restrooms. Most of the developed facilities are below ADA accessibility standards; however, the more recently constructed facilities have been designed to comply with ADA accessibility guidelines. Although most recreational visitors interviewed expressed general satisfaction with the condition of the sites, they also noted their desire for improvements, such as improved public access when the reservoirs are low, additional facilities along the reservoirs, and site improvements throughout the Projects.

SMUD's proposal to enhance, expand and formalize the sites listed in table 3-62 would substantially improve public access in the Project area. The proposed improvements to recreational facilities within the Project boundary would be site-specific, derived from a recreational needs assessment, prepared in consultation with the Forest Service and stakeholders, and targeted at either improvements to existing facilities or development of informal facilities. In addition, the proposal considers recreational needs from a geographical perspective and recommends site improvement measures based on the overall need in the Project area. This approach would help to ensure that certain areas of the Project or certain facilities are not over-capitalized and that other areas receive appropriate improvements to meet existing and projected needs.

PG&E's proposal to provide a parking area off Rock Creek Road, a trail that leads from the Rock Creek Road to Chili Bar reservoir, an informational kiosk along the trail, and a picnic table at the reservoir would address the demand for day use recreational opportunities identified in the recreation needs study.

The FPA requires the licensee to provide safe public access to Project lands and waters and include those lands necessary for Project operations in the Project boundary. In accordance with this law, the Commission requires that the Project boundary contain the primary recreational facilities used to access Project waters, as well as the lands necessary to ensure access for the term of the license, and the lands necessary to ensure an appropriate buffer between the Project and neighboring lands. As part of any new license, SMUD and PG&E would provide revised exhibit G (Project boundary map) for the Projects that would include a detailed description and maps of the Project boundary.

Most of the recreational facilities proposed to be included in the Project boundary are immediately adjacent to the existing Project boundary and directly associated with recreational sites that provide access to the lands and waters used for hydroelectric operations. There is a clear physical nexus between the Project and these sites, many of which have been developed by SMUD to provide access to reservoir shorelines, boat launches, campgrounds or shoreline trails.

However, two of the proposed recreational site enhancements listed in table 3-62 are well outside the current boundary and we note that the Commission does not have the authority to require site modification beyond the Project boundary. These sites include the Airport Campground and the Big Hill Communication Site. We discuss each of these sites below and their nexus to the Project.

SMUD built Airport Flat Campground in 1996 as part of the exhibit R amendment to the License. It is one of the few licensee-developed facilities away from a main reservoir. This site was developed in lieu of expanding Gerle Creek Campground as a result of concerns that an expanded Gerle Creek Campground would lead to crowding conditions and degradation of the recreational experience. As such, the Airport Flat Campground was developed to handle recreational demand associated with the Project. This relationship appears to establish a nexus between the site and Project operations.

Big Hill Communication Site is primarily used as a communication, fire observation and fire staging area for the Forest Service. The site also includes the Big Hill Vista, which SMUD built under the current license. Recreational visitors to the area often drive to the top of Big Hill to overlook Crystal Basin and the high Sierra Mountains to the east. Although the principal purpose of the site is for Forest Service operations, including those recreational specific facilities within the Project boundary on top of Big Hill would ensure that the site is maintained for public use for the term of any new license issued.

Cleveland Coral Information Center serves as the first public contact facility for visitors to the Crystal Basin, providing public information services to nearly 70,000 visitors annually. The site provides visitors with the best opportunity to find appropriate campgrounds and plan the details of their trip to the basin. In the draft EIS, we also recommended that SMUD include the Cleveland Corral Information Center in the Project Boundary. In comments on the draft EIS, SMUD pointed out that there are no proposed measures relating to physical improvements to this facility in the Settlement Agreement, other than providing informational brochures. Therefore, we revisited our recommendation and now conclude that inclusion of this facility in the Project boundary would not be necessary for Project purposes.

Recreational Access Plan for Slab Creek Reservoir

Slab Creek reservoir is located deep in the SFAR canyon. The site is difficult to access and the parking and staging area at the end of the Project road is steep, narrow and in disrepair. Nonetheless, SMUD's whitewater boating study determined that the reach is Class IV-V and would be boatable by advanced and expert boaters if sufficient flows were available. Under Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes to provide recreational releases below Slab Creek dam, which would attract more recreational use to confined staging area.

Under Proposed Article 1-19, *Specific Recreation Measures,* SMUD proposes to develop a recreation access plan that addresses recreational access to the reservoir. This plan would address recreational access during the time of construction of Iowa Hill reservoir and the tunnel connecting to Slab Creek reservoir, and when Iowa Hill reservoir and associated powerhouse are operational.

Our Analysis

SMUD found public access difficulties associated with the Slab Creek run, including the lack of suitable sites to develop sufficient parking at the put-in and potential take-out locations due to steep terrain, the lack of existing legal public access to potential take-out locations, and limited possibility to achieve public access to potential take-out locations by securing easements from private landowners. Developing an access plan to help provide a reasonable level of public access to these facilities would help ensure that boaters could use recreational releases.

Monitoring and Adaptive Management

Project licenses typically extend from 30 to 50 years. Over such long timeframes, recreational use patterns would likely change, potentially causing impacts to important environmental resources or reducing the adequacy of existing recreational facilities to meet visitors' needs. In addition, many of the environmental measures proposed by the licensee and recommended by the Agencies could alter recreational use patterns or have direct adverse affects on habitats that have been established under existing conditions. For example, the proposed recreational flow releases could directly affect aquatic and terrestrial habitats or could attract an unanticipated number of boaters that have not historically visited these areas.

As part of the Settlement, SMUD proposes a monitoring program (Proposed Article 1-5 *Monitoring Program*) to track changes in important habitats and indicators species associated with recreational use, pulse flows and recreational flows. SMUD also proposes to enter an adaptive management process to change Project operations in response to adverse effects on environmental resources observed through the monitoring program.

The Proposed Action calls for SMUD to implement a monitoring program after license issuance and through the term of the new license and any annual licenses, in coordination with the Agencies. The recreational monitoring component is further defined in Proposed Article 1-16, *Recreation Survey*, under which SMUD would conduct a Recreational Survey and prepare a report on recreational resources every 6 years of the new license. The survey would include, but not be limited to, changes in kinds of use and use patterns, levels of use, user preferences in recreational activities, kinds and sizes of recreational vehicles, preference for day use versus overnight use, carrying capacity information sufficient to indicate changes in capacity, and recreation user trends within the Project area.

In addition, Proposed Article 1-25, *Public Information Services*, calls for SMUD to provide data to support the determination of carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of “desired conditions,” user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience. It appears that this information would be collected as part of the surveys discussed above.

SMUD’s proposed adaptive management measures (Proposed Article 1-6, *Adaptive Management Program*), which are closely tied to the environmental monitoring and recreational use survey findings, would include changes to Project operations if the monitoring program and other scientific information indicates that the ecological resource objectives would not likely be met without adjustment. SMUD and the consulting agencies would analyze monitoring results and other scientific information to determine the effects on applicable ecological resource objectives identified in the Settlement Rationale Report. Specific recreation-related adaptive management measures that SMUD and the agencies would consider include: cancellation of pulse and recreational releases in SFSC if foothill yellow-legged frogs are found on the creek and water temperatures in the creek become unsustainable for the frogs; cancellation of recreational flows in SFAR below Slab Creek dam if water temperatures below the dam rise above 12°C mean daily temperature for a 7-day running or if October releases adversely affect foothill yellow-legged frogs; implement good-faith effort to avoid untimely spill events below Slab Creek and Camino dams once foothill yellow-legged frog breeding has been Initiated.

Our Analysis

Monitoring recreational use over time would provide environmental and recreational use baseline data from which to change Project operations to protect sensitive environmental resources. As proposed, the recreational measures would provide substantial benefits to recreational visitors and the proposed recreational releases are generally planned to mimic natural conditions and enhance terrestrial and aquatic resources within and downstream of the Project developments. Based on what is known about the Projects, the proposal appears to simultaneously protect and enhance environmental resources while continuing to provide and enhance recreational opportunities.

However, as with any complex system, changes in recreational use patterns or Project operations could have unanticipated adverse effects on aquatic or terrestrial resources. The proposed adaptive management measures would provide a means to address these effects over the term of any new license issued. As proposed, SMUD would file reports with the Commission summarizing monitoring results. If any recreation-related adaptive measures are required during the term of any new license, SMUD would file an amendment to the proposed recreation implementation plan with the Commission for approval.

Recreational Site Operation and Maintenance

Long-term O&M of Project recreational facilities helps ensure that the quality of the recreational sites is maintained for the term of any new license. Under the current license, SMUD has contributed O&M funds annually to the Forest Service and has assisted the Forest Service with new capital improvements at its recreational sites. Overall, the recreational facilities at the Project are generally in fair to good operating condition. However, some formal sites and many of the informal sites have deferred maintenance needs or receive minimal ongoing services.

As part of Proposed Article 1-21, *Recreation Operation, Maintenance, and Administration*, SMUD proposes to contribute annually to the Forest Service up to a maximum of, $1,000,000 (year 2005 cost basis). As part of the Settlement, the Forest Service would use the funds to provide for operation, maintenance, and administration of those developed recreational sites, facilities, or uses that are both within, or near the Project reservoirs and facilities listed in Proposed Articles 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures* (either developed as part of the original/amended license or affected by operations). The proposal would include, but not be limited to, managing use within and immediately adjacent to the Project boundary, and performing both regular and annual maintenance. In addition, the Forest Service would use the funds for the special use permit administration required for facilities developed as part of the original/amended license and operated by a concessionaire. Work to be completed within these areas would consist of conducting patrols, picking up litter, providing public information, enforcing rules and regulations, rehabilitating impacted areas, addressing sanitation, maintaining day use sites (such as concentrated use areas), maintaining trails, information signs, and regulatory signs, responding to fires and other emergencies, assisting in search and rescue, addressing resource impacts, and area condition monitoring.

Our Analysis

The provision of recreational facilities in the UARP vicinity has been a collaborative effort since the construction of the UARP with SMUD funding the construction of new facilities over time and the Forest Service managing the day-to-day operations of the facilities assisted by a combination of public funds as well as SMUD support through an annual collection agreement. We find that this arrangement has benefitted the public who use the project recreational facilities at and near the Project.

Project studies (CDFG, 2007) show that the people who visit the Project recreational facilities also use the areas adjacent to and near the Project facilities and frequently need services. For example, visitors may come primarily to camp at or boat on the Project's reservoirs, but then visit other nearby areas. The Forest Service provides services to these visitors if they get injured and require help, start fires, or leave trash. The costs the Forest Service spends on these services in the dispersed areas adjacent to or in the vicinity of the Project are a small part of the total costs associated with the operation and maintenance of project facilities provided under their collection agreement with SMUD.

Fish Stocking

One of the primary recreational activities associated with the Project includes angling in the large storage reservoirs. CDFG currently stocks these reservoirs to improve the recreational fishery, but does not guarantee that stocking would continue through the term of any new license.

Under Proposed Article 1-26, *Fish Stocking*, SMUD proposes to match the amount of fish stocked by CDFG, per direction from CDFG, and distribute the fish among Loon Lake, Union Valley, and Ice House reservoirs. SMUD would provide between 25,000 and 50,000 pounds per year.

Our Analysis

Because reservoir-related angling is one of the most important recreational activities associated with the Project, particularly in the large storage reservoirs, including Loon Lake, Union Valley, and Ice House reservoirs, assisting CDFG in stocking would help ensure that the recreational fishery is maintained for the term of any license issued.

Trails System Management

Hiking and camping along the Forest Service-managed trail systems is an important recreational use, particularly in Crystal Basin and the high-elevation areas. In some cases, the highest reservoirs are in or near wilderness areas with no road access, requiring SMUD to carry in Project-related equipment.

As part of Proposed Article 1-19, *Specific Recreation Measures*, SMUD proposes specific trail enhancements including new trails, trail closings, and rehabilitation of existing trails, as summarized in table 3-63.

Table 3-63. SMUD's proposed trail enhancements. (Source: SMUD and PG&E, 2007, Proposed Article 1-19)

Location	**Proposed Trail Enhancements**	**Within How Many Years of License Issuance?**
Buck Island reservoir Area: West Shoreline	Improve or relocate existing non-motorized trails connecting to the Rubicon Hiking Trail.	2 years
High Country Area Trails	Improve selected connecting trails off Rubicon hiking trail that access Spider Lake.	2 years
Rubicon Hiking Trail	Reconstruct or relocate portions of the trail to meet Forest Service standards and facilitate proper drainage, including improvement of tread on the portion of the trail using the old construction road. Trail width would accommodate quads for SMUD's administrative use only up to the wilderness boundary.	2 years
Trail Connecting Pleasant Boat-In Campground to Rubicon Hiking Trail	Reconstruct trail to standard, including tread, vegetation clearing, drainage, and signage.	2 years
Angel Creek Trail	Extend the trail to tie to the Summer Harvest Trail (making a loop trail around the reservoir).	5 years
Summer Harvest Trail	Upgrade trail surface to a similar standard (aggregate base) as the new trail at Angel Creek Day Use Area. Replace missing or damaged interpretive signs as needed.	5 years
Union Valley Bike Trail	Complete the bicycle trail system around Union Valley reservoir.	
Ice House Reservoir Lakeshore Road	Provide access trails from paved turnouts and/or parking pockets along the road to the shore. Restore damaged sites between road and shoreline.	5 years
Ice House Mountain Bike Trail	Extend the Ice House Mountain Bike Trail (native surface) completely around Ice House reservoir, including stream and spillway crossings. Construct an interconnecting trail between the Ice House mountain bike trail and the Union Valley mountain bike trail.	10 years

As part of Proposed Article 1-31, *Trails System Management*, SMUD proposes to file with the Commission a trails system management plan for the trails that are needed for Project operations and are located on or affect National Forest System lands. The licensee would implement the plan upon approval. At a minimum, the plan would:

(1) include a map showing the location of all trails, both the Forest Service system (classified) trails and Forest Service non-system (unclassified) trails associated with the Project; (2) map trail locations using a global positioning system (GPS), software, pre and post-processing standards, collection standards and data dictionary approved by the Forest Service, to ensure that data collected meet national standards; (3) identify the season(s) of use and the amount of use by the licensee for each trail annually; and (4) identify the condition of the trails described above, including any construction or maintenance needs. SMUD would update the plan every 5 years identifying maintenance and reconstruction needs for trails. The licensee would file the plan with the Commission after approval by the Forest Service.

For the Chili Bar Project, as part of Proposed Article 2-13, *BLM Recreation Improvements*, PG&E proposes to plan, design, and construct a new hiking trail between Rock Creek Road and the Chili Bar reservoir to provide public access and formal, safe travel to the reservoir shoreline as previously described under *Specific Site Improvements*.

Our Analysis

Trails provide important recreational and hunting access to the federal lands adjacent to the Project, as well as access to the Project from surrounding roads, and, in cases, access for SMUD to Project developments in the remote high-county areas. Although many other types of recreational uses are declining on a national level, demand for trail-related activities, such as walking, hiking, and biking appear to be increasing.

Of the numerous recreational and hiking trails that provide access to public lands managed by federal agencies near the Projects, many begin along roads or recreational sites related to the Project. Some of these trails are informal and formed by user groups, including the trail on BLM lands from Rock Creek Road to Chili Bar reservoir, and many of the short spur trails that access SMUD's reservoirs from Forest Service roads in the Crystal Basin.

As proposed by SMUD and PG&E, the trail-specific measures would provide substantial benefits to recreational visitors by extending and formalizing trail access to Project facilities. The trails would continue to provide a variety of recreational opportunities, including walking, hiking, angling, sightseeing and biking access.

SMUD's proposed trail plan would help to ensure that the condition of the trail system is maintained at an adequate level over time. In addition, the plan would help ensure that trail users are educated about permissible and prohibited activities in order to avoid adverse effects on aquatic and terrestrial resources in the area.

PG&E's proposal to develop a trail on BLM lands to access the Chili Bar reservoir would formalize recreational use that already occurs in this area. Currently, anglers, picnickers, and other visitors follow an old logging road part way into the canyon and follow a user-made trail to the water's edge. Formalizing this trail would help ensure that it is designed to follow natural contours and reduces erosion and other impacts that can be associated with informal trials. Based on existing use of the informal trial, PG&E's proposal would also address a clear recreational demand for improve trails to the reservoir. Developing the trail and associated facilities in the context of a recreational plan for the Project, updated periodically with the filing of FERC Form 80, would help ensure that the licensee responds to changing recreational demand and needs over the term of any license issued.

Reservoir Levels

Project operations include substantial drawdown of lake elevations, although most of this drawdown does not occur during the primary recreational season. Such drawdown can interfere with boat access to the reservoirs and reduce the quality of the boating experience.

Proposed Article 1-23, *Reservoir Levels*, calls for SMUD to meet or exceed the end-of-month reservoir elevation targets for Loon Lake, Union Valley, and Ice House reservoirs and attempt to maintain higher levels and reduce daily fluctuations during the primary recreational season. These measures are fully defined and considered from an operational perspective in section 3.3.2 *Water Resources*.

Our Analysis

Recreational use within the Projects is primarily associated with the Project reservoirs. Typically, SMUD operates Loon Lake, Union Valley, and Ice House reservoirs (the large storage reservoirs in the Project) at full pool by mid-June, drops the reservoirs consistently through the summer and reaches full drawdown in October. During this period, and in most years, most of the public boat ramps are accessible.

As proposed, SMUD would ensure that the reservoirs would be maintained at a higher level than those allowed under current conditions during the primary recreational season. This would improve the quality of recreational experience by covering much of the lake bottom when most of the visitors are at the Project and establishing minimum standards for lake levels associated with different water years.

Operation of a pumped-storage facility could create hazardous hydraulic conditions at the intake/outlet structure in Slab Creek reservoir during operations in both the turbining and pumping mode. The minimum operating elevation is 1,800 feet, and the intake is located 80 feet below elevation 1,850 feet or elevation 1,770 feet. The lowest recorded elevation during the period of record we reviewed was 1,807.8 feet in 2005. Using that value as the minimum operating elevation and assuming the intake structure is 15 feet high, the water depth above the intake during pumping operations could be as little as 22 feet. Under the proposed operations, SMUD would release up to 5,200 cfs when the water surface elevation is at the lowest point of the operating range and this release would cause water surface disturbances. The design of the intake for the lower reservoir would need to provide for adequate safety features, including boat restraining barriers, warning signs, and other guidance to the general public. Such designs should use the Commission *Guidelines for Public Safety at Hydropower Projects* to develop adequate protection for the public. The design of such barriers should use either physical modeling or computation fluid dynamics modeling to assess the zone of potential influence and design preventative measures accordingly. Typically, such details[39] are developed during the final design stage and are subject to review by an external engineering board of review and by the Commission.

Coordinated Operations

Currently, boatable flows downstream of the Chili Bar development are primarily controlled by operations of the UARP. The lack of coordination leads to substantial variability in flows and loss of generation capacity when inflow to Chili Bar exceeds the hydraulic capacity of the powerhouse and the Project spills.

Proposed Article 1-4, *Coordination with Chili Bar Licensee*, calls for SMUD to coordinate operations with the licensee of the Chili Bar Hydroelectric Project, in order to comply with the minimum stream flows, pulse flows, ramping rates, and recreational stream flows for both Projects. Proposed Article 2-3 calls for PG&E to coordinate operations with SMUD.

Our Analysis

The whitewater runs between Chili Bar dam and Folsom reservoir are of regional, if not national importance. Theses river sections are the most heavily boated in California, in part because the flows are relatively dependable and extend well into the summer and falls months and in part because of their close proximity to large population centers. Historically, SMUD and PG&E have had limited coordination, where PG&E calls SMUD plant operators shortly before upstream releases in order for PG&E to decide how low to draw down Chili Bar reservoir. Often, this coordination does not work well, causing Chili Bar to spill and providing unpredictable flows in the whitewater runs below the Chili Bar dam. As proposed, coordination would provide substantial improvements to recreational resources by allowing boaters and other recreational users to more closely predict the timing and magnitude of flows and helping PG&E avoid lost generation opportunities.

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[39] Although the location of the intake/outlet structure was provided in exhibit F-160 and shown to be near the east shore of Slab Creek reservoir, we did not find a detailed drawing showing the structure or any boat restraining barriers.

Recreational Streamflows

SMUD determined that Project operations limit whitewater boating opportunities between Slab Creek dam and Chili Bar reservoir, as well as the SFSC downstream of Ice House reservoir. In some years, these developments spill intermittently and unpredictably, or do not spill at all.

As part of Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes to provide recreational streamflows in the SFSC downstream of Ice House reservoir (tables 3-64 and 3-65). The releases would include a range of flows and durations during spring months associated with the water year. The duration and magnitude of the proposed flows would be based on the water year, with shorter flow events at lower magnitudes occurring during dryer years.

Table 3-64. Proposed recreational streamflows in the Ice House dam reach the first 5 years. (Source: SMUD and PG&E, 2007)

Water Year Type	**May**	**June**
CD	300 cfs for 1 weekend day	
Dry	300 cfs for 1 weekend days	
BN	400 cfs for 2 weekend days/holidays plus 500 cfs for 2 weekend days/holidays	
AN	400 cfs for 2 weekend days/holidays plus 500 cfs for 4 weekend days/holidays	
Wet	400 cfs for 4 weekend days/holidays plus 500 cfs for 5 weekend days/holidays	

Table 3-65. Maximum possible recreational streamflows in the Ice House dam reach after year 5. (Source: SMUD and PG&E, 2007)

Water Year Type	**May**	**June**
CD	300 cfs for 2 weekend days	
Dry	300 cfs for 6 weekend days	
BN	400 cfs for 5 weekend days/holidays plus 500 cfs for 2 weekend days/holidays	
AN	400 cfs for 5 weekend days/holidays plus 500 cfs for 5 weekend days/holidays	
Wet	400 cfs for 7 weekend days/holidays or Fridays plus 500 cfs for 9 weekend days/holidays or Fridays	

SMUD proposes to spill water from the Slab Creek dam to provide recreational streamflows between 850 cfs and 1,500 cfs in BN, AN, and wet water years within 3 months of license issuance. These flows would be provided between the hours of 10:00 a.m. and 4:00 p.m. in no fewer than three flow events during the period between March 1 and May 31.

SMUD would monitor the amount and type of boating use for both runs for 5 years. For the Slab Creek run, if the construction of the Iowa Hill development has not commenced, SMUD would prepare a whitewater boating recreation plan at the end of 5 years, in consultation with the Forest Service, the Water Board, BLM, and other interested parties, describing whitewater recreational use and impacts on aquatic species and establishing triggers that would determine if SMUD enhances recreational streamflows to include releases in October. SMUD would continue to provide spring releases through year 10 at which time, if the construction of Iowa Hill has not commenced, SMUD would determine if physical modifications would need to be made to the White Rock tunnel adit to provide the proposed October recreational flow releases. After 15 years SMUD would provide the enhanced recreational streamflow releases shown in table 3-66 if the Iowa Hill development is built or if the Iowa Hill development is not built and the recreational use triggers have been met.

Within 2 years of new license issuance, SMUD would also prepare a plan to provide easement for access and parking in the immediate vicinity of White Rock powerhouse for recreational flow events, as well a management plan to address the whitewater recreation needs in the Slab Creek dam to White Rock powerhouse. SMUD would develop and implement measures identified in this plan. The management plan would address the following elements: use levels and projected future use levels; carrying capacity; sanitation and garbage; user conflicts; resource effects along the river and including effects to private land; necessary put-ins, take-outs and parking for whitewater activities; emergency resource protection measures; public safety, search and rescue needs and other emergency response needs; information and educational signing needs; demand for commercial services or outfitting, including shuttle services and guiding; on-river boat patrol.

For the SFSC run, SMUD would annually, in cooperation with the Forest Service, CDFG, and other interested parties, identify large woody debris that is hazardous to recreation streamflow users. SMUD would relocate the large woody debris within the channel, with approval by the Forest Service.

Under Proposed Article 2-15, PG&E would maintain minimum recreational streamflows below in the SFAR downstream of the Chili Bar dam as shown in table 3-67. If the Water Board, California Department of Parks and Recreation, and BLM determine there should be changes to the times shown in table 3-67, PG&E would adjust the minimum recreational streamflows accordingly provided that inflows to the Chili Bar reservoir and Chili Bar reservoir elevations are sufficient to maintain these flows.

Table 3-66. Proposed recreational streamflows in the Slab Creek dam reach after Iowa Hill development is constructed, or year 15 if criteria are met. (Source: SMUD and PG&E, 2007)

<table>
<tr><th>Water Year Type</th><th>March</th><th>April</th><th>May</th><th>October</th></tr>
<tr><td>CD</td><td></td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 4 weekend days and

1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 2 weekend days</td><td></td><td></td></tr>
<tr><td>Dry</td><td colspan="2">850–950 cfs from 10:00 a.m. to 1:00 p.m. for 4 weekend days
and
1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 6 weekend days</td><td></td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 2 weekend days</td></tr>
<tr><td>BN</td><td></td><td colspan="2">850–950 cfs from 10:00 a.m. to 1:00 p.m. for 3 weekend days/holidays[a]
and
1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 9 weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
<tr><td>AN</td><td></td><td colspan="2">1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 12 weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
<tr><td>Wet</td><td colspan="3">1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 12 days, weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
</table>

[a] Priority given to Memorial Day weekend

Table 3-67. South Fork of the American River downstream of Chili Bar reservoir dam minimum recreational flow by water year (cfs). (Source: DTA and Louis Berger, 2004c)

Water Year Type	**Period**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
		(hours at cfs)						
Super Dry	April–Memorial Day	3 hours at 1,300					3 hours at 1,300	3 hours at 1,300
	Memorial Day–Labor Day	3 hours at 1,300			3 hours at 1,300	3 hours at 1,300	5 hours at 1,300	5 hours at 1,300
	Labor Day–September						3 hours at 1,300	3 hours at 1,300
	October–March						3 hours at 1,300	
Critically Dry	March–Memorial Day	3 hours at 1,300					3 hours at 1,300	3 hours at 1,300
	Memorial Day–Labor Day	3 hours at 1,300			3 hours at 1,300	3 hours at 1,300	5 hours at 1,500	5 hours at 1,500
	Labor Day–September					3 hours at 1,300	3 hours at 1,300	3 hours at 1,300
	October–February						3 hours at 1,300	
Dry	March–Memorial Day	3 hours at 1,300	3 hours at 1,300			3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	Memorial Day–Labor Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	5 hours at 1,500	5 hours at 1,500
	Labor Day–September					3 hours at 1,300	3 hours at 1,300	3 hours at 1,300
	October–February						3 hours at 1,300	3 hours at 1,300
Below Normal	March–Memorial Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	Memorial Day–Labor Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	6 hours at 1,500	6 hours at 1,500
	Labor Day–September				3 hours at 1,300	3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,300	3 hours at 1,300
Above Normal	March–Memorial Day	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	4 hours at 1,750	4 hours at 1,750
	Memorial Day–Labor Day	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Labor Day–September				3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,500	3 hours at 1,500

Water Year Type	Period	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		(hours at cfs)						
Wet	March–Memorial Day	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Memorial Day–Labor Day	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Labor Day–September				3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,500	3 hours at 1,500

Our Analysis

SMUD's investigation of all of the reaches below Project dams determined that whitewater recreation is feasible on the Slab Creek, Camino, and Ice House dam reaches. The other Project reaches have low whitewater recreation potential due to various attributes such as remoteness, physical barriers or excessive or insufficient gradient. During periods when there is sufficient flow resulting from spill events, there are days when flows in the boatable range exist on the Slab Creek and Camino dam reaches, but this rarely occurs on the Ice House reach. The Slab Creek dam reach has received boating use during past spill events and this dam is known to spill in AN and Wet water year types.

SMUD's proposed spring recreational streamflows releases during years 1 through 15 would provide reliable boating flows of high difficulty that would enhance whitewater boating opportunities at the UARP. SMUD's monitoring for effect of these flows on aquatic species and to determine use would provide SMUD and the Agencies with the information necessary to adjust flows in response to environmental effects and user demand. After 15 years both the spring and fall flows would be provided if the recreational demand and aquatic triggers are met.

As proposed, SMUD's and PG&E's recreational releases would provide substantial recreational benefits for whitewater boaters, especially during dry years when these dams would not typically spill. The proposed flows would occur at a magnitude that would provide high-quality boating opportunities for a variety of skill levels and for a variety of boats and that would be consistent with the results of the recreational use and boating studies.

Streamflow and Reservoir Elevation Gaging

Accurate and timely stream flow and reservoir levels provide important information for recreational visitors planning water-related visits to the Project. Currently, flow information is provided by SMUD on a public Internet site for a number of Project-related waterways. However, the public information is incomplete and does not include flows on many of the Project's creeks and streams.

As part of Proposed Articles 1-10 and 2-8, *Streamflow and Reservoir Elevation Gaging*, SMUD and PG&E propose to develop and file with the Commission for approval a streamflow and reservoir elevation gaging plan within 1 year of license issuance that meets USGS standards. SMUD and PG&E would provide copies of their respective plans and USGS review results to the Forest Service, the Water Board, CDFG, and the Commission. The Chief of the Division of Water Rights would approve the plans prior to filing with the Commission. See section 3.3.2.2, *Water Resources, Water Quantity*, for details of the streamflow and reservoir gaging locations.

The measure also calls for SMUD to install and maintain simple staff gages at the put-ins for the Slab Creek and Ice House recreational boating runs within two years of new license issuance. SMUD would perform an investigation to determine whether telemetry equipment can be installed at Rubicon River below Rubicon dam and Little Rubicon River below Buck Island dam to monitor conditions and/or control operations. If SMUD and the Forest Service concur that such equipment is economically and technologically feasible and can be installed consistent with law, regulations, and policies applicable to Desolation Wilderness, SMUD would seek necessary approvals for such installation and would install this equipment if the necessary approvals are received.

SMUD and PG&E also propose to develop public information services (Proposed Articles 1-25 and 2-15, *Public Information Services*) to provide stream flow and reservoir level information on the Internet.

Elements of SMUD's stream flow and reservoir level measure would include:

1. Publication of flow and reservoir level on the Internet.
2. Notification of recreational streamflow releases at least 7 days in advance of the actual releases.
3. A plan that addresses, at a minimum, information on daily average reservoir stage height for the following reservoirs: Rubicon, Loon Lake Ice House, Union Valley, Gerle Creek, Brush Creek, and Junction. The plan would also address, at a minimum, information on hourly average reservoir stage height and storage for Slab Creek reservoir.
4. A plan that addresses real-time streamflows for the following Project-related stream reaches: Rubicon River below Rubicon dam; Little Rubicon River below Buck Island dam; Gerle Creek below Loon Lake dam; Gerle Creek below Gerle Creek dam; SFRR below Robbs Peak dam; SFSC below Ice House dam; Silver Creek below Junction dam; Silver Creek below Camino dam; Brush Creek below Brush Creek dam; SFAR below Slab Creek dam.
5. The plan would be approved by the Forest Service and the Water Board prior to filing with the Commission. Following approval, the minimum streamflow schedules from appendix a, section 1, and current water year type information would be published on the licensee's website. Within 6 months of completion of the information plan described above, the licensee would implement the elements described in the information plan. The streamflow and reservoir level information plan may be modified upon mutual agreement of the licensee, Forest Service, CDFG, and the Water Board.

PG&E's plan would include: (1) real-time lake stage height and storage information for Chili Bar reservoir; (2) installation of up to two simple staff gages for use by the public; (3) real-time streamflow and reservoir level information that is available to the public year-round via toll-free telephone number or other appropriate technology approved by BLM; and (4) streamflow information collected consistent with the standard USGS gage facilities downstream of the Chili Bar reservoir dam (using USGS gage 11444500) on a web site that includes 15-minute increments and streamflow releases from the past 7 days.

Our Analysis

SMUD's and PG&E's proposals, including gaging and publication of flow information, would provide substantial amounts of new flow and lake level data for recreational visitors. This information would be useful in planning and staging water-related trips to the Project, such as flat water and whitewater boating trips and fishing trips.

Public Information Services

Public information at the primary recreational sites helps visitors understand acceptable and prohibited activities, as well as provide information about important cultural and environmental resources in the area.

As part of Proposed Article 1-25, *Public Information Services*, SMUD proposes to develop public information services that would require SMUD to develop brochures and maps, and develop an interpretation and education plan for the Project. Specifically, SMUD proposes develop and print one or more brochures and maps that describe the recreational opportunities, recreational facilities, rules, and responsibilities within the area of the Project, including the Canyonlands, high country lakes, and streams. The brochure would be provided to the Forest Service for review and approval prior to completion. The licensee would make the brochure/map available to the public free of charge. The brochure/map would be made available continuously and would be updated as conditions change.

SMUD also proposes to develop an interpretive, educational, and public information plan within 2 years of license issuance, in consultation with the Forest Service and other appropriate agencies and interested parties. At a minimum, the plan would include themes, design, audience, delivery methods, and schedule for implementation for providing up-to-date information such as: sightseeing, hiking, observing wildlife, and utilizing facilities such as boat ramps, campgrounds, and beaches. SMUD proposes to coordinate development of this plan with PG&E.

As part of Proposed Article 2-14, *Public Information Services* PG&E would annually pay $15,000 (escalated by GDP-IDP) to BLM to provide Project recreation brochures and maps and an interpretive, education, and public information plan.

Our Analysis

The proposed brochures and map and the interpretive, education, and public information plan would improve upon existing public education and interpretation information with updated materials that compliment the Forest Service and BLM publications. The proposal would help expand recreational opportunities by providing visitors with easily accessible information about Project resources.

UARP-Only Alternative

The effects of Project operations on existing and proposed recreational facilities would be the same as under the Proposed Action, except that if recreational use triggers are met, the provision of enhanced recreational boating flows would require physical modifications to the White Rock tunnel in year 15.

3.3.6.3 Cumulative Effects

The recreational measures proposed by SMUD and PG&E would improve recreational opportunities throughout much of the SFAR Basin. Each proposed measure is incrementally small. However, together, the recreational measures would improve opportunities in the region, allowing the Projects to adapt to change recreational use over time, better using existing recreational resources, and developing new resources that address current and foreseeable recreational activities, such as hiking and biking.

3.3.6.4 Unavoidable Adverse Effects

None.

3.3.7 Land Use

3.3.7.1 Affected Environment

Land Ownership

The UARP is located in El Dorado County and the northeastern part of Sacramento County, California, within the SFRR, SFSC, and SFAR drainages. The Project boundary encompasses about 9,432 acres, which includes the seven developments as well as the proposed Iowa Hill development (including transmission tie-in and access roads) (table 3-68). The Forest Service administers about 64 percent (6,048 acres) and BLM administers less than 1 percent (42 acres) of the federal lands within the UARP boundary, none of which are in the proposed Iowa Hill development. SMUD owns about 34 percent (3,193 acres) of the land. The private owners (Sierra Pacific Industries) hold about 2 percent (150 acres) of the land within the Project boundary.

The proposed Iowa Hill development boundary including the transmission line tie-in would include about 283 acres of land. The Forest Service administers 185 of these acres, and the remaining acres are owned and managed primarily by SMUD (77.9 acres) and Sierra Pacific Industries (20 acres).

BLM owns about 227 acres of undeveloped land in the vicinity of the Chili Bar Project. About 48 of those acres are located inside the Chili Bar Project boundary.

Table 3-68. Land ownership (acres) within the FERC Project boundaries, by development.[a] (Source: DTA and Goodavish, 2005a)

Development	SMUD	Forest Service	BLM	Private	Totals
Loon Lake	253.1	2,041		11.3	2,305.4
Robbs Peak	28.2	188.8		33.5	250.5
Jones Fork	666.6	518.8			1,185.4
Union Valley	2,018.1	2,257.5		6.8	4,282.4
Jaybird	52	336		7.9	395.9
Camino		227.1		0.2	227.3
White Rock	96.6	293.4	42.3	70.3	502.6
Iowa Hill	77.9	185		20	282.9
Total	**3,192.5**	**6,047.6**	**42.3**	**150**	**9,432.4**

[a] The Commission charges SMUD annually for the use of federal lands under section 10(e) of the FPA for 4,553.41 non-transmission line acres and 359.79 transmission line acres, which is less than the total federally owned acres in this table because acreage transferred to the Forest Service in the 1960s for which SMUD retains occupancy rights is not included in the total.

Land Uses

Industrial Uses

Industrial uses with the Project areas are predominantly related to SMUD and PG&E's hydropower operations. These facilities (described in sections 2.1.1 and 2.2.1, *Project Description)* include 12 reservoirs, 12 transmission lines, tunnels, and support facilities.

Recreational Uses

Rubicon reservoir in the Loon Lake development is surrounded by the Desolation Wilderness Area within the Eldorado National Forest, and the Forest Service manages the land around the reservoir consistent with wilderness goals and objectives. The land within and immediately surrounding Buck Island and Loon Lake reservoirs is public land managed primarily for recreational activities, including boating, fishing, hiking, horseback riding, camping, and wilderness appreciation. The Rubicon OHV Trail passes along the north side of Loon Lake and Buck Island reservoir, and users camp at informal dispersed campsites near the route.

SMUD provides formal public recreational facilities and shoreline access primarily at four of the reservoirs in Crystal Basin (described in section 3.3.6.1, *Recreational Resources*). Facilities include four campgrounds, a boat launch, a wilderness trailhead, and a chalet at the Loon Lake development; two campgrounds, two day-use areas, an interpretive trail, and a fishing pier at the Robbs Peak development (Gerle reservoir); three campgrounds, a day-use area, a boat-launch, a trail, an information station, and a sanitation station at the Jones development (Ice House reservoir); and 12 campgrounds, a day-use area, three boat launches, and two sanitation stations at the Union Valley development. There are two private resorts, Robbs Valley Resort which intrudes on the Project boundary at the Robbs Peak development, and Ice House Resort in the vicinity of the Jones Fork development. A commercial whitewater put-in, a public whitewater put-in, and the Nugget Campground are located along the SFAR downstream of Chili Bar dam.

Recreational use in the Canyonlands at the Jaybird, Camino, and Slab Creek/White Rock developments is informal and minimal and generally limited to fishing and dispersed camping on Eldorado National Forest lands; boating on Junction, Brush Creek, Slab Creek, and Chili Bar reservoirs via informal boat launches (boats are not permitted on the Camino reservoir); and OHV use. There are no developed recreational facilities at the reservoirs associated with the three developments. The downstream reach of the Chili Bar Project is a popular whitewater recreation run.

The proposed Iowa Hill development would be located within the Eldorado National Forest, near Slab Creek reservoir and the communities of Camino and Swansboro/Mosquito. No formal recreational facilities are proposed at this development.

Timber Harvesting

There are an estimated 428,844 acres of land managed for commercial timber production on the Eldorado National Forest. Timber-producing land is classified into five major forest types: mixed conifer, red fir, ponderosa pine, sub-alpine, and hardwoods. Timber harvesting emphasizes regeneration of poorly stocked stands. Timber harvesting occurs near each development at Robbs Peak, Jones Fork, Union Valley, Jaybird, and the proposed Iowa Hill development, as well as on privately owned lands owned by Sierra Pacific Industries adjacent to the Project boundary.

Residential Uses

Private residential development in the Project area is sparse with several privately owned parcels abutting the Project boundary along the north end of Loon Lake reservoir, several parcels in vicinity of Gerle reservoir, two parcels in the vicinity of Jones Fork development, several parcels abutting the Union Valley development, one parcel near the access road to the south of Camino developments, and several parcels in the vicinity of the Slab Creek/White Rock development. All of these private-residential parcels are zoned as Natural Resource Areas by El Dorado County and may be used for rangeland, wildlife management, forestry, water resource development, and or residential use supporting one dwelling per 40 to 160 acres. There is also sparse residential development to the north and south of the Iowa Hill site, which would be constructed on SMUD-owned land currently designated as rural residential with a platted lands overlay, on Eldorado National Forest lands, and on Sierra Pacific Industries lands designated as Natural Resource. The lands in the Chili Bar Project area include rural residential parcels, and several residences are located within 0.75 mile downstream of Chili Bar dam.

Access Roads

The SMUD operations and maintenance staff use a variety of federal, state, county, and private highways/roads to access Project facilities. SMUD's use of these roads consists of light and heavy vehicles at varying levels of frequency. All roads (about 104) within the UARP were surveyed and identified for existing or potential sources of erosion or sediment that may reach a watercourse. SMUD, Sierra Pacific Industries, the Forest Service, El Dorado County, or a combination of two or more of these jurisdictions maintains these roads. Main access roads to Project features and Project campgrounds that were paved generally had formal drainage systems, implemented erosion control measures, and little or no observed erosion and sediment transport. Access roads to transmission line towers generally followed the natural grade and used water bars for drainage. Ruts were observed on several of these roads, but sediment usually did not leave the roadway. In the worst cases, sediment traveled 15 to 20 feet from the road. Because these roads are typically on the tops of ridges and far from streams or rivers, there is little opportunity for sediment reaching watercourses.

Unpaved roads and trails (surfaced with gravel or native materials) that provide access to Project features typically have drainage features, including side ditches, water bars, and cross culverts. Some of these roads are near watercourses and have the potential to transport sediment to the water; however, most of these roads have higher usage and appear to be maintained. Very few problem areas were identified. During the winter, SMUD plows Ice House Road and several other roads needed to operate and maintain the UARP facilities. SMUD also voluntarily plows selected parking areas for recreationists in accordance with the Eldorado National Forest's annual snow removal plan, and during spring opening of campgrounds. SMUD removes the snow from Ice House Road consistent with a use permit issued by El Dorado County.

The roads that would serve the Iowa Hill development are U.S. Highway 50 (U.S. 50), Carson Road, Larsen Drive, North Canyon Road, Slab Creek dam access road, Slab Creek reservoir access road, Cable Road, and Iowa Hill Road. U.S. Highway 50 is the primary east-west transportation corridor through the county that serves all of the county's major population centers. Carson Road is a two-lane, east-west roadway extending from Camino to Placerville. Cable Road is a two-lane road paved up to the Sierra Express Drive intersection that runs generally north-south (with many curves). The remaining road segment to Iowa Hill Road is loose gravel or dirt. Cable Road would serve as the primary access route for the upper reservoir site, and it would be graveled from Sierra Express Drive to the Iowa Hill development as part of the Project improvements. Iowa Hill Road, off of Cable Road, is the access road to the upper reservoir site. Iowa Hill Road is a dirt road with no shoulder, and it would be graveled as part of the Project improvements. Larsen Drive is a two-lane, rural local collector that runs generally north-south between North Canyon Road and Carson Road. It also connects North Canyon Road to Cable Road. North Canyon Road is a two-lane north-south local road between Placerville and Camino. Slab Creek dam access road, off of North Canyon Road, provides access to the lower reservoir site, and it has a varying roadway width and no shoulder. It connects to Slab Creek reservoir access road at Slab Creek reservoir. Both Slab Creek dam access road and Slab Creek reservoir access road would be upgraded as part of the Proposed Action.

The Chili Bar Project access road extends to the Project facilities east from Highway 93. Three privately developed roads lead to shoreline areas that are located on Project lands including two roads off of Rock Creek Road along the northern shore of the Chili Bar reservoir and one road off of Bear Rock Road on the southern side of the Chili Bar reservoir.

Vegetation Management below Transmission Lines

SMUD currently implements a vegetation management program to maintain the vegetation in the transmission line right-of-way. SMUD voluntarily complies with California Public Utility Commission rules and regulations regarding power line clearances (General Order 95). The purpose of the plan is to sustain an adequate distance between overhead transmission lines and vegetation within the right-of-way. SMUD mainly uses mechanical methods, such as hand cutting and bulldozing, to clear the right-of-way outside the Eldorado National Forest. Recently, the Forest Service authorized SMUD to use herbicides in addition to mechanical treatment within the right-of-way on National Forest System lands. Herbicides allow for selective treatment of vegetation where undesirable plant species, such as noxious weeds, are selectively treated, and desirable species, such as low-growing trees and shrubs that provide wildlife habitat or food for foraging, are preserved. The reduction of fuels within the right-of-way has an added benefit as it creates a fuel break that will contribute to the control or containment of a wildfire.

Fire Risk and Protection

SMUD conducted a fire risk and protection study that concluded that that fire risk is highest in lands within the immediate vicinity of the UARP reservoirs and where recreation occurs. Fire risk progressively decreases moving further away from the reservoirs. Within the Pacific Ranger District, there are about 28,200 acres in need of fuels reduction treatment. Projected fuel treatments to reduce fire hazard to acceptable levels includes treating areas with a combination of thinning and slashing in the first decade, followed by periodic underburning to maintain desired conditions over the next five decades. SMUD's study found a positive correlation between human-caused fires and proximity to dispersed recreation located on Eldorado National Forest-managed lands sites; historically, fires are clustered along roads and surrounding recreational areas such as Union Valley, Loon Lake, and Ice House reservoirs. However, available data do not allow distinction between the types of human-caused fires. While transmission line sag is a fire risk, measures are in place to evaluate and remove hazard trees under and adjacent to transmission lines. Removal of these trees on a periodic basis minimizes the risk of fire start from the transmission lines.

While some wildfires in the UARP area have occurred historically, the Eldorado National Forest has an active fuels management program in place to minimize fire risk. Fires at UARP-related recreational areas are relatively rare, and when they occur they are usually small and quickly suppressed.

Land Management

Federal

As noted above, federal lands managed by two federal agencies (Forest Service and BLM) account for about two-thirds (6,090 acres) of the acreage within the Project boundary.

Forest Service—In 2001 and 2004, the Eldorado National Forest Land Resources and Management Plan was amended by the Sierra Nevada Forest Plan Amendment. This was a planning effort to respond to the study of the Sierra Nevada Mountain bioregion. The Sierra Nevada Plan addressed the following five management problems: (1) old forest ecosystems and associated species, (2) aquatic, riparian, and meadow ecosystems and associated species, (3) fire and fuels management, (4) noxious weeds, and (5) lower Westside hardwood forest ecosystems. The 2004 amendment established management direction and goals; land allocations; desired future conditions; standards and guidelines for future management actions; and strategies for inventory, monitoring, and research to support adaptive management.

The goals of the old forest and associated species strategy are to (1) protect, increase, and enable desired conditions of old forest ecosystems and conserve species associated with these ecosystems while meeting people's needs; (2) increase the frequency of large trees, increase structural diversity of vegetation, and improve stability and distribution of old forests across the landscape; and (3) restore forest species composition and structure following large-scale, stand-replacing disturbance.

The aquatic management strategy goals are to maintain and restore (1) water quality, (2) species viability, (3) plant and animal diversity, (4) special habitats, (5) watershed connectivity, (6) floodplains and water tables, (7) watershed condition, (8) streamflow patterns and sediment regimes, and (9) stream banks and shorelines.

The goals for fire and fuels management include reducing threats to communities and wildlife habitat from large, severe wildfires and re-introducing fire into fire-adapted ecosystems. The long term goals are (1) treating fuels in a way that reduces intensity and spread, therefore making fire suppression more effective; (2) treating hazardous fuels in a cost-efficient manner to maximize program effectiveness; and (3) actively restoring fire-adapted ecosystems. The management of hazardous fuels in and around communities combined with strategic placement of treatment across broad landscapes can modify wildland fire behavior.

The Eldorado National Forest Land and Resource Management Plan was also amended in 1998 to include the Desolation Wilderness Management Guidelines. These guidelines were developed because of the following issues: (1) increased day use in the wilderness due to increasing population in urban areas and improved access at wilderness trailheads, (2) the development of more refined methods of managing wilderness use, and (3) the national direction for the Forest Service to use land resource management plans to create standards and guidelines for consistent wilderness management.

U.S. Bureau of Land Management—The BLM's management plan for the SFAR pertains to the management of public lands. This management plan contains a set of assumptions that apply to the UARP and the Chili Bar Project. Planning Assumption #10 states, "It's anticipated that there will be no significant changes in water flow in the SFAR in the foreseeable future" (BLM, 2004, not seen, as cited in DTA and Goodavish, 2005a).

The Federal Land Policy and Land Management Act is the organic act of the BLM. The act establishes the agency's multiple-use mandate to serve present and future generations. The act requires periodic and systematic inventorying of publics and land use planning to project present and future land uses.

El Dorado County—All lands in the study area owned by El Dorado County are located outside the Project boundary. Lands in El Dorado County are subject to the policies detailed in the El Dorado County General Plan, River Management Plan, Trails Master Plan, and Water Agency Water Resource Development and Management Plan.

In El Dorado County, designations include Rural Residential, Low, Medium and High Density Residential, Natural Resource Areas, and Open Space. Rural Residential is defined as areas for residential and agricultural development where there is one dwelling unit per 10 to 160 acres. Low Density Residential establishes areas for single-family residential development in a rural setting with a maximum of one dwelling unit per 5 acres. Medium Density Residential is for detached single-family residences with larger lot sizes that enable limited agricultural land management activities. There is a maximum of one dwelling unit per 1 acre. High Density Residential areas are suitable for intensive single-family residential development (condominiums, townhouses, detached dwellings, and manufactured homes) at densities from one to five dwelling units to 1 acre. In the vicinity of UARP, within the Eldorado National Forest boundary, both governmental and non-governmental lands are designated as Natural Resources Area, which means these areas contain economically viable natural resources and protect the economic viability of those resources and those engaged in harvesting/processing of those resources, including water resources development. Compatible uses may include agriculture, rangeland, forestry, wildlife management, recreation, water resources development, and single-family dwellings necessary to support compatible uses. The Open Space land use designation includes public lands under governmental title (other than those designated as Natural Resources) where no development other than that specifically needed for governmental-related open space uses is desired.

3.3.7.2 Environmental Effects

Land Ownership, Management, and Use

The proposed management plans and associated land management strategies and implementation measures could affect land use and land management within the UARP area over the term of a new license. There are no measures in PG&E's Proposed Action that would affect land use at the Chili Bar Project.

Transportation System Management Plan

Under Proposed Article 1-30, *Transportation System Management,* SMUD would (1) develop and implement a transportation system management plan, approved by the Forest Service, for roads on or affecting National Forest System lands, (2) undertake specific road improvements, and (3) provide to the Forest Service an annual snow plowing plan to address public safety and access.

The proposed transportation system management plan would (1) establish SMUD's level of responsibility for Project roads with SMUD having primary responsibility for non-system roads and for maintenance level 1 and 2 roads and sharing levels of responsibility for maintenance level 3, 4, and 5 roads with the Forest Service; (2) include maps showing all roads, a traffic safety and signage plan, drainage crossings, easements or right-of-way agreements identifying those roads for which an easements or right-of-way agreements are needed; road use by season, conditions of the roads, a signage plan, measures to control erosion at the UARP facilities; and identification of access points at the UARP; and (3) provision for 5-year plan updated every 5 years to identify the maintenance and reconstruction needs for Project roads.

SMUD would also address specific road projects, including (1) improvements to North Union Valley Road; Wrights Lake Tie Road to improve the intersection with Ice House campground entrance road, and Lakeshore Road within 5 years of license issuance and close the road to Junction dam to public access and construct a turnaround/parking area within 10 years of license issuance.

Our Analysis

Some of the Forest Service and other public roads the licensee uses to access Project facilities for operation and maintenance purposes are also used by the Forest Service for administrative and land management purposes, and the public for recreational activities. The development of a transportation management plan, in consultation with the Forest Service, would enable ongoing maintenance and associated planning responsibilities to be clearly defined. Such clarification of maintenance responsibilities and implementation of erosion control measures during maintenance activities would minimize the potential for road erosion and damage caused by snow removal or other factors and other resource damage caused from precipitation and increased traffic. We note that any Project access road requiring routine maintenance would need to be included in the Project boundary. Implementation of the specific road improvements to those roads constructed by SMUD and used primarily for Project purposes would enhance public safety and access at several highly used recreational facilities.

Iowa Hill Development

Under SMUD's proposal, construction at Iowa Hill would begin with updating existing access roads to accommodate construction vehicles. The updated roads would serve as the main avenues for construction vehicles and for the estimated 235 temporary construction workers to access the upper and lower construction areas. The access road improvements and regular road maintenance associated with Project construction could enhance the potential for development after construction is complete.

Along with its license application, SMUD filed a draft Transportation Management Plan that addresses traffic safety and road improvements (also discussed in section 3.3.10.2). Appendix A of this plan states that SMUD would comply with federal and state laws, ordinances, regulations, and standards (LORS) that would govern the construction of Iowa Hill and the transport of materials on public roads and highways.

To address traffic safety and the road improvements noted above, SMUD's draft Transportation Management Plan includes a traffic analysis that addresses construction workers' parking, public safety for children, public information dissemination, and emergency access. According to this plan, SMUD would provide parking for about 30 workers near the powerhouse access tunnel entrance and at the upper reservoir. The draft plan also considers an offsite parking area (and a shuttle service) near U.S. 50 to reduce the number of construction worker trips on most area roads.

Under the proposed access routes, SMUD would reduce potential hazards to school buses and children of the Camino Union School District by coordinating most of the Project site construction commuter traffic to occur before 6:30 a.m. so as not to interfere with morning pick-up times from 7:00 to 8:00 a.m. Material deliveries to the Project site would occur between 9:00 a.m. and 2:00 p.m. while school is in session. In the afternoon, however, construction traffic could overlap with school traffic. To ensure the safety of school children, construction workers would be informed of bus routes and times to reduce the possible conflict between construction worker traffic and school traffic. SMUD would organize meetings and other forms of communication to inform the public about transportation effects.

SMUD proposes to submit a final Transportation Management Plan at least 90 days prior to any land disturbing activity. The plan would include descriptions of road segments to be upgraded, along with engineering assessments of the roads used for transporting oversize materials. All temporary lighting, signs, and traffic control devices would follow the standards of the Federal Highway Administration and the California Department of Transportation. The final Transportation Management Plan would have an emergency access policy. SMUD would also provide directions to ensure that most vehicles would access the site through the East Camino Interchange; and a message board would be provided for construction workers to facilitate carpooling to the construction site. Truck deliveries to the Project site would be scheduled to avoid conflicts with local traffic. As noted above, training would be provided to construction in workers with regard to school bus routes and child safety. Measures would also be taken to minimize dust and erosion from transportation. In the draft Transportation Management Plan, SMUD proposes to develop a road monitoring program to monitor the condition of Project-related roads and repair any damage caused by construction-related traffic. SMUD would provide a point-of-contact and a mechanism for the public to voice any concerns or to report violations of traffic protocols established in the plan

During the public meeting and in comment letters on the draft EIS, many local residents expressed concerns about public safety related to construction of the Iowa Hill development despite the protection measures outlined in the draft transportation plan. Local residents expressed a continuing concern about the increased construction traffic and the effect it would have on local traffic, children using school buses, and those walking or bicycling along the narrow roads.

To address these concerns, SMUD is considering alternative routes that it describes in filings dated December 7, 2007 and January 2008. The 11 alternatives evaluated by SMUD in its December 7, 2007, filing include the following:

Routes to Lower Construction Site

1—Carson Road East (original proposed route), exiting U.S. 50 at the Camino at-grade intersection;

3—Carson Road West with Underpass, exiting U.S. 50 at a new connection in the vicinity of the existing Carson Road at-grade intersection;

5—Barkley Road, exiting U.S. 50 at the existing Camino at-grade intersection;

8—Carson Road East with Underpass, exiting U.S. 50 at a new connection in the vicinity of the existing Carson Road at-grade intersection;

10—Jacquier Road, exiting U.S. 50 at the Point View Drive interchange, and requiring a new connector road to Jacquier Road; and

11—Golf Course with Underpass, exiting U.S. 50 at a new connection in the vicinity of the Carson Road at-grade interchange, and transiting the Apple Mountain Golf Course.

Routes to Upper Construction Site

2—Cable Road via Cedar Grove Exit, exiting U.S. 50at the Cedar Grove interchange;

6—Cable Road via Camino Exit, exiting U.S. 50 at the Camino at-grade interchange;

7—Badger Hill Road, exiting U.S. 50 at the Pollock Pines interchange;

9—Mace Road/Cable Connector, exiting U.S. 50 at the Cedar Grove interchange; and

13—Golf Course with Underpass with New Road to Upper Site, similar to alternative 11, with the addition of a new road (the SW Connector) to the upper construction site.

SMUD evaluated the 11 alternative routes based on the length of the routes, roadway geometric alignments, existing traffic volumes, neighborhood and local business impacts, potential park and ride locations near U.S. 50, and the amount of roadway construction needed to accommodate construction vehicles (CH2M HILL, 2008b). To determine the preferred routes, SMUD gave higher preference to shorter routes, roadways with stronger and wider construction cross-sections, roadways with milder grades, and routes with the fewest local businesses and residences along the route. Routes with higher traffic volume were considered less desirable. Regarding access from U.S. 50, interchanges were preferred over intersections, because interchanges allow vehicles to exit the roadway more safely and without the need to stop to make left turns from the highway. For similar reasons, park-and-ride locations on the north side of U.S. 50 were preferred so that vehicles would not need to cross the high-speed road. Construction of an underpass, required for routes 3, 8, and 11, would make those alternatives extremely costly compared to most of the other options. Similarly, the need for a new road across the golf course and compensation for acquisition or temporary use of the property would increase the cost of those alternatives (#11 and #13).

Based on these criteria, SMUD concludes that the preferred routes to the lower construction site would be Carson Road East (#1), Barkley Road (#5), and Jacquier Road (#10), noting that all three routes offer a good balance of minimizing community impacts (by avoiding most residences, businesses, bus routes, etc.), maximizing the construction contractor's efficiency (by using roadways that would reduce trip length and that would not require major reconstruction), and minimizing overall project costs. Among these three routes, SMUD concludes that there is no "best" route, and that all offer benefits and some tradeoffs.

Again based on these criteria, SMUD concludes that the preferred route to the upper construction site would use the SW Connector rather than depending upon Cable Road (#2, #6, #7, #9). The primary constraint associated with all of the studied routes to the upper construction site is the geometric cross-sections of the roads. Cable Road, Mace Road, Blair Road, and Badger Hill Road would require significant improvements to allow construction vehicles to pass safely. The roads currently have narrow cross sections, have deteriorated pavement or only gravel and dirt construction, and in some places have obstructions immediately adjacent to the roadway. Much of the distance is single lane, and the roads have many sharp turns and narrow curves. Blair Road also has a single lane bridge. In addition, the use of these roads in some areas would require access to private property.

In contrast, the SW Connector would not have these issues, and if constructed, it would provide a second egress from the construction site (the other egress being along the existing Cable Road). However, the SW Connector would traverse steep slopes, and its feasibility has not been demonstrated. If it turns out that there is no feasible way to construct the SW Connector, SMUD concludes that alternatives #2 (Cable Road via Cedar Grove exit) and #9 (Mace Road/Cable Connector) have the fewest negative characteristics among the upper construction site routes. The negative aspects of the routes include traffic in residential areas (#2) and logistical issues for the contractor (#9).

In addition to its other criteria, SMUD considered various park-and-ride alternatives as a means of alleviating traffic-related project effects. Vehicles could access routes to the upper reservoir from a park-and-ride location on Forest Service property along 8 Mile Road or at three possible locations around the SPI Camino mill property. Using these routes at the daily hours described in the draft transportation plan would avoid adverse impacts to the bus routes, existing traffic volume, and businesses along these roadways. However, SMUD indicates in its study that all of the studied park-and-ride sites are not necessarily available or feasible for use as Project staging areas.

Ultimately, SMUD may spread various types of construction traffic out among multiple routes to alleviate congestion, to reduce costs and improve construction efficiency, and to act in the best interests of the community. The routes of the construction traffic will be defined in the final Transportation Management Plan. The plan should also address the feasibility of the SW Connector and therefore the use of the preferred routes to the upper construction site. Selection of an alternative route in consultation with the Advisory Committee would help address public safety concerns raised by local residents and reduce user conflicts on the existing local roads.

Once operating, we could not expect the two on-site employees and periodic trips by supply and maintenance vehicles to generate much Project-related traffic at Iowa Hill.

Trails System Management Plan

Under Proposed Article 1-31, *Trails System Management*, SMUD would develop a trails system management plan, approved by the Forest Service, for the trails that are needed for Project operations and are located on or affect National Forest System lands. SMUD would also address specific trails management projects, as described in Proposed Article 1-19, *Specific Recreation Measures*. Section 3.3.6, *Recreational Resources*, contains information on specific elements of the plan and trails projects.

Our Analysis

The trail system management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with the trails are addressed in a consistent manner and so as not to adversely affect environmental resources. Some of the Forest Service trails the licensee uses to access Project facilities for operation and maintenance purposes are also be used by the Forest Service for administrative and land management purposes, and the public for recreational activities. The trails system management plan would provide for ongoing maintenance and improvement of the trail system for UARP, Forest Service, and people using the recreational facilities at the reservoir. Trails requiring routine maintenance would need to be included within the Project boundary.

Iowa Hill Development

The construction schedule at Iowa Hill does not include initial upgrades of trails as the trails are not main avenues for accessing the construction areas at Iowa Hill or Slab Creek. The trail usage generated from construction activity would be minimal.

Trail usage created during operation of the proposed project would be minor.

Facility Management

Under Proposed Article 1-32, *Facility Management*, SMUD would develop and implement a facility management plan, approved by the Forest Service. The proposed plan would include a map showing all UARP facilities, including structures on or affecting National Forest System or BLM lands and above-or below-ground storage tanks; a description of the type and season of use of each structure; and a description of the condition of each structure, and planned maintenance or removal. In addition, every five years SMUD would prepare a plan identifying maintenance, reconstruction, and removal needs for UARP facilities, including transmission lines.

Our Analysis

Development and implementation of the proposed facility management plan would provide Forest Service or BLM with information on planned maintenance activities that might affect federal lands.

Proposed Project Boundary

Project boundaries of the UARP and Chili Bar Project would be changed under the proposed actions. SMUD proposes to revise the UARP Project boundary to encompass the new Iowa Hill development south of Slab Creek reservoir, which covers about 283 acres and includes a berm, tunnel, powerhouse, and transmission line. Steep terrain limits land use in the area. Currently, lands are used minimally for timber production by Sierra Pacific Industries and Eldorado National Forest with limited dispersed recreation. SMUD would also include the Project recreational facilities.

PG&E proposes to revise the Chili Bar Project boundary. The existing Chili Bar Project boundary includes about 255 acres of PG&E-owned lands from approximately 50 to 250 feet from either side of the river and extending from 3.2 miles upstream of the Chili Bar dam to 320 feet downstream of the dam. The PG&E proposed boundary would be about 103 acres within the normal maximum water surface elevation at 997.5 feet mean sea level and would enclose all Project works, as well as a 12-foot wide corridor for a new proposed hiking trail (the Sand Bar Trail) to provide public access to the reservoir shoreline.

Our Analysis

The UARP proposed boundary change would not affect land ownership, but would change land use in vicinity of the Project south of Slab Creek reservoir. Under the Proposed Action, existing timber production and recreational use would be converted to industrial use. However, because existing land use is limited to timber production and dispersed recreation, the environmental effects of the proposed boundary change would be minor. Inclusion of the Project recreational facilities would ensure the ability of the Commission to enforce compliance with the proposed measures for recreation facility, road, and trail improvements and maintenance over the term of any license issued for the Project.

The proposed Chili Bar Project boundary excludes approximately 152 acres of BLM, PG&E, and private lands included in the existing boundary. PG&E does not provide any specific information about why the lands are no longer needed for Project purposes. However, land use and ownership would not be changed, and recreational access to the reservoir would be provided through development of the Sand Bar Trail. Environmental effects of the proposed boundary on land use and management would be negligible.

Effects of Proposed Iowa Hill Development (Overall)

The proposed Iowa Hill development would be located south of Slab Creek reservoir. The current land uses, including recreation, are minimal due to the steep terrain. The SMUD-owned lands have no existing use while the Sierra Pacific Industries and Eldorado National Forest lands are management mainly for timber production. The construction of the proposed Iowa Hill development would have minimal effects on land use and management at UARP. Construction of the Iowa Hill development would not prevent future development of residences on the private parcels around the Project, but would adversely affect residential parcels, ranging from short-term construction-related disturbances to the long-term obstruction of views. However, the Project as proposed may enhance the potential for development because of access road improvements and regular road maintenance.

Vegetative Management Plan

The proposed vegetation management plan primarily affects terrestrial resources and is discussed in section 3.3.4.2, *Terrestrial Resources, Vegetative and Noxious Weed Management* and would address vegetative management under Project transmission lines.

Fire Management and Response Plan

Under Proposed Article 1-34, *Fire Management and Response Plan*, SMUD would develop and implement a plan for the prevention, cost sharing, coordination, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations. The proposed plan would include (1) the identification of fire hazard reduction measures to prevent the escape of Project-induced fires, (2) the locations of exit routes and determination of fire suppression strategies, as well as address fire danger and public safety associated with Project-induced recreation, (3) analysis of emergency response and fire prevention needs including equipment and personnel, (4) reporting, (5) lists of the location and availability of fire suppression equipment and personnel, and assurances that prevention measures meet water quality protection practices, and (6) investigation of Project-related fires.

Our Analysis

The UARP continues to create a wildfire threat. Recreation at the reservoirs and stream reaches, including Project facilities and user-created dispersed sites, pose a substantial fire risk and that risk will increase as recreational use increases in the future. Given the known high incidence of fire starts and previously treated and untreated fuels in the area, SMUD should take reasonable preventative and pre-suppression actions at its Project facilities to help prevent wildfires and create safer conditions for the visitors brought to the Crystal Basin by the Project facilities and reservoirs. Implementation of the proposed fire management and response plan would improve planning, management, and coordination for wildfire protection and prevention measures, as well as lead to a reduction in the occurrence and suppression of wildfires that might be Project-induced.

3.3.7.3 Unavoidable Adverse Effects

None.

3.3.8 Aesthetic Resources

3.3.8.1 Affected Environment

The UARP is located in El Dorado County and the northeastern part of Sacramento County, California. UARP lies on the western slope of the Sierra Nevada mountain range. This part of the county is largely undeveloped and retains much of its natural character, with scattered rural residences and small communities located along major corridors throughout the western slope. Nearly all of the UARP facilities, except for the White Rock powerhouse and the section of the UARP transmission line that leads from the powerhouse to Folsom Junction, are located on lands within the Eldorado National Forest.

The UARP existing facilities and proposed Iowa Hill development can be placed into three aesthetically distinct geographic areas: Desolation Wilderness, Crystal Basin, and Canyonlands. SMUD identified key view points (table 3-69) associated with Eldorado National Forest viewsheds within and near the Project boundary to assess the existing visual condition of UARP facilities and operations within the surrounding forest landscape.

Table 3-69. Aesthetics resources at UARP, key viewpoints. (Source: DTA and Goodavish, 2005a)

Rubicon Trail	Sunset / Fashoda Road
Loon Lake reservoir	Union Valley reservoir
North Loon Lake Road	Union Valley Bike Path
Red Fir Access Road	Big Hill Lookout Road
McKinney Creek Road	Ice House-Wrights Road
Wentworth Springs Road	Ice House Reservoir Road
Gerle Creek Access Road	Ice House reservoir
Gerle Creek reservoir	Bryant Springs Road
Ice House Road	Forebay Road
Wolf Creek Road	Highway 193
Yellow Jacket Road	State Scenic Highway 50
Deer Knob Peavine Road	

Desolation Wilderness

The Desolation Wilderness lies within the crest zone of the Eldorado National Forest. The Eldorado National Forest is managed in terms of visual quality objectives (VQO), which are reflected in the 1988 Land and Resource Management Plan (Forest Service, 1988, not seen as cited in DTA and Goodavish, 2004). The VOQs represent a combined rating of the scenic integrity or visual variety of the landscape with a sensitivity rating that reflects the number and relative concern of viewers for the scenic quality of the landscape. The Desolation Wilderness is characterized by a strongly glaciated landscape with peaks that tower above glaciated rocky basins. The UARP boundary is excluded from wilderness designations but is required to be managed in a manner that is consistent with the adjacent wilderness. Desolation Wilderness is managed for a VQO of Preservation that allows only ecological changes to be made, where management activities (except for low visual impact recreational facilities) are prohibited. Because the facilities at UARP are man-made, the Project will never meet the wilderness Preservation VQO. The Forest Service goal is to move as close to a Preservation VQO as is reasonable.

The UARP facilities within the wilderness are associated with Rubicon reservoir and affect views from the Rubicon Trail. As viewed from the trail, the scale and color of the main dam blend in fairly well with the surroundings. The auxiliary dam has an angular form that contrasts with but does not dominate the characteristic landscape. Due to the proximity of the trail to the intake structure, boom, and gaging structure, the built facilities are major visible features that contrast with the natural appearing wilderness area and dominate views from the trail. Traveling north from the reservoir, Rubicon trail splits. Along the northwest trail, the outlet structure, gauging station, and cable crossing over the channel dominate the view. The tunnel outlet is gated by a chain link fence that detracts from the natural setting. The concrete color and texture of the tunnel matches that of the surrounding rocks although the smooth texture and geometric form appear unnatural. The light color of the gaging station, contrasts with the characteristic landscape.

Crystal Basin Landscape

The Crystal Basin lies within the mixed conifer-red fir zone of the Eldorado National Forest. Within the Crystal Basin are 5 areas of power generating developments: Loon Lake, Robbs Peak, Union Valley, Jones Fork, and Jaybird. Views from trails, roads, and reservoirs are affected by the UARP facilities.

At the Loon Lake development, the main and auxiliary dams at Buck Island reservoir have a horizontal form and smooth texture that contrasts with the natural setting, whereas the scale and color of the dams reasonably blend well. The Buck Island dam, intake, transmission lines, and powerhouse are not obvious to those utilizing the Rubicon Trail or the Buck Island reservoir. At Loon Lake reservoir, the scale and horizontal line of the main and auxiliary dam contrasts with the natural settings surrounding the dam, although the colors blend in well. Looking at these features from the reservoir and Red Fir Access Road they are unnatural appearing and dominate the view. The main and auxiliary dams at Loon Lake are intermittently visible from Rubicon Trail but are obscured by the landforms and vegetation. The Loon Lake dike and powerhouse are off the reservoir shoreline and are not visually evident from the reservoir, although the angular shape of the powerhouse contrasts the surrounding landscape. The powerhouse is visually evident from North Loon Lake Road. The intake at Loon Lake is near the shoreline, light in color, and angular in shape making it subordinate to the surrounding landscape. The Loon Lake intake can be seen easily from the Rubicon Trail and other points on the reservoir. The transmission line and substation at this development are hard to see from the reservoir but are noticeable from North Loon Lake Road and McKinney Road. One tower is visible from Rubicon Trail.

Within the Robbs Peak development, users at Gerle Creek reservoir, the trail to Angel Peak, and the Summer Harvest Trail can see the UARP dam and intake. The dam and intake area introduce an angular shape and smooth texture into the landscape. The color is similar to the granite rock but contrasts with the forested background.

At the Union Valley development UARP facilities such as the Gerle Creek canal, Robbs Peak dam area, and the Robbs Peak penstock can be seen from Ice House Road near the Robbs Peak forebay. The Gerle Creek canal and the Robbs Peak dam area do not dominate the view but both have contributed to the developed nature of the forebay site. Development at the dam area at Robbs Peak includes dam gates, an intake structure, fences and gates, cleared areas, and a small building. The dam area also consists of angular shapes and light colors which contrast with the surrounding scenery. The Robbs Peak penstock forms a dominate line that can be seen briefly from Ice House Road. The penstock is also evident from Big Hill Lookout Road, Big Hill Vista, Union Valley reservoir, and portions of the Union Valley bike path.

The Jones Fork penstock, near the Jones Fork powerhouse, is also visible from Ice House Road. The penstock is well screened to the east but is visible to the west of Ice House Road because of clearing from the road. The penstock is visible where there are forest openings at other locations, such as from Big Hill Lookout Road. It is also visible in the middle-ground viewed from Big Hill Vista. The penstock is light in color and contrasts the soil and dark green surrounding vegetation.

Along Deer Knob Peavine Road, the Union Valley dam, powerhouse, switchyard, and intake can be seen. The dam dominates the view. The powerhouse is angular and the color contrasts with the surrounding environment. The switchyard and substation are in close proximity to the powerhouse which together dominates the view of a confined canyon setting. Two towers of the Union Valley transmission line can also be seen from Wolf Creek Road near Deer Knob Peavine Road.

The Union Valley dam and transmission lines, and the Robbs Peak penstock, transmission lines, and powerhouse, can be seen from the Union Valley reservoir. The horizontal form of the Union Valley dam is apparent and contrasts with the surrounding landscape. The Robbs Peak penstock color blends well with surrounding soil but in combination with other surrounding features, such as the powerhouse, it dominates the view. The powerhouse is dark in color and contrasts with the light soil surrounding it in the foreground view from the reservoir but blends in with the surrounding vegetation when viewed in the middleground. Most of the Union Valley transmission lines are shielded from view by the forest, although visibility is temporarily increased due to the Cleveland Fire, which occurred in 1997.

From different view points on Ice House reservoir, there are views of the main dam, intake, and dikes. The main dam is angular and contrasts with the surrounding landscape. When the water level is high, the scale of the dam is relatively small when compared to the size of the reservoir; it is noticeable but does not dominate the view from any location. The intake is only visible to viewers directly in front of it. The dikes at Icehouse reservoir are low and similar in color to the surrounding shoreline.

At the Jaybird development from Bryant Springs Road, the Union Valley dam and substation, as well as Union Valley-Jaybird transmission line are visible. From the road, the Union Valley dam is large in scale and takes up the view. The substation is seen in front of the dam contributing to the dominating view. The Union Valley-Jaybird transmission towers are screened by forest vegetation and only visible intermittently whereas the transmission lines govern the view around Junction reservoir.

Canyonlands Landscape

The Canyonlands lie within the front country zone of the Eldorado National Forest. The front country terrain is characterized by rolling uplands and steep rugged river canyons. The canyon lands contain the Camino development and the Slab Creek reservoir / White Rock development. At the Camino development there are no Eldorado National Forest managed viewsheds in the area. Relatively few people view the UARP facilities in this area.

UARP facilities, such as the Camino penstock and powerhouse, and the Camino-White Rock transmission lines affect views from Forebay Road (El Dorado County Road). The penstock contrasts with the natural setting because it is linear in form and does not blend well with the dark green forested hillside. Where the penstock is visible from Forebay Road, it dominates the upstream view. From Forebay Road bridge, the powerhouse and substation are not easily noticeable. The transmission line corridor dominates the view from locations along Forebay Road and where they cross over the canyon from the powerhouse to a knoll above the river.

Within the Slab Creek/White Rock development, the White Rock Spoil pile can be seen from State Highway 193. The spoil pile stands out and dominates the view because of its geometric shape, color, and size, in comparison to the surrounding forest land.

Reservoir Levels

SMUD conducted a survey to evaluate visitors' aesthetic expectations for, and satisfaction with, water surface elevations at the Loon Lake, Union Valley, and Ice House storage reservoirs. Visitors were asked about their historical and current use and satisfaction with reservoir levels. They were shown three pictures of different reservoir elevations, and asked what their level of satisfaction would be if the reservoir looked like the picture during their visits.

Of those interviewed who had visited Loon Lake reservoir before, only 15 percent said they had been dissatisfied with water levels in the past. Most respondents (92 percent) at Loon Lake reservoir were neutral, satisfied, or very satisfied with reservoir elevations at or above 6,399 feet (11 feet below full-pool). About half of the respondents were dissatisfied or very dissatisfied at an elevation of 6,390 feet (20 feet below full-pool), but only a quarter of respondents would find the 6,390-foot elevation to have a negative effect on their experiences.

Of those interviewed who had visited Union Valley reservoir before, 38 percent said they have been dissatisfied with water levels in the past. Over three-fourths of the respondents (78 percent) at Union Valley reservoir were neutral, satisfied or very satisfied with the 4,852-foot reservoir elevation (17 feet below full-pool). At elevation 4,816 feet (54 feet below full pool), 70 percent of the respondents were dissatisfied or very dissatisfied with the appearance of the reservoir and 72 percent said their experience would be negatively affected.

Of the respondents who have visited Ice House reservoir before, 34 percent said they have been dissatisfied with water levels in the past. Most respondents (88 percent) at Ice House reservoir were satisfied with reservoir elevations at and above 5,438 feet (12 feet below full-pool). At elevation 5,425 feet (25 feet below full-pool), 55 percent of the respondents were dissatisfied or very dissatisfied with the appearance of the reservoir. Similarly, 47 percent of respondents said their experience would be negatively affected at the 5,425-foot level.

Proposed Iowa Hill Development

For its 2005 Visual Resources Technical Report (DTA and Goodavish, 2005b), SMUD prepared photographic visual simulations at five key observation points within and near the proposed Iowa Hill development boundary focusing on the visibility of the proposed upper reservoir, switchyard, and transmission line from residential viewpoints. This 2005 study used still photos to simulate the view from each viewpoint looking toward the upper reservoir berm. Two simulations were completed for each key observation point. One photo depicted the view of the project 1 year after construction, and another depicted the view 10 years after construction. SMUD identified the key observation points in consultation with the Forest Service (figure 3-36) within and near the proposed Iowa Hill development boundary to represent views of the aesthetic environment of the UARP facilities and operations as well as to assess the aesthetic resources of the Project[40]. The analysis includes the effects on visual resources due to the existence of existing and proposed facilities and their operations. Field results

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[40] Selection of key observation points was limited by private property access and no privately owned residential parcels were included in the study. Some of the private residential parcels may have more direct views of the project site than the publicly available view points included in the study

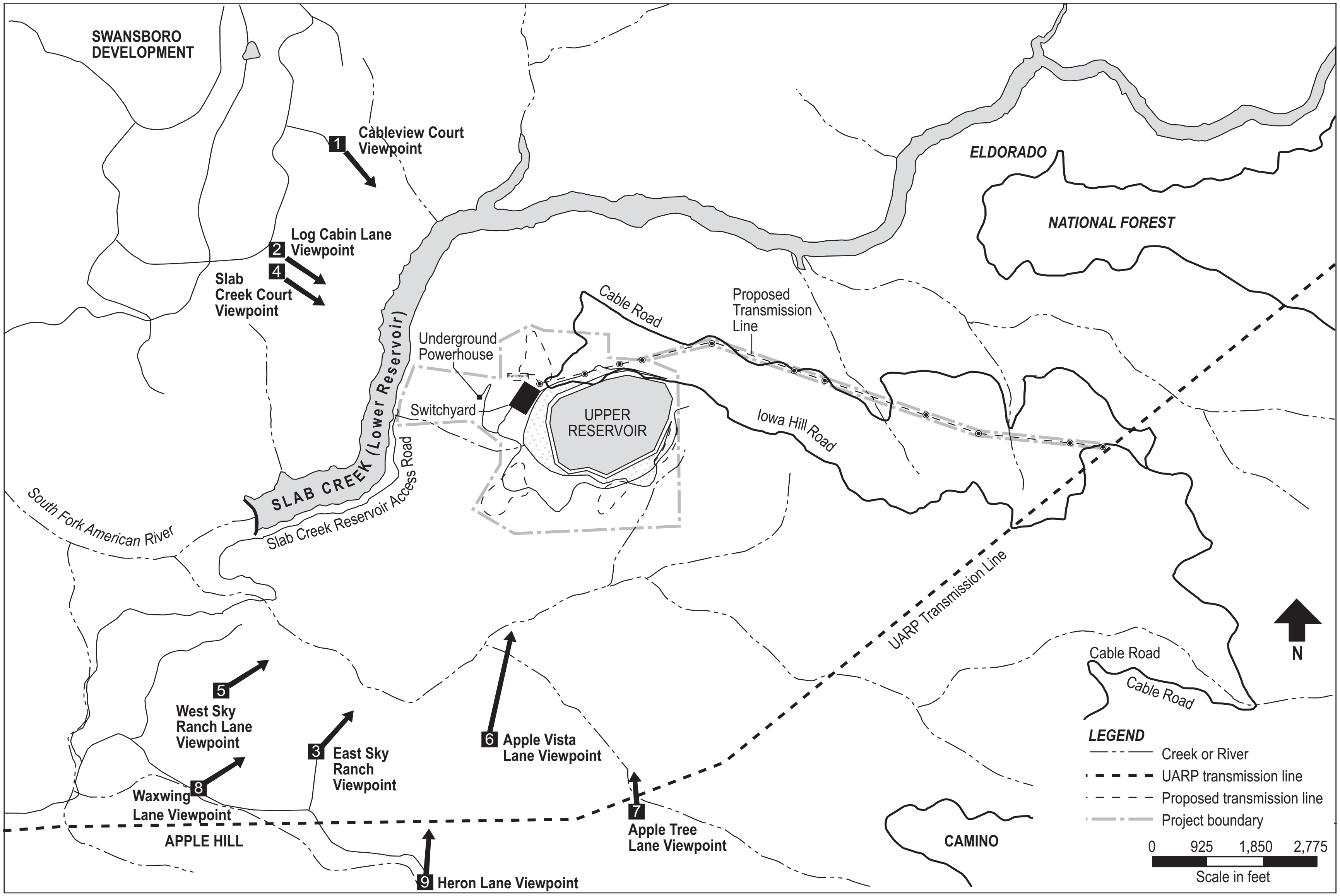

Figure 3-36. Key observation points in Project area. (Source: CH2M HILL, 2008a; PG&E, 2005, as modified by staff)

indicated that views of proposed Iowa Hill development are confined to lots located on the canyon side of roads and courts that border the outer edge of the subdivision above the SFAR: Deer Canyon Court, Cableview Court, Log Cabin Lane, Slab Creek Court, and White Oak Drive. There appear to be no views of proposed Iowa Hill reservoir from the “interior” roads of the development.

Along Deer Canyon Court, the proposed Iowa Hill development would not be seen from the road, although the road ends in a cul-de-sac where three lots may have views of the proposed development. On Cableview Court (no. 1 on figure 3-36), there would not be views of Iowa Hill because the area is heavily forested. A view of Iowa Hill to the south would be possible from an unmarked road off the side of Cableview Court, although vegetation would partly screen the view. Views from Log Cabin Lane (no. 2 on figure 3-36) were obscured by forested areas. About 10 lots on the east side of the road between Cableview and Slab Creek Courts (no. 4 on figure 3-36) would be affected by the proposed Iowa Hill development. Iowa Hill would be visible from the backyard of a lot at the north end of Slab Creek Court. The visibility of the proposed Iowa Hill facilities from these viewpoints could also be affected in the future should the trees that currently block views of the facilities be removed either by homeowners or through natural events such as bug kill or wildfires.

One key observation point is located on White Oak Drive (no. 4 on figure 3-36), which terminates at an entrance gate to a large lot from which Iowa Hill can be seen to the west. The proposed Iowa Hill development can be seen from the gate on Chute Camp Road (no. 5 on figure 3-36). Sky Ranch Lane (east and west) heads north and veers west, where the proposed Iowa Hill development can be seen (no. 3 on figure 3-36). It then turns into a private drive where the posted signs ask people to turn around. Along Winding Lane, the area is heavily wooded and there is no access to the lot at the end of the road. The lot, however, appeared to have a direct view to the north of the proposed Iowa Hill development based on the parcel map information. Skyview Drive passes under the existing UARP (Loon-White Rock) transmission line, where Iowa Hill could be seen from near the transmission line tower along the road. No apparent views of the proposed facility were evident from Mace Drive. Forebay Road provides access to the east end of Slab Creek reservoir and the Camino powerhouse. From this observation point, Iowa Hill and the slope the transmission line were visible at the last switchback in Forebay Road before it descends into the SFAR canyon.

In its 2008 addendum to the 2005 technical report (CH2M HILL, 2008a), SMUD compared the results of the 2005 report to the results of newly conducted 3-D visual simulations from the same 5 viewpoints and also presented the results of 3-D visual simulations for 4 new viewpoints. The public requested the 4 additional viewpoints at an Advisory Committee Visual Resources Subcommittee meeting in December 2007. The four additional viewpoints are Apple Vista Lane, Apple Tree Lane, Waxwing Lane, and Heron Lane. All 9 viewpoints are shown in figure 3-36.

For the 5 original viewpoints, the 3-D simulations depict the views toward the project directly after construction rather than 1 or 10 years later, and include a conceptual location of the lower portal at Slab Creek. The simulations also present a worst-case simulation by clearing all trees in the foreground area that could screen the view toward the upper reservoir. This was done because tree placement cannot be accurately represented and future tree clearing at any viewpoint is unknown. Additionally, in the 3-D simulation transmission lines were lowered from 120 feet to 100 feet, because transmission line structures could be lowered to 100 feet to reduce visibility. The comparison of the 2005 and 2008 simulation results are presented in table 3-70. For the 4 new viewpoints included in the 2008 addendum (CH2M HILL, 2008a), the 3-D simulations indicate that the view of the upper berm from Apple Vista Lane (viewpoint 6) is minimal. It is located behind trees on top of the ridgeline and only faintly viewable. From viewpoints 7-9, Apple Tree Lane, Waxwing Lane, and Heron Lane, the berm is hidden by vegetation and topography.

Project Area Management

Forest Service

Management of all National Forest System lands within the Project boundary is guided by several documents including the Eldorado National Forest Land and Resource Management Plan. All of the Project lands and lands influenced by Project operations that are managed under the Eldorado National Forest Land and Resource Management Plan fall within the Desolation Wilderness, Crystal Basin, or the Canyonlands areas.

The Eldorado National Forest Land and Resource Management Plan provides standards and guidelines for the VQO specified for each management area. VQOs are a measure of the degree of acceptable alteration permitted within the natural characteristic landscapes and are applied to all Project proposals and activities on National Forest System lands. The VQOs prescribed by the Eldorado National Forest Land and Resource Management Plan for the National Forest System lands within the UARP facilities boundary are as follows.

Preservation—The Preservation VQO allows for ecological change only. Except for very low visual-impact recreational facilities (such as hiking trails), management activities are prohibited. This objective applies to wilderness areas, primitive areas, other specially classified areas, areas awaiting classification and some unique management units that do not justify special classification. Project facilities that fall under the Preservation VQO include Rubicon reservoir and its diversion and tunnel. Although the Rubicon reservoir area sits inside the Desolation Wilderness boundary, the reservoir itself is not within the wilderness due to congressional exclusion, however, the act calls for the excluded lands "…. to be managed in a manner that is consistent with the adjacent wilderness."

Table 3-70. Comparison of Project visibility in the photographic visual simulations and 3-D visual simulations. (Source: CH2M Hill, 2008a, as modified by staff)

Location	2005 Photographic Simulation	2008 3-D Simulation	Comparison
Viewpoint 1 Distance to Upper Reservoir is 1.0 mile (middleground view) **Cableview Ct.**	The middle photo simulation shows the upper reservoir berm above the ridgeline and tops of the transmission line structures nearest to the reservoir. The switchyard equipment would not be discernable. It would add a form to the top of the ridgeline and be a dominant feature. There would be a change in color and texture at the ridgeline. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would be less prominent due to vegetation growth near it. The color of the berm would change.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would barely be visible; it would not dominate the view. The tops of the transmission line structures nearest to the reservoir would not be discernible.	The upper reservoir berm would be above the ridgeline and be a dominant feature in the photographic simulation. In the 3-D simulation, its visibility would be limited due to its location at the top of the ridgeline and the tint of the berm blending with the surrounding environment. It would be a subordinate feature in the 3-D simulation. Its mass would be smaller than that shown in the photographic simulation.
Viewpoint 2 Distance to Upper Reservoir is 0.8 mile (middleground view) **Log Cabin Lane**	The middle photo simulation shows the upper reservoir berm, partially screened by a tree that is at the viewpoint location. The berm's form would be noticeable, but would not dominate the view. A change to the ridgeline would not be visible. A change in color and texture to the area through the tree would be visible. The switchyard and transmission line structures would not be visible. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would barely be visible through the tree.	The 3-D simulation shows the top of the upper reservoir berm slightly below the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, but would not dominate the view. The switchyard equipment and transmission line structures would not be discernible.	The upper reservoir berm would be slightly below the ridgeline and not a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be slightly below the ridgeline. Its visibility and its mass would be similar to that shown in the photographic simulation.

Location	2005 Photographic Simulation	2008 3-D Simulation	Comparison
Viewpoint 3 Distance to Upper Reservoir is 1.1 mile (middleground view) **East Sky Ranch Lane**	The middle photo simulation is visible because it would change the ridgeline from an uneven texture to a smooth surface. It would add a form that does not dominate the view. The color and texture would blend with the surrounding environment. The switchyard equipment and transmission line structures would not be discernible. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would barely be visible due to the vegetation growth near it.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, but would not dominate the view. The switchyard and transmission line structures would not be discernible.	The upper reservoir berm would be slightly below the ridgeline and would not be a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would be more noticeable than the photographic simulation depicts, but would not dominate the view. Its mass would be comparable to that shown in the photographic simulation.
Viewpoint 4 Distance to Upper Reservoir is 0.8 mile (middleground view) **Slab Creek Ct.**	The middle photo simulation shows the upper reservoir berm's form as a dominant feature and the tops of the transmission line structures nearest to the reservoir are evident. It would change the height, texture, and color of the ridgeline. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would remain a dominant feature. Minimal vegetation growth around the berm would be evident, and the color of the berm would change.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible similar to Viewpoint 2, and would be more noticeable than in Viewpoint 3, but would not dominate the view. The switchyard equipment and the transmission line structures would not be discernible.	The upper reservoir berm would be slightly above the ridgeline; it would be a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would be less noticeable than the photographic simulation depicts. It would not dominate the view; its mass would be smaller than that shown in the photographic simulation.
Viewpoint 5 Distance to the Upper Reservoir is 1.2 mile (middleground view) **West Sky Ranch Lane**	The middle photo simulation shows the upper reservoir berm, partially screened by a tree that is at the viewpoint location. It would add a form to the ridgeline. The color and texture along the ridgeline would change. The berm would be visible and noticeable, but would not be a dominant feature in the photo. The switchyard and transmission line structures would not be visible. The bottom photo (10 years after the project is constructed), the upper reservoir berm would remain noticeable; the only visible change would be the color of the berm. Vegetation would have grown, but would not screen the berm.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, similar to that shown in Viewpoint 3, but would not dominate the view. The switchyard equipment and transmission line towers would not be discernible.	The upper reservoir berm appears to be above the ridgeline in the photographic simulation. It would be visible and noticeable, but would not dominate the view. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would not dominate the view. Its mass would be comparable to that shown in the photographic simulation.

Retention—The Retention VQO provides for management activities that are not visually evident. Under Retention, activities may only repeat the form, line, color and texture frequently found in the characteristic landscape, but changes in their qualities of size, amount, intensity, direction and pattern should not be evident. Most of the reservoirs and surrounding shorelines associated with the UARP have a Retention VQO, including Buck Island, Loon Lake, Gerle Creek, Union Valley, Ice House, Robbs Forebay, and Slab Creek reservoirs.

Partial Retention—The Partial Retention VQO allows for management activities that remain visually subordinate to the characteristic landscape. Activities may repeat the form, line, color, or texture common to the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape. The area surrounding Junction reservoir has a Partial Retention VQO. Portions of Union Valley and Ice House reservoirs (and the surrounding area), and the upper development area for the Iowa Hill development have a Partial Retention VQO.

Modification—Under a Modification VQO, management activities may visually dominate the characteristic landscape. However, activities of vegetative and land-form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area character-type. None of the UARP reservoir areas are in a Modification VQO.

U.S. Bureau of Land Management

The BLM-managed land in the UARP boundary is about a 40-acre parcel, located at White Rock. Visual Resource Management by BLM is based on the agency’s Visual Resource Management system, which involves inventorying scenic values and establishing management objectives for those values through the resource management planning process. The BLM VQOs are defined by the Eldorado National Forest Land and Resource Management Plan. The standard intended to decrease conflicts with visual management objectives of the National Forests and BLM, yet allow continued Project operation. The BLM visual management objectives also apply to the 48 acres of BLM-managed lands within the Chili Bar Project boundary.

El Dorado and Sacramento County General Plans

The general plans for El Dorado and Sacramento counties include goals and objectives associated with the protection of visual resources, however there are no inventory and assessment systems similar to those of the federal agencies for managing visual resources. Therefore, the aesthetic assessment of Project facilities on lands outside the Eldorado National Forest (except for BLM lands where the VRM system applies) will use the environmental checklist questions from the CEQA Guidelines for evaluating any on-going visual or auditory effects of the Project within El Dorado and Sacramento counties.

3.3.8.2 Environmental Effects

Visual Resource Protection Plan

Under Proposed Articles 1-27 and 2-16, *Visual Resource Protection*, SMUD and PG&E would develop and implement, in coordination with the Forest Service and BLM, respectively, visual resource protection plans. The proposed visual resource protection plan was designed to improve how well Project facilities blend in with the surrounding landscape. SMUD and PG&E would file plans with the Commission with the Forest Service (for UARP) and BLM approval (for Chili Bar) including proposed mitigation and implementation schedules to bring the Projects' facilities affecting visual resources into compliance with visual resource standards and guidelines. Enhancement measures would include (1) surface treatments with natural appearing materials that will be in harmony with the surrounding landscape, (2) use of non-specular conductors for the transmission lines, (3) use of native plant species to screen facilities from view, (4) reshaping and revegetating disturbed areas to blend well with surrounding visual characteristics, and (5) locating transmission facilities to minimize visual impacts.

Under the plan, SMUD would implement the following specific visual enhancement measures: (1) at Rubicon reservoir, paint the metal components of the gaging station, intake booms, telemetry facilities, cable crossing and bucket a non-reflective black color and replace the chain link fence with black fencing within 2 years of license issuance; (2) at Robbs Peak forebay, paint the railings black, replace the chain link fences with vinyl black fences, paint the roof a dark gray color; (3) at Robbs Creek, paint the powerhouse facilities the same color as the penstock within 8 years of license issuance; (4) at Union Valley dam and substation, sandblast the guardrail to remove white paint then repaint with black paint or replace with core-ten guardrail, within 13 years of issuance; and replace the chain link fences with vinyl black fence with black posts, where powder coated posts are preferred over painted metal; (5) at Loon Lake, paint the doors on the substation a dark gray within the first two years, and remove the Loon Lake passive reflector (Wentworth Peak) from the skyline to a location with a backdrop and camouflage it to blend into the surroundings within 2 years of license issuance, and paint the roof of the gate shaft with approved colors within 2 years of issuance; (6) paint the handrails and guardrails at Gerle reservoir non-reflective black and paint the licensee-owned weather stations with non-reflective black paint within 4 years; and (7) at the Jones Fork, paint the penstock to match the color of the Robbs Peak penstock with in the first 3 years the license is issued.

Under Proposed Article 1-44, *Compliance with Visual Quality Standards*, SMUD would develop a design for the Iowa Hill development that meets the visual quality standards of the Eldorado National Forest Land and Resource Management Plan and would provide the Eldorado National Forest with plan specifications and simulated views of the design to assist in determining whether the design meets the visual quality standards.

Our Analysis

Some Project facilities and operations are visible on the landscape and contrast with the surrounding forested setting. Implementation of visual resources plans including the proposed measures would help to ensure that Project facilities blend with the surrounding landscape, yet allow the operation of UARP and Chili Bar Project facilities. Painting facilities black will make them less visible from a distance considering the facilities are surrounded by dark forested landscapes. Painting the facilities or taking action to blend them in with surroundings would enhance aesthetics at the Project by minimizing the view of Project facilities.

Reviewing any new construction with BLM, prior to any ground-disturbing activities would ensure that any new construction at the Chili Bar Project would blend with the surrounding landscape.

Iowa Hill Development

In the 2008 addendum (CH2M HILL, 2008a) to the Visual Resources Technical Report, SMUD concludes that the 3-D simulation demonstrates that following construction, the upper reservoir berm, switchyard, and transmission line would comply with the Eldorado National Forest Partial Retention VQO found at the upper reservoir site. The Partial Retention VQO allows for forest management activities that may be noticeable while blending well with the natural appearance of the landscape. The Forest Service does not agree with SMUD's conclusion and instead indicates that the berm would permanently dominate the landscape because of the introduction of line, color, texture, and form at a scale that contrasts with the surrounding natural appearing landscape as viewed by some local residents. Based on the Forest Service criteria, we conclude that the proposed project facilities located at the upper reservoir site, as currently designed, would not blend with the surrounding natural appearance of the landscape and would not meet the Partial Retention VQO.

In its report SMUD also concludes that the tunnel portal entrance may conflict with the VQO category (Retention) in the area around the tunnel portal and road leading to the portal. Because the tunnel portal occurs within the Retention VQO, there are stricter visual standards that allow only management activities that are not visually evident and appear to be from natural causes. The 2008 report shows that the tunnel portal would be visible within Slab Creek reservoir only when the viewer is directly in front of and facing the portal and the portal would not be visible from the opposite bank because the steep terrain precludes access to that bank except for a few residences. After reviewing the report and based on the Forest Service criteria, we also conclude that the tunnel portal may not meet the Retention VQO.

As noted above, SMUD would consult with the Eldorado National Forest on the design of the Iowa Hill development. In the 2008 addendum (CH2MHILL, 2008a) SMUD proposes to consult with Eldorado National Forest about the tunnel portal designs and whether or not the proposed tunnel portal would meet with the VQOs. If, as a result of these consultations, the Eldorado National Forest concludes that the tunnel portal would not meet the Retention VQO, SMUD states that it would develop mitigation measures in consultation with Eldorado National Forest. We assume that SMUD would include any needed mitigation measures in the visual resources protection plan. Overall, SMUD's consultation with Eldorado National Forest in the development of final designs would help to minimize any effects on the viewscape from the proposed upper reservoir berm and tunnel portal.

Under the proposed construction sequence, SMUD would begin construction by first improving the existing access roads and clearing the majority of the 283 acres of land associated with the Iowa Hill development. SMUD would then drill and blast to excavate the reservoir and tunnel leading to Iowa Hill. After the reservoir and tunnel are complete, SMUD would construct the powerhouse and other facilities underground. Construction activity would entail using vehicles, trailers, equipment, materials, laborers, earthen debris, and fencing. The area would be de-vegetated, re-graded, leveled, barricaded, lined, and filled. Effects from construction on visual resources would last for up to 5 years. The contractor would be responsible for implementing dust control measures within the Project limits and approaches to the construction area. During construction traffic would increase on local roads. Dust and dirt in the area would increase from all the construction vehicles as well as the excavation and construction process. The negative impacts would affect boaters, anglers, trail users, road users, residents, and any others near the construction of Iowa Hill. The level of use in the Project area is relatively low and the effects associated with dust, dirt, and traffic would be limited to the 4-year construction period.

The operation of Iowa Hill would vary from day to day. Some days the development would not be used at all and other days it could be used heavily. On heavy use days, the water level fluctuation would increase then decrease about 9 to 15 feet, whereas weekly fluctuation would be approximately 30 feet; however the maximum fluctuation in Slab Creek reservoir would not be altered by Iowa Hill. Generally, the Iowa Hill reservoir would rise during the day in response to generation and fall during the night in response to pumping. Operation of Iowa Hill reservoir would have minimal effects on the aesthetic environment.

Reservoir Levels

Also, under Proposed Article 1-23, *Reservoir Levels*, SMUD would, within 6 months of licensing issuance, meet or exceed the end-of-the-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs as shown in table 3-21 in section 3.3.2.2, *Water Resources*.

Our Analysis

Based on the user preference surveys, reservoir levels in BN, AN, and Wet water years would satisfy the majority of users of the Loon Lake, Union Valley and Ice House reservoirs. At Loon Lake, about 50 percent of the users would be satisfied with end of month water surface levels except for all month in CD water years and September in Dry water years. At Union Valley and Ice House reservoirs, at lease 75 percent of users would be satisfied with end of month water surface levels in July of BN water years and in AN and Wet water years. Users would generally not be satisfied with surface water levels in CD and Dry water years; however these reservoir levels would be similar to the current operations and would not have any additional effect on water surface levels.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed and the visual impacts on Iowa Hill and the surrounding canyon terraces would not occur. The remaining aesthetic enhancements proposed by SMUD would be as described under SMUD's Proposal.

3.3.8.3 Unavoidable Adverse Effects

There would be short-term negative effects from construction activity on boaters, anglers, trail users and residents in the vicinity of the proposed Iowa Hill development.

3.3.9 Cultural Resources

3.3.9.1 Affected Environment

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (section 106), requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register of Historic Places (National Register) prior to an undertaking. An undertaking means a Project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. In this case, the undertaking is the proposed issuance of new licenses for the Projects. Potential effects that may be associated with this undertaking include any Project-related effects associated with the day-to-day operation and maintenance of the Projects after issuance of a new license.

Historic properties are cultural resources listed or eligible for listing in the National Register. Historic properties represent things, structures, places, or archeological sites that can be either Native American or European-American in origin. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources also have to have enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archeological sites may not have enough contextual integrity to be considered eligible.

Section 106 also requires that the Commission seek concurrence with the State Historic Preservation Officer (SHPO) on any finding involving effects or no effects on historic properties, and allow the Advisory Council on Historic Preservation an opportunity to comment on any finding of effects on historic properties. If Native

American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by a proposed new license within a project's APE. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties and/or traditional cultural properties (TCPs), if any such properties exist. In this case, the APE for the UARP encompasses all lands and waters within that project's boundaries plus the location of the proposed Iowa Hill development. The APE for the Chili Bar Project encompasses all lands and waters within the existing licensed project boundary, including the access road from Highway 193, the powerhouse and dam, and upstream to a point upriver of the UARP White Rock development. It also includes the route of PG&E's proposed Sand Bar hiking trail, which PG&E proposes to bring within its proposed license boundary. The SHPO concurred with these respective APEs by letters dated April 22, 2003 and November 24, 2004.

Cultural History Overview

Over the years, archaeologists have proposed a number of archaeological chronologies for the North-Central Sierra Nevada and for the Sacramento Valley/foothills regions in which the American River drainage lies. Collectively, they can be loosely organized into five general periods characterized by artifacts and other remnants of human settlement.

To date, archaeologists have found no conclusive evidence that humans occupied the American River drainage during the Late Pleistocene period, prior to 10,000 BP. This appears to have begun to change toward the end of the Early Holocene period (10,000 BP-7000BP) in areas to the east of the Sierra crest, as indicated by the presence of stemmed projectile points and stone tools.

Archaeologists have found more evidence of human occupations for the Archaic period (7000 BP to 3200 BP) to suggest that indigenous peoples were beginning to incorporate seeds and other vegetable matter into a diet heretofore based largely on meat (and in the foothills area, fish as well). There is also evidence of trade among groups in the form of shell ornaments and other "exotic" materials that suggest interaction between groups in the Central Valley and groups normally occupying areas east of the Sierras.

During the Early-Middle Sierran period (3200 BP to 600 BP), archaeologists believe there was increasing regionalization of Native land use and also regular use of certain locales. Although no evidence of permanent habitation above 3,500 feet has been found in the American River watershed, scholars generally believe that indigenous peoples timed forays above that elevation to take advantage of local resources. Big game and acorns appear to have been the staple components of Native diet during this period. Toward the end of this period archaeologists have discerned the introduction of the bow and arrow—an important technological development for both subsistence and warfare. Also during this time, relatively large, dense and increasingly sedentary populations began to concentrate in the foothill regions.

By the Late Sierran period (600 BP to 150 BP; also known as the Late Emergent period), there was year-round native occupation in the American River area; there is archaeological evidence of village sites in foothill areas, and increasing populations would have increased competition for resources.

Although contact with Europeans began with mid-16th century coastal explorations by Spaniards, the effect of European presence did not become evident until arrival of Spanish missionaries in 1769. That year initiated a period—extending into the early 19th century—during which missionaries implemented a process to aggregate and colonize the Native inhabitants through the institutions of missions, presidios and pueblos, greatly affecting the demography, social life and culture of the area's indigenous peoples.

With Mexico's independence from Spain in 1821, the missions were gradually secularized as "ranchos" dependent on Native inhabitants for labor required for farming and ranching. The United States' war with Mexico in the middle 1840s resulted in the cession of California in 1848. That same year, discovery of gold initiated Euro-American migration into the region on an enormous scale. There soon emerged a need for food, shelter and the infrastructure that accompanies thousands of people in a developing area. Immigrants from Europe, Asia and elsewhere followed the miners to the gold fields to grow crops, raise cattle, harvest timber, and build towns. Roads were built over the Sierra Nevada, often following trails used by Native populations for millennia.

By 1850, El Dorado County had one of the largest populations in the state. Miners, agriculturalists, loggers and merchants all settled in the area. The UARP and Chili Bar Project area intersects a number of historic period mining districts, in which an elaborate network of ditches and flumes were built, beginning in the mid-19th century, to provide power for miners. As the call for hydraulic power increased, so did the size of the ditches, at first providing water for placer mining and later to the expanding agriculture of the region. Grazing emerged as one of the biggest industries in the county and surrounding area, even as the gold rush began to decline. The many unsettled areas of the Sierra Nevada and foothills drew cattlemen, soon followed by sheepherders, including a significant number of Basques. In the 1890s logging, which had begun in the area in the mid-19th century, became a major extractive activity in the county under the American River Land and Lumber Company and under successor companies until the Great Depression.

Of the many cultural groupings occupying various ecological niches in the Sierra Nevada and foothills, those most usually associated with the UARP and Chili Bar Project area are the Miwok, Nisenan (Southern Maidu) and Washoe. Travelers and explorers in the early 19th century would have encountered these people living within their traditional territories. The Coast Miwok and Plains Miwok had for many years been affected by missionization and the Mexican ranchos, the Sierra Miwok less so. The Nisenan occupied the Sierra foothills below about 3000 feet in the vicinity of the American, Bear, Cosumnes and Feather River. The Washoe lived in the vicinity of Lake Tahoe, east of the Sierra crest, but traveled extensively to the west. However, traditional ways of life were deeply disrupted by the disease, wars with military expeditions, enslavement and relocation that attended Euro-American occupation of the region in the 19th century and precipitated significant disruption of traditional ways of life. Nisenan, Miwok and Washoe communities were displaced from their lands by miners, ranchers and others seeking to extract resources from the region.

By the late 19th century the "Rancheria" emerged as a Euro-American solution to problems of displaced Native peoples in California. The rancherias were lands purchased by Congressional authorization for displaced and homeless Native Americans of various tribal groups. Although the US government terminated 30 rancherias under the California Rancheria Act of 1958, court decisions forced the government to recognize the "tribes, bands, communities and groups" of 17 rancherias and restore those Rancherias to their previous status. Among these were the Shingle Springs and Auburn Rancherias, whose residents include Nisenan and Miwok families; and the Jackson Rancheria, home to a population of primarily Sierra Miwok. Some Nisenan and Miwok are affiliated with other Rancherias, such as Sheep Ranch, Tuolumne, Chicken Ranch, and Buena Vista.

The El Dorado Indian Council is among groups without federal recognition that represent descendants of the historical tribes affected by displacement and Federal Indian policy. The Washoe, after many attempts to regain their lands and establish a reservation, were provided with 156 acres of land near Carson City for the Carson Indian Colony in 1917; an additional 40 acres were allocated for the Washoe at Dresslerville, and the Reno Sparks Indian Colony was allocated for both Washoe and Northern Paiute communities. In 1970, in a settlement of a claim against the government, the Washoe gained another 40 acres near Woodfords in Alpine County, California.

Prehistoric and Historic Archaeological Resources

Archaeological surveys in and around the UARP began in the 1940s, with increasing frequency after passage of the NHPA in the mid-1960s. Many of the surveys have been conducted by the Forest Service or its consultants in association with various logging and other projects, particularly during the period from the 1970s to 1990s. Archaeological surveys conducted between 1999 and 2004 in association with SMUD's relicensing effort combined verification of data from the earlier surveys and systematic field investigations of locations not previously surveyed in the APE. These surveys did not include the land above the Project's tunnels because there are no Project operations on the surface at these locations. The archaeological resources inventory report prepared for SMUD documented 87 sites in the APE. Forty-seven of the sites consisted of prehistoric components (with three of these also having some historic period artifacts), while 40 sites dated to the historic period. The prehistoric sites generally consist of bedrock mortars and lithic scatters, a few possibly associated with camps or other Native American use of the area. The historic-period sites include old roadbeds, remnant ditches and dams associated with irrigation, mining remains, and home sites. The Forest Service had previously determined five of the prehistoric sites and two of the historic sites were ineligible for the National Register. The eligibility of the remaining 80 sites has not been formally determined; these "unevaluated" sites are considered by the archaeologists, SHPO and SMUD as "potentially eligible" until such time as more intensive archaeological investigations may be undertaken.

Location surveys conducted for SMUD and PG&E in 2004 and 2005 in the Chili Bar Project APE were accomplished chiefly by boat, due to the steep slopes of the river canyon and heavy vegetation. These surveys identified four historic-period archaeological sites. PG&E ultimately determined, in consultation with the SHPO, that two of these (a mine adit and a hydraulic mining cut with associated equipment pad, were ineligible for the National Register. PG&E did not evaluate the third site, known as the Chili Bar Toll House Cemetery because it lies on BLM land outside its proposed Project boundary. This cemetery consists of a headstone marker and a flat area that may have been prepared as a cemetery pad; information in PG&E's application associates the grave with Ella Coolidge (who died April 24, 1862), daughter of a toll house keeper whose wife reportedly was a Native American. The fourth recorded resource is an old road alignment from Rock Creek Road to Chili Bar reservoir, which features a section of fieldstone wall. PG&E has asked the SHPO to concur in its opinion that the road alignment is not eligible for the National Register. By letter dated August 9, 2005, the SHPO concurred with PG&E's determination that the road alignment is not eligible.

Traditional Cultural Properties

The previously-mentioned Chili Bar Toll House Cemetery is the only publicly known potential TCP to have been formally recorded to date in either the UARP or Chili Bar Project APE.

SMUD contacted the Native American Heritage Council in association with its relicensing effort. By letter of March 16, 2004, they informed SMUD that a sacred site was located in the Project, and suggested contact with the El Dorado Miwok Tribe for further information. SMUD also commissioned an ethnographic report in its effort to identify TCPs in the UARP. The study included a review of existing literature coupled with interviews with Tribal elders and others knowledgeable of traditional Sierra Miwok, Nisenan and Washoe lifeways in the area of the project. Interviews with descendants of 19th and early 20th century Euro-American settlers were also included in the study to provide a fuller picture of land use and occupation of the UARP area over time. The ethnographic study did not result in identification of specific TCPs (beyond the recorded prehistoric sites, which may be considered potential TCPs by virtue of their association with area Native American groups). The failure to record specific TCPs may be attributable to Native American concerns about potential plundering of cultural sites should they be identified. The study did, however, document the tribes' strong sense of association with the area and the continued importance to them of gathering plants for instrumental, medicinal, ceremonial and food uses.

PG&E also contacted tribes, identified by California's Native American Heritage Council as potentially interested in the Project, to elicit information or concerns those tribes might have regarding TCPs in the Chili Bar Project. Although none of the contacted tribes and groups (El Dorado Miwok Tribe; Ione Band of Miwok Indians, Shingle Springs Band of Miwok Indians, Sierra Native American Council, United Auburn Indian Community, and Wilton Rancheria) offered comment, the El Dorado Miwok Tribe requested a map of the area depicting the Project.

Historic Buildings and Structures

Neither Project APE contains buildings or structures more than 50 years old and both hydroelectric Projects (including Project facilities) date to the late twentieth century.

3.3.9.2 Environmental Effects

Continued Project operation and enhancements and new construction could affect cultural resources listed in or eligible for inclusion in the National Register.

Under Proposed Articles 1-28 and 2-17, *Heritage Resources*, SMUD and PG&E would complete, within 6 months after license issuance, HPMP for the Forest Service (for UARP) and BLM (for Chili Bar) approval. Each HPMP would take into account Project effects on prehistoric and historic resources, Native American traditional cultural values, direct and indirect effects to heritage resources within the APE, ethnographic studies, historic archaeological studies, and Project recreational impacts to archaeological properties affecting National Forest System or BLM lands, as applicable. Each HPMP would also provide measures to mitigate the identified impacts, a monitoring program, and management protocols for the ongoing protection of archaeological properties. The plans would be filed with the Commission, and SMUD and PG&E would implement the plans upon approval.

Under Proposed Articles 1-29 and 2-18, *Heritage Resource Discovery*, if prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on National Forest System or BLM lands and licensee adjoining property, a licensee would immediately cease work in the area so affected. SMUD or PG&E would notify the Forest Service or BLM, as applicable, and would not resume work on ground disturbing activities until it received written approval from the land-owning agency. If it deems it necessary, the Forest Service or BLM could require SMUD or PG&E to perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service or BLM.

Iowa Hill Development

The Settlement Agreement also contains a separate provision (Proposed Article 1-45, *Heritage Resources Protection*) regarding cultural resources protection for the construction and operation of the event that the Iowa Hill development. Under this provision if prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value were reported or discovered, or a known deposit of such items was disturbed, SMUD would immediately cease work in the area so affected. SMUD would then notify the Forest Service and would not resume work on ground-disturbing activities until it received written approval from the Forest Service.

Our Analysis

SMUD drafted an HPMP that was reviewed in second draft form by the Forest Service. On February 11, 2008, the Commission staff circulated a draft PA and draft HPMP for comment and directed SMUD to file a revised HPMP within 90 days of the close of the comment period. Implementation of SMUD's HPMP in consultation with the SHPO, Tribes, the Forest Service and the Commission would ensure that adverse effects on historic properties arising from UARP operations or Project-related activities over the term of the license would be avoided or satisfactorily resolved. Similarly, an HPMP for the Chili Bar Project, prepared and implemented by PG&E in consultation with the SHPO, Tribes, BLM and the Commission would ensure that adverse effects on historic properties arising from Project operations or Project-related activities over the term of the license would be avoided or satisfactorily resolved.

UARP-Only Alternative

Under the UARP-only Alternative, the proposed Iowa Hill development would not be constructed and measures to protect historic properties at Iowa Hill would not be necessary; however, SMUD and PG&E would still develop and implement the proposed HPMPs to address the potential effects of issuing new licenses for the continued operation of the UARP and Chili Bar Project on historic properties.

3.3.9.3 Cumulative Effects

The UARP and Chili Bar Project are among a large number of hydroelectric Projects in central California that affect prehistoric and historic archaeological resources located along the American River and its tributaries. These Projects attract recreational use around the reservoirs. The increased recreational use resulting from the availability of the reservoirs has contributed to both inadvertent and intentional destruction of prehistoric and historic archaeological resources and of potential TCPs. While continued erosion and recreational use of the American River area would be expected to continue to affect archaeological resources and potential TCPs, the measures included in HPMPs for the UARP and Chili Bar Project, as well as measures being or already developed and implemented at other hydroelectric projects in the area, would cumulatively reduce the rate of destruction of these cultural resources.

3.3.9.4 Unavoidable Adverse Effects

In the event of relicensing and pursuant to the NHPA, the Commission would execute PAs with the SHPO and the Advisory Council on Historic Preservation (should they chose to participate) to implement final HPMPs within one year of license issuance as a condition of any license for the UARP or Chili Bar Project. Each licensee, the Tribes, the Forest Service and BLM would be invited to participate in the respective PA as consulting parties.

Execution of the PAs and implementation of the final HPMPs would ensure proper protection and management of significant cultural resources within the Projects' APEs and would also provide satisfactory resolution of any Project-related adverse effects.

3.3.10 Socioeconomic Resources

3.3.10.1 Affected Environment

The region of influence includes the local area, or El Dorado County as a whole and communities in proximity to the UARP, Chili Bar Project, and Iowa Hill development, and the regional area, or the Sacramento Primary Metropolitan Statistical Area (PMSA), which comprises the economically linked counties of Sacramento, Placer, and El Dorado.

El Dorado County

El Dorado County occupies 1,711 square miles of land and is located on the western slope of the Sierra Nevada between the Central Valley of California and the state of Nevada. It contains the Eldorado National Forest, which is considered one of California's most prized recreational areas. The northern boundary of the county is primarily defined by the Middle Fork American River and the southernmost border is shared with Amador County. U.S. Highway 50 runs east/west through El Dorado County, while state highways 49 and 89 run north/south through the western and eastern portions of the county, respectively.

Population

El Dorado County has an estimated population of 176,841 (103.4 persons per square mile), an increase of 40.3 percent from the 1990 census, approximately double the growth of the entire United States (20.4 percent) and 1.7 times the comparable growth for the state of California (U.S. Census, 2005). The population of El Dorado County is projected to reach 241,263 individuals by 2025. New home permits, which grew by nearly threefold during 1995-2004, will decelerate gradually from a peak of 2,123 in 2005 to 1,743 in 2025 as constraints on developable land begin to bind (California Department of Finance, 2004).

Employment

There were an estimated 87,689 full-time and part-time jobs in El Dorado County during 2004, a 68 percent gain over the 1990 count. Of the 2004 total, just over 54,000 jobs were classified as wage and salary as opposed to proprietor's employment (BEA, 2007).

In contrast to much of the United States, El Dorado County added a significant number of manufacturing jobs during the 1990s, but the California Department of Finance is projecting a sharp slowdown in that growth going forward. The western slope of the county is "emerging as an information technology center" recently attracting such businesses as software engineering and research and development. This shift is reflected in recent historical growth patterns and in the current population projections (California Department of Finance, 2004).

Much of the job growth is in white collar occupations. Growth in information technology jobs, which was virtually flat from 1995-2004 (530 jobs to 540 jobs), is expected to accelerate to 710 jobs in 2025. Professional services jobs increased from 2,000 in 1995 to 5,840 in 2004 and are projected to climb to nearly 12,000 in 2025 (California Department of Finance, 2004). In 2005 38.9 percent of the work force was engaged in management and professional service jobs (U.S. Census, 2005). Jobs in health and education and in leisure services will experience similar expansions, but farming and construction jobs (300 and 4,960 jobs, respectively) will be relatively unchanged from the 2004 count, the latter owing to an anticipated slowdown in the home construction industry.

Income and Demographics

Median household nominal income in El Dorado County was $63,147 in 2005, and per capita nominal income is estimated to be $38,652 (U.S. Census, 2005). Household income for the county amounted to $6.6 billion in 2004 (U.S. Bureau of Economic Analysis, Regional Economic Accounts).

El Dorado County's racial and ethnic composition is less diverse than much of California. Most of the residents (89.2 percent) were White, 3.7 percent Asian, 1.2 percent Native American or Alaska Native, 0.8 percent African American, 0.03 percent Native Hawaiian and other Pacific Islander, 2.8 percent some other race, and 2.2 percent two or more races.

The median age is 39.3 years, and 66.1 percent of the population was between 18 and 64 years of age. The poverty rate was 7.7 percent compared to 13.2 percent for the state as a whole. The housing stock for El Dorado County stood at 77,181 units as of January 1, 2004. Single-family homes accounted for 64,227 units, multiple-family dwellings accounted for 8,580 units, and mobile homes accounted for 4,374 units. In December 2001, the median home price in the county was $215,000 but in 2005 it was $542,000 (U.S. Census, 2005).

Placerville is the county seat of El Dorado County and is located at an elevation of 1,866 feet. Incorporated in 1853, Placerville had a population of about 9,900 individuals as of 2001. Besides Placerville, communities with populations of 1,000 or more in the county include South Lake Tahoe, El Dorado Hills, Shingle Springs, Pollock Pines Cameron Park, and Diamond Springs. The closest major population center outside the county is the city of Sacramento, located about 44 miles to the west.

Sacramento County

Employment

There were 779,572 full and part-time jobs in the county in 2004 with 642,586 classified as wage and salary. Government jobs (181,118 workers) form the bulk of Sacramento County's employment. Other service jobs, such as retail (83,596 jobs), healthcare and social assistance (67,099 jobs), and professional and technical services (50,947 jobs), dominate the economy. Construction jobs (55,892 workers) are the majority of non-service occupations. During 2001–2004, job growth was a modest 4.3 percent but this was more than twice the growth for the state of California. During the same interval, jobs in educational services, construction, utilities and real estate underwent the fastest rate of growth while management of companies and enterprise, forestry, fishing and related activities, mining, and manufacturing have each declined.

Income and Demographics

The inflation-adjusted household income in 2005 in Sacramento was $51,793 and inflation adjusted per capita income was $24,616. The total household income for the county amounted to $43.2 billion in 2004, or 3.4 percent of the total state of California personal income.

Sacramento's racial and ethnic composition is similar to the state of California. Approximately 60.2 percent are White, 13.8 percent Asian, 1.2 percent Native American or Alaskan Native, 10.1 percent African American, 0.7 percent Native Hawaiian and other Pacific Islander, 9.9 percent some other race, and 4.2 percent two or more races.

Sacramento County's population has a median age of 33.7, and individuals 18 to 64 years of age accounted for 61.7 percent of Sacramento County's total population in 2005. The poverty rate in Sacramento County rose from 11.1 percent in 2003 to 13.6 percent in 2005. In 2005, the median home value of occupied units was $365,500.

Placer County

Employment

The Projects are expected to affect only small parts of Placer County. Placer County's population has a slightly lower median age than that of El Dorado's population; 38.4 compared to 39.9, but it is still considerably higher than the median age of the state of California (34.4). Individuals aged 18 to 64 make up 63.1 percent of the total population. Placer County's poverty rate during 2005 was just 5.5 percent, less than half the poverty rate of California and Sacramento County.

The racial composition of Placer County is comparable to El Dorado County's, with 84.9 percent White, 5.2 percent Asian, 0.9 percent Native American or Alaskan Native, 1.1 percent African American, 0.1 percent Native Hawaiian and other Pacific Islander, 5.0 percent some other race, and 2.7 percent two or more races.

The median value for homes in Placer County in 2005 was $492,000, and housing in Placer County is 78 percent single-unit.

Income and Demographics

Placer County has a higher inflation adjusted median household income than the state of California, $62,080 and $53,629, respectively, and the 2005 inflation-adjusted per capita income is also higher at $31,853.

The most common occupations in Placer County in 2004 were in retail trade, which employs more than 25,000 workers or 15.6 percent of private sector wage and salary employment. Retail trade is followed closely by construction, employing almost 14 percent of private sector workers. From 2001-2004, there have been no apparent significant shifts in employment among industry employment shares.

3.3.10.2 Environmental Effects

The Impact Analysis for Planning (IMPLAN) model was used to derive estimates of the socioeconomic costs and benefits of the UARP and the Iowa Hill development. The IMPLAN model is an input-output model developed in 1979 by the Forest Service and is one of the most widely used input-output models to evaluate the impact of changes in policy on regional socioeconomics and to produce socioeconomic forecasts. Its primary attribute is that it captures multiplier effects as changes in policy create ripples throughout the economy. The effects of policy can be classified as direct, referring to changes in production associated with a change in demand; indirect, referring to a secondary impact caused by the changing input requirements of producers; and induced, referring to changes in household spending as a function of the additional employment generated by the direct and indirect effects. IMPLAN's assumptions are limiting in that they restrict production functions to be homogenous across all firms within an industry, and linear with constant returns to scale. Output is also assumed to be homogenous or undifferentiated by quality, branding, etc. The IMPLAN model places no constraints on supply, and it assumes that in- and out-migration maintains the region under study at full employment at all times. While these assumptions are not entirely realistic, the model does serve as a sound approximation of real world effects of policy changes on the local and regional economies.

UARP

IMPLAN model results indicate that UARP-related operation and maintenance expenditures directly benefit the local and regional economies. At the local level, UARP generates 131 jobs in El Dorado County and additional personal income totaling $9.7 million. Total operation and maintenance expenditures within the county produce $26.2 million in additional outputs. At the regional level, 186 jobs are associated with the UARP adding $13.9 million in personal income. Additional regional output amounts to $37.0 million. Non-resident recreational activities in the Crystal Basin generate 166 direct jobs and 63 secondary or induced jobs at the local and regional levels. These jobs raise personal income by $3.6 million at the local level and $1.7 million at the regional level. Whitewater recreation downstream on the SFAR downstream of Chili Bar dam generates $33.0 million in revenues and taxes annually to El Dorado County.

Further benefits accrue to Eldorado National Forest and El Dorado County in the form of fees and taxes. SMUD subsidizes Eldorado National Forest in the maintenance of recreational facilities located at the UARP. These payments amounted to approximately $335,000 in 2004. SMUD also contributes to the local infrastructure including maintenance of roads, fire fighting, and telephone lines. SMUD has also contributed to producing recreation brochures for Crystal Basin and is a contributor to one-time projects such as helipad lighting, restoration of the Crystal Basin Information Station, lighting design for Loon lake Chalet and reconstruction of the Eldorado National Forest lookout at Big Hill. Although SMUD lands are tax-exempt under California law, SMUD paid $184,000 in property taxes to El Dorado County in 2003 and has paid approximately $3.0 million through the middle of 2005.

SMUD lists six specific socioeconomic elements where the baseline operation of UARP provides benefits at the local level.

- **Air Quality Benefits—**By generating significant amounts of electricity without producing any undesirable air emission as a byproduct, the UARP has a positive effect on air quality.
- **Summer Recreational Opportunities—**The general operational regime of storing some of the spring runoff and releasing it in the summer and early fall

contributes to the whitewater recreation industry on the SFAR. And in years with sufficient precipitation, near full reservoirs during the spring and summer provide an abundance of flat-water recreation opportunities in the Crystal Basin.

- **Access for Winter Recreation—**SMUD plows snow during the winter from Highway 50 to the Loon Lake Chalet area and creates parking areas along the route for winter recreationists.
- **Economic Effects—**expenditures by SMUD's local project operations (Fresh Pond) and non-resident visitors to the Crystal Basin area create local jobs, direct income, and secondary income.
- **Road Maintenance—**SMUD helps maintain the roads it uses to access Project features, performing paving, repairing road segments, installing guardrails, and cleaning out culverts.
- **Grid Stability—**the UARP is used to help ensure reliability of the electric transmission system within SMUD's service area and Northern California.

SMUD indicates that the Proposed Action does not cause any change from baseline conditions and therefore would not interfere with the provision of the above benefits to the local community.

Our Analysis

SMUD's conclusions regarding employment and income at the local and regional levels are drawn from the application of the IMPLAN model to the operation of the proposed facility under the Proposed Action. As such, we consider the results to be sound. Regarding the six specific socioeconomic elements, the Proposed Action would not change baseline conditions, and, therefore, the flow of the above benefits to the local area would continue unimpeded.

Iowa Hill Development

The Iowa Hill development would have short-term effects during its construction and long-term, operational effects.

SMUD identifies and summarizes the local short-term socioeconomic benefits of the Iowa Hill development as derived primarily from the creation of short-term construction jobs and long-term operations jobs. Secondarily, SMUD indicates that the upper reservoir would facilitate access to water for the purposes of fighting forest fires by airdrop. Access to the upper reservoir would provide a safer source of water for aircraft, which currently must fly through narrow canyons. At the regional level, SMUD asserts that benefits would accrue in the form of increased operational flexibility, efficiency and reliability; [power] transmission system benefits; and environmental benefits.

Effects of Construction of Iowa Hill

Input-output analysis was used to evaluate the contribution of the Iowa Hill development construction to the El Dorado County economy. The inputs to the model were construction cost estimates on capital, materials and supplies, and labor. The output of the model is employment and income. The following 10 assumptions served as a backdrop to the model:

1. The region of influence for the construction economic impact analysis is El Dorado County.
2. Construction is anticipated to start July 2009 with operation expected to commence in 2014.
3. Impacts are evaluated for a 5-year construction period.
4. Total construction expenditures on materials and supplies are estimated to be $235 million in 2004 dollars. Of these expenditures, $75 million would be spent within El Dorado County.
5. Average local (within El Dorado County) construction expenditures on materials and supplies for a 5-year construction period are $15 million.
6. SMUD is expected to hire a total of 830 construction personnel over the course of the 5-year construction period, for an average of 166 personnel working on the Project each of the 5 years.
7. Total construction payroll was estimated at $115 million in 2004 dollars.
8. About 25 percent of the construction workforce is assumed to be local (from El Dorado County). Thus, the average local construction payroll over the 5-year construction period is estimated at $5.75 million in 2004 dollars.
9. Disposable labor income is 70 percent of total labor income. This means that 30 percent of gross income is used for taxes and savings.
10. The base year of analysis is 2001 but the impacts were adjusted to reflect year 2004 price levels.

Each assumption is based on the distribution of average expenditures developed for the Project by Montgomery Watson-Harza, assuming a total construction cost estimate of $445.1 million[41] (not including interest during construction and sales tax on equipment) (MWH, 2004, as cited in CH2M HILL and DTA, 2005a). Assumptions 1 through 3 frame the geographic market and the length of the construction period. Assumptions 4 through 8 outline Project costs, labor requirements, and source. Table 3-71 partially reproduces the cost estimates for materials, supplies, and labor.

Table 3-71. Iowa Hill development construction cost estimates, 2004. (Source: CH2M HILL and DTA, 2005a)

	Total Cost	**Average Annual Cost**
Expenditures on materials and supplies	$235,000,000	$47,000,000
Local expenditures on materials & supplies	$75,000,000	$15,000,000
Construction payroll	$115,000,000	$23,000,000
Local construction payroll	$28,750,000	$5,750,000

[41] In April 2007, SMUD submitted to FERC an increased Iowa Hill construction cost estimate ranging from $519.6 million to $704.1 million (not including interest during construction and sales tax on equipment), reflecting a 17 percent to 58 percent increase in the cost estimate. SMUD indicates that the range results from the variability in construction cost information sources and reflects, among other things, a number of factors. Some of these factors might alter the project-related income and employment estimates presented in the draft EIS. For example, the tightening of the skilled labor market in the Northern California region could lead to an increase in average wages paid to local workers. On the other hand, the increased global competition for commodity items like steel, concrete, and fuel could result in higher prices paid for those commodities, but would likely not affect local project-related income and employment. Given the variability of the construction cost estimates and the uncertainty associated with whether the higher material and labor costs would benefit persons within the region, the analysis of construction-related jobs and personal income discussed in this EIS was not revised to reflect the higher construction cost estimates. As a result, the estimates presented here may underestimate the potential employment and income impact of Iowa Hill construction. However, it impossible to determine the degree to which the results presented here underestimate the likely impacts.

Our Analysis

SMUD provides average Project construction expenditures but not statistical distributions of estimated costs that would permit the derivation of a range of possible employment and income outcomes. The Project is relatively small scale, such that even large deviations from average expenditure estimates would not yield employment and income effects that would have a substantial impact on local and regional economies.

Regarding assumption 8, SMUD estimates that 25 percent of the construction labor force would be sourced locally. Given that approximately 10.1 percent of the El Dorado county workforce is engaged in wage and salary construction jobs (California Department of Finance, 2004), this is a reasonable assumption.

The construction expenditures, including the payroll for the 166 direct jobs, are projected to generate a further 370 indirect and induced jobs, primarily in the service sector (i.e., grocery stores, restaurants, gas stations). This projection is derived using the IMPLAN model. The projection of 370 secondary jobs rests on the assumption that about 32 percent of the total expenditures ($75 million out of $235) million would go to local suppliers. SMUD does not indicate how it arrived at a figure of 32 percent local sourcing.

Monetizing the local short-term benefits, the IMPLAN model indicates that construction of the Iowa Hill development would generate local income on the order of $18.9 million per year over the 5-year construction period. There would be $4 million in direct income (payments to local suppliers of labor and materials) and $14.9 million in secondary income (worker and supplier expenditures on goods and services). SMUD asserts that $18.9 million in annual additional income represents just 0.3 percent of the total 2004 El Dorado County annual personal income of $6.31 billion.

Effects of Operations of Iowa Hill

The IMPLAN model was also used to evaluate the long-term employment and income benefits for the operational phase of the Iowa Hill development. The Covered Employment and Wages data published by the U.S. Bureau of Labor Statistics proved inadequate for use as inputs to the model, so SMUD substituted an input data set composed of actual operations and maintenance average expenditure distributions for the SMUD Fresh Pond hydroelectric facility (a facility similar to the proposed Iowa Hill development) and SMUD personnel expertise. Expenditures are those devoted to labor, materials, and supplies required to operate the Project. The total cost in 2004 is just slightly more than $3.5 million. Table 3-72 shows Iowa Hill development operations expenditure data.

Table 3-72. Iowa Hill operational payroll and operation and maintenance expenditures, 2004. (Source: CH2M HILL and DTA, 2005b)

	Total Cost	Cost Spent Within El Dorado County	Cost Spent Within Sacramento Region
Payroll[a]	$262,480[b]	$262,480[b]	$262,480[b]
Other O&M Expenditures[c]	$3,306,000	$1,653,000	$1,983,600
Total	$3,568,480	$1,915,480	$2,246,080

[a] Includes benefits. Payroll shown for El Dorado County is for the two Iowa Hill employees who are assumed to be El Dorado County residents while that shown for the Sacramento region is for the same two Iowa Hill employees who are also residents of the Sacramento region (El Dorado, Placer, and Sacramento counties).

[b] Total annual O&M labor cost at Fresh Pond was estimated at $10,637,230. Because 2 percent of these costs are spent on headquarters staff, only 98 percent is actually associated with Fresh Pond. Assuming 81 full-time employees at Fresh Pond, the average labor cost (salary plus benefits) per employee is $128,722. Since Iowa Hill operation would have two O&M employees, the labor cost for these two additional O&M employees is estimated at $257,400 (or 2 times $128,722).

[c] 50 percent of the other O&M expenditures are spent within El Dorado County. Thus, of the total $3,306,000 in other O&M expenditures, $1,653,000 (or 50 percent), is spent within El Dorado County. For the Sacramento region, the amount of other O&M expenditures spent within the region is $1,9843,600 or 60 percent of the total other O&M expenditures for Iowa Hill in 2004.

The payroll component accounts for just a small fraction (7.3 percent) of total expenditures and would support just two full-time employees sourced from within the Sacramento Region (including El Dorado County). The remaining expenditures on materials and supplies are assumed to be split 50-50 between El Dorado County and other areas and 60-40 between the Sacramento region (including El Dorado County) and areas outside. Such a split reflects the same local/regional distribution as do operational expenditures at the SMUD Fresh Pond site.

Using this expenditure data and its geographic distribution as inputs to the IMPLAN model generates 12 indirect and induced jobs in addition to the two jobs directly generated at the Project. These 14 jobs are just a tiny fraction (0.03 percent) of the overall employment for El Dorado County, and the annual income generated from them ($698,300 direct, indirect, and induced) is an even smaller fraction (0.01 percent) of the county total personal income.

Project operation is expected to add $3.5 million in direct output, $670,129 in indirect output, and $303,162 in induced output for a total of $4.5 million.

The IMPLAN model was also run for the Sacramento region, inclusive of El Dorado County. In this case, the direct jobs generated by Project operation remain at two but there would be 18 indirect and induced jobs created as well. These would lead to $262,500 in direct income and $812,300 in indirect and induced income. These outcomes represent insignificant fractions of the total income for the Sacramento region.

In terms of output in the Sacramento Region, the IMPLAN model predicts $6.1 million or just 0.01 percent of the total regional output.

Our Analysis

Use of the IMPLAN model is a sound approach to evaluating the effect on labor and income from proposed Project construction and operations. Although the use of expenditure data from the Fresh Pond facility is not ideal, it is acceptable in light of the lack of published government data. The numbers of jobs and their associated income and output are extremely small relative to the economies of El Dorado County and the Sacramento region as a whole, and the operational phase of the proposed Project would not carry with it substantial economic benefits.

Regional and Environmental Benefits

SMUD lists the benefits of the Project to the region and to itself as the provision of operational flexibility, efficiency, and reliability; transmission system benefits; and environmental benefits.

Operational flexibility, efficiency, and reliability imply that the Project would strengthen SMUD's ability to cover periods of peak power demand without the need for additional power generation facilities. SMUD's UARP provides about 20 percent of the power needs to about 180,000 homes in its service area during a normal water year. The Proposed Action would support this operation by improving the facility's ability to smooth the delivery of power between peak and off-peak periods. Transmission system benefits refer to the reliability and stability of the system in delivering power to customers without constructing new transmission lines. Environmental benefits refer primarily to improved air quality in the Sacramento Valley that would ensue during Project operations, and secondarily, SMUD indicates that the Iowa Hill development would create a safer source of water for aircraft engaged in fighting forest fires in the vicinity to refill their water buckets. Currently, aircraft must fly through narrow canyons to refill their buckets

Our Analysis

SMUD does not explicitly state that the Iowa Hill development would result in lower energy prices to consumers, nor does it relate the smoothing of power delivery to socioeconomic benefits such as the potential for increased disposable income, positive employment effects, and economic development of the region. Improved regional air quality is mentioned as a key socioeconomic benefit of the existing Project, but it is not quantified in monetary terms. The benefit of facilitated access to water for fire-fighting aircraft also is not quantified in monetary terms. Likely, the lack of supporting empirical data and analysis is a function of the relatively small size of the Project. While socioeconomic benefits would certainly accrue to the region, the extent of these benefits would be negligible from a social accounting perspective.

Property Values

The number of jobs created by the Project would be small. Because at least 25 percent of those jobs would be sourced from the local labor market, the Iowa Hill development likely would have zero or negligible effects on the overall demand for local housing. However, the Iowa Hill development may affect housing amenities in the area, particularly scenic views. This section describes the nature of the change in scenic views and the potential monetary impact on area housing values.

SMUD evaluated short- and long-term effects of the Iowa Hill development on residential property values from the effects of (1) views of the upper reservoir, switchyard, and transmission tie-in; (2) the proximity of the proposed transmission lines to nearby properties; and (3) the improved accessibility brought about by the upgrading of Cable Road and Iowa Hill Road on the properties to which access is provided. Particular attention is paid to the Apple Hill and Swansboro areas (see figure 3-36). In both areas property values are rising significantly. It is possible that, owing to negative alteration of scenic views and construction of transmission lines, the Iowa Hill development could adversely affect or even reverse this trend. In total, there are 70 properties from which scenic views may be affected by the Iowa Hill development, all of which are located within a 3-mile radius of the proposed site (this geographic definition is based on standards developed by the Forest Service).

SMUD concludes that property values in the area would suffer a short-term reduction as scenic views are adversely affected by the construction itself. Secondarily, high noise levels and reduced air quality during the construction period would also reduce housing values temporarily. In the long-term, however, SMUD concludes that housing values would be unaffected. Furthermore, SMUD concludes that 28 properties directly adjacent to the Iowa Hill site could see a small increase in property values if the proposed access road improvements are made. That benefit would not be realized if the SW Connector were built in lieu of upgrading Cable Road.

SMUD's analysis is qualitative and based on a review of applied academic and practical literature on the effects of scenic views and transmission lines on property values. Assessment of the Iowa Hill development's impact on scenic views from surrounding properties is derived from a review of the literature on the impact of scenic views on property values. The conclusions are supported by the presentation of a series of photographs that show the actual pre-construction view and a simulated, post-construction view.

In addition, SMUD referenced recent sales data, and conducted interviews with local real estate professionals. SMUD identified the changes to the visual environment seen from residences in the Project area. These study results are supplemented by existing academic and applied research on property values, presumably because of a lack of existing data on property sales in the vicinity of the site and because the Project represents a new development for which historical comparisons are not available.

The literature on the impact of scenic views on property values is nearly unanimous. Several academic studies reveal that scenic views have an unequivocally positive impact on sales price ranging from 1.4 to 16.6 percent. Some studies reviewed are clearly not relevant to the Project, however, such as the case where ocean views offer the highest premium on property values.

Our Analysis

Rather than undertake original research, SMUD submitted results based on an extensive review of already existing academic and applied property value research. Much of this research is based on the use of statistical models that isolate and quantify the effect of various attributes on the value of a particular good. When applied in the study of property/housing values, these models frequently incorporate attributes such as the square footage of the property, its number of bathrooms, lot size, distance from major transportation facilities, age, and any other feature(s) that could create variation in property values, including environmental attributes such as whether the property offers a scenic view and its proximity to infrastructure. This approach is a generally accepted methodology and has been featured prominently in the academic literature. SMUD reviewed articles taken from both the peer-reviewed academic journals (*Land Economics, Journal of Real Estate Literature, Journal of Real Estate Research*) and from private consulting firms and government agencies.

The property value research described above was supplemented by an analysis of Project views based on comparisons of actual and simulated photographs for five viewpoints located within Forest Service guidelines of 3 miles from the proposed site. The actual photographs show the viewpoints as they currently exist and the simulated photos show the viewpoints' likely appearance one year after construction and 10 years after construction. Of particular interest are the views of the canyons that surround Iowa Hill. According to the photos, the Project would not obscure the views of the canyons; however, the Project includes construction of a berm that would be visible from all five viewpoints. Also a portion of the proposed switchyard and a portion of the proposed transmission lines would be visible. The changes in view would moderate over time as the berm is covered with more mature vegetation and thicker forest cover screened views of the switchyard and transmission lines. While the analysis of the photo simulations can be considered subjective, the method is a reasonable approach to the analysis.

Proximity to Transmission Lines

In addition to the construction of the upper reservoir itself, a 3-acre switchyard would be located adjacent to the reservoir, and a new, 2-mile-long 230-kV transmission line would connect the switchyard to the existing Loon-White Rock transmission line. SMUD states that the switchyard would not be visible and would therefore have no effect on property values in the area, although it does not support this position with any data.

SMUD concludes that the placement of transmission lines would have aesthetic effects and possibly health, safety, and noise effects as well. To estimate the monetary impact of transmission lines on property values, SMUD relied extensively on research conducted by Hamilton and Schwann, who examined the impact of transmission lines on Canadian properties. The authors found that transmission lines have no statistically significant impact on property value past a distance of 656 feet, and SMUD applies this result to Iowa Hill. Only 6 properties would lie within 656 feet of the proposed transmission lines, and SMUD states that they would experience some negative impact. But in general, SMUD indicates that any negative impacts on property values would be mitigated because the views of the proposed transmission lines would be partially obscured by thick tree cover. However, there are two very small (2.5-acre) undeveloped parcels that lie partially within the transmission line's zone of potential influence, whose values could be decreased by as much as 33 percent ($1,650).

In addition to the Canadian study, SMUD refers to several other studies in Montana and in Australia that show distance thresholds to be in the range of 0.31 mile to 1.24 miles where negative perceptions of health, safety, and aesthetics begin to erode property values. In general, transmission lines were found to have only small impacts on property values (on the order of 2 to10 percent for single family homes). Some findings suggest that there is no impact on property values and in other cases, transmission lines were found to raise property values because they offer owners the use of right-of-way for recreational purposes.

The number, quality and geographic dispersion of the studies reviewed by SMUD appear to include adequate representations of the impact of transmission lines on property values in the markets studied and are reasonably applied to El Dorado County, California.

Of the 70 properties under study, SMUD concludes that housing values would decrease up to 33 percent for two undeveloped properties adjacent and 15 percent for two properties just east of the Iowa Hill site. In the Apple Hill area, 16 properties would decline by 3 percent in value and in Swansboro, 22 properties would undergo a 5 to 10 percent decrease. SMUD concludes that under the Proposed Action, the 28 properties adjacent to Iowa Hill Road would rise in value by 5 percent because of road improvements included in that proposal. That property value increase would not occur if the SW Connector were built in lieu of improving existing roads.

SMUD believes that the long-term effects of the Iowa Hill development on property values would be zero at worst and modestly improved at best as mitigation efforts such as re-vegetation of the site help to adjust perceptions over time. SMUD is already committed to mitigate the impact on scenic views and under the Settlement Agreement would develop a design for the Iowa Hill development that meets the visual quality standards of the Eldorado National Forest Land and Resource Management Plan to ensure adequate protection during utilization of the Forest. Upgrading Cable Road/Iowa Hill Road under the Proposed Action would lead to modest (assumed 5 percent) improvement in property values for the 28 properties affected by that action.

In sum, SMUD's conclusions regarding the impact of the Iowa Hill development on area property values are reasonable. Because the Project is not expected to affect property values by generating increased demand for housing, the conclusions rest primarily on the effect of the Iowa Hill development on aesthetics and secondarily on the improved access associated with the proposed upgrading of Cable Road/Iowa Hill Road. SMUD is committed to achieving Forest Service standards of visual quality according to the Settlement Agreement.

Effects on Fiscal Conditions and Services

In this section we address the impact of the Project on local government fiscal resources in El Dorado County. According to SMUD, El Dorado County's revenues and expenditures increased from approximately $100 million in fiscal year (FY) 1998–1999 to about $160 million in FY 2002–2003. Major sources of El Dorado County revenue are intergovernmental transfers from the federal and state governments, and taxes and assessments. Intergovernmental transfers account for approximately half of all revenue sources while taxes and assessments account for about a third. Over the past 5 years, the proportion of county revenues from taxes and assessments has declined from about 32 percent in FY 1998–1999 to 29 percent in FY 2002–2003. On the other hand, the proportion of the county's revenues from intergovernmental transfers has increased from about 45 percent in FY 1998–1999 to 51 percent in FY 2002–2003. In each FY from FY 1998–1999 to FY 2002–2003, El Dorado County government appears to have generated a surplus of revenues over expenditures.

In the area of the proposed Iowa Hill development, five elements of government services were studied, including schools, fire protection, law enforcement, emergency response services and hospital use, and available hospital resources.

Schools—Based on conversations with local school officials, SMUD asserts that overall enrollment in El Dorado elementary public schools is undergoing a decline and that this trend is expected to continue. High school enrollment, on the other hand, has been experiencing a slight increase. Further, since the Iowa Hill development is not expected to generate any meaningful level of population increase, the capacity of the local school system should remain adequate.

Fire Protection—The majority of the physical space of the Iowa Hill development would be located on private SMUD-owned property with some additional encroachment on federal lands (Eldorado National Forest). However, the California Department of Forestry and Fire Protection has agreed to provide assistance to the El Dorado County Fire Department in the event of a major fire. SMUD does not conclude that Iowa Hill development would raise the probability of a fire and thus does not attempt to quantify its impact on the local budget. However, under Proposed Article 1-34, *Fire Management and Response Plan*, SMUD would develop a fire prevention and response plan in consultation with state and locate fire agencies and would implement the plan.

Law Enforcement—SMUD states that, in spite of an anticipated increase in theft and vandalism at the site, plus an increase in emergency medical situations, there would be no impact on local law enforcement. SMUD plans to deploy its own private security personnel at the site during construction.

Emergency Response—SMUD does not anticipate any significant impacts on the county's emergency response system because it plans to implement construction safety plans, particularly with respect to blasting.

Search and Rescue—The workers at the site would not engage in activities that would raise the possibility of the need for additional search and rescue operations.

Hospital—Because it is a relatively small undertaking, the Iowa Hill development would not have any material impact on hospital care in El Dorado County. SMUD does not address the potential costs associated with providing hospital services for construction workers who may be injured on the job, except to state that in the event of such an occurrence, patients would receive treatment in trauma centers located outside of El Dorado County. As such, the fiscal impact of the Project on El Dorado hospitals would be at or near zero.

Our Analysis

We reviewed the information provided on the potential effect on schools in El Dorado County and conclude that construction of the Project would not result in school population growth over the normal growth. Again, the relatively small size of the Project is consistent with SMUD's conclusions.

The fact that there will be human activity involving heavy equipment and machinery in the area where there was none before would probably increase the risk of fire but given that the state of California has agreed to assist the county in the event of such an occurrence, the impact on El Dorado County's fiscal budget would be zero. Therefore, SMUD's conclusion with regard to this fiscal impact element is reasonable.

Since local law enforcement would be assisted by private security, we would not expect cost impacts on local law enforcement services.

There is no reason to doubt that SMUD's construction safety plan would preclude an increase in the county's emergency response activity or in search and rescue hospital services.

Economic Value of Harvestable Timber

The Iowa Hill development would permanently eliminate 128 acres of timberland and temporarily affect 25 acres during construction. SMUD used prevailing market prices for species known to be common to the Eldorado National Forest, and applied growth estimates provided by the Forest Service. Assuming all timber is composed of the most valuable species (Ponderosa Pine), the financial loss associated with its removal would amount to $699 per year and a net present value of $11,500 (using a 6 percent discount rate).

Our Analysis

There was no formal timber inventory or "cruise" of the area. However, it is understood that the estimates of the financial losses provided by SMUD are conservative, in that they account for the worst possible case. Given that the acreage is relatively small and that a full forest inventory of the area is not available, SMUD's approach is sound and its findings reasonable. Construction of the Iowa Hill development would have a minor effect on timber harvesting.

Construction Traffic Impact and Impact on Tourism at Apple Hill

SMUD provides a worst case scenario for the impact of construction-related traffic and then measures these findings against California Environmental Quality Act guidelines. The guidelines state that the impact of the Iowa Hill development would be significant if it would:

1. Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to ratio on roads, or congestion at intersections);
2. Exceed, either individually or cumulatively, a level of service standard established by El Dorado County for designated intersections;
3. Result in a change in traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks;
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses;
5. Result in inadequate emergency access;
6. Result in inadequate parking capacity; or
7. Conflict with adopted policies, plans, or programs supporting alternative transportation.

SMUD focused on automobile and truck traffic likely to be generated by the Project, stating that the area does not have public transportation facilities and is generally not suitable for walking or bicycling. Of most concern is the effect of traffic on tourism at Apple Hill and potential effects on homes located on or near the transportation routes, such as along Cable Road.

Under the transportation assumptions included in the Proposed Action, traffic would be generated by construction workers driving to the site and by trucks delivering construction materials and supplies to the site. SMUD assumes the worst case scenario, where all construction workers travel to the site from the greater Sacramento area. It assumes 360 daily trips would be generated under the assumptions that average vehicle occupancy is 1.3 persons and the peak-level workforce is 235. SMUD does not make clear why it chose 1.3 as the average vehicle occupancy but it may be assumed that it derives from previous research on journey-to-work habits for construction workers in the area. Most if not all of the worker trips generated by the construction would occur in off-peak hours assumed to be 5:30 a.m. to 6:30 a.m. and 3:30 p.m. to 4:30 p.m. Normal highway peak traffic commute hours are 7:00 a.m. to 8:00 a.m., and 5:00 p.m. to 6:00 p.m. Project-related trips would overlap with the afternoon school bus hour of 3:00 p.m. to 4:00 p.m.

According to the January 2005 *Iowa Hill Pumped Storage Development Socioeconomic Assessment of Construction and Operations Technical Report* (page 57), the Iowa Hill construction would further generate 25 delivery truck trips per day traveling over the same routes used by construction workers during non-commute hours. The specific materials and equipment expected to be delivered to the Project site was not given. SMUD concludes that while there would be additional traffic generated by the Project, most of it would occur in off-peak hours and further, since it would occur in off-peak directions (west-east during mornings and east- west during evenings) its impact would be minimal. SMUD's studies show that the construction activity would not affect the level of service at key intersections except at the Carson Road Eastbound ramp during the a.m. period. Assuming that 10 percent of the construction-generated traffic used this intersection to access the site, SMUD concludes that there would be a minimum of queuing delays. According to SMUD, queuing problems would not be expected to emerge until more than 20 percent of construction traffic uses this intersection. In this case, congestion could occur on U.S. Route 50, which is the area's major highway. These findings are based on levels of service outlined in the *2000 Highway Capacity Manual.* It is not clear why SMUD chooses to assume a 10 percent split between the use of the Carson Road interchange and The Old Highway interchange. SMUD further asserts that there is sufficient capacity to accommodate the construction traffic in the peak years of construction and consequently it would have minimal impact on traffic conditions during the off-peak years of construction.

In spite of the fact that most of the traffic would occur on week days, SMUD indicates that construction activities could exacerbate the traffic congestion that currently occurs during the annual Apple Hill recreational season. This is because while most of the estimated 500,000 visitors to the area during the season come on weekends, there is substantial traffic generated on weekdays as well. SMUD does not quantify the impact of construction traffic on Apple Hill tourism but given the modest level of additional traffic it would be reasonable to assume that Apple Hill tourism would not be significantly affected. The report addresses air traffic, emergency access and parking and finds no reason to believe that Project-generated traffic would have any impact on any of them. Finally, post-construction traffic impacts would be extremely minimal because the number of workers during this phase would be negligible.

Subsequent to publication of the draft EIS and in response to public concerns over the transportation issue, SMUD prepared the *Iowa Hill Pumped-Storage Development Transportation Route Technical Report* (CH2M HILL, 2008b), which investigated several routes as alternatives to the proposed route described in the draft EIS. The report considered alternative routes to both the upper and lower construction sites, and also evaluated the use of park and ride and/or equipment staging facilities as a means of alleviating traffic pressures. The alternatives evaluated in the technical report and the evaluation criteria are described briefly in this final EIS in section 3.3.7.2, *Environmental Effects; Land Ownership, Management, and Use; Transportation System Management Plan.*

The technical report includes a quantitative study of traffic patterns in the Iowa Hill area that was lacking in earlier reports. Based on traffic counts, a review of roadway features such as sharp turns, narrow roadways, and deteriorated roadways; a review of additional construction requirements such as a new overpass or road widening; and a review of homes and businesses located along the alternative routes. SMUD concluded that the following routes would be preferable from the "community-focused" point of view of minimizing impacts on neighborhoods and visitors:

Routes to Lower Construction Site:

- Route 1—Carson Road East (same as original proposed route)
- Route 5—Barkley Road
- Route 10—Jacquier road

Routes to Upper Construction Site:

- Route 9—Mace Road/Cable Road

All of those routes would avoid going through the town of Camino, and would avoid neighborhoods to the extent possible. The primary conclusion of the technical report, however, is that in terms of minimizing neighborhood impacts, the SW Connector route linking the upper and lower construction sites would be much superior to any of the alternative routes to the upper construction site. Significantly, however, the feasibility of constructing the SW Connector has not been determined at this time.

Our Analysis

Despite a few shortcomings in SMUD's reports, we find the overall approach and results to be reasonable. SMUD provides a worst-case scenario where it is assumed that all workers and deliveries are sourced from the greater Sacramento area and the analysis is conducted during what are scheduled to be the peak construction years. However, SMUD does not support its contention that the peak travel hours in the area are different from the peak travel hours for construction workers, except to say that the non-construction hours are "normal." Additionally, SMUD does not consider the potential adverse effects on the condition of the area roads that could result from increased truck traffic, likely because there are no weight restrictions on the roads that are most likely to serve the trucking needs of the Project.

The traffic counts and quantified approach to route evaluation in the Transportation Route Technical Report (CH2M HILL, 2008b) is a substantial improvement over the transportation-related information we had available for preparing the draft EIS. The technical report uses a reasonable approach to evaluating and comparing the various alternative routes that could be used to the upper and lower construction sites. We find that because the Project would generate only a small number of additional vehicle traffic, its impact on total traffic would be minimal. If the SW Connector proves to be a feasible route to the upper construction site, the potential adverse effect to homes on or near Cable Road and the other access roads would be eliminated. As discussed in section 3.3.7.2, SMUD would develop and implement a transportation management plan to address traffic safety and road improvements. These measures may include the use of a park-and-ride facility and/or staging area to reduce construction-related car and truck trips to the construction sites. Additionally, SMUD could plan to disperse different types of traffic along different routes, so that the potential traffic disruption along any one route would be reduced.

Recreational Impacts

SMUD indicates that there is little if any recreational activity in the Iowa Hill area owing primarily to (1) the lack of water-related recreational opportunities; (2) the lack of recreational facilities (campgrounds, trails, etc.); and (3) the loose gravel/dirt, unimproved, 4-mile-long segment of Iowa Hill Road/Cable Road leading to the site from Camino.

There are, on the other hand, limited recreational activities downstream of the Iowa Hill site at Slab Creek reservoir and other places further downstream from Slab Creek and Chili Bar. SMUD studies show that recreational use of Slab Creek reservoir is low compared to other UARP sites, primarily because at an elevation of 1,850 feet with steep topography, access is limited. The area is used primarily by local residents who are limited to just two points of access. Construction traffic could impact recreation at Slab Creek reservoir by periodically limiting access to the area but the SMUD does not foresee any drastic change in the availability of the recreational activities at this site during the construction phase of the Project.

Construction techniques planned for the Project would not affect water levels in areas downstream of Slab Creek reservoir, including White Rock powerhouse, the SFAR downstream of Slab Creek dam, Chili Bar reservoir, and the reach downstream of Chili Bar reservoir. Therefore, recreational activities in these areas such as flat water boating will not be affected by the Project and therefore will not have any socioeconomic effects.

SMUD reports that the *operation* of the Project could affect recreational use at various downstream locations. In particular, (1) the 8-mile reach of the SFAR between the Slab Creek dam and PG&E's Chili Bar reservoir; (2) at Chili Bar reservoir; and (3) in the 19.1-mile reach downstream of Chili Bar dam. Since flat water boating and swimming at Chili Bar reservoir are currently prohibited, there is no reason to consider the socioeconomic impact of the Project on them. Recreational activities around Chili Bar reservoir such as picnicking, off-highway vehicle use, hiking and fishing are not anticipated to be adversely affected by Project operations.

To simulate the impact on recreational use of downstream facilities, SMUD relies upon the CHEOPS model. This is a model of water balance required to meet particular monthly and daily power generation schedules. The recreational effects of the Project stem primarily from the level of fluctuation in water levels at the reservoir. The model predicts that operation of the Project will cause water levels the Slab Creek reservoir to fluctuate by 6 feet or more approximately 95 percent of the time, more than 18 feet approximately 5 percent of the time, up to a maximum of 30 feet. In relative terms, current water level fluctuations at the Slab Creek reservoir are typically between 2 and 5.1 feet but on a weekly basis may fluctuate by up to 30 feet.

Our Analysis

SMUD concludes that construction techniques employed during the construction would preclude any adverse impact on recreation during the construction of the Project. There is no basis for argument on a socioeconomic basis and therefore this statement is considered valid.

The recreational impact of the Project-operation phase is concentrated in the Slab Creek reservoir. According to a visitor survey and use count conducted in summer of 2002, annual use of the Slab Creek reservoir is 5,100 visitor days per year and that 78 percent of the users reside locally in El Dorado County. Swimming is the most popular activity among visitors while 36 percent reported fishing along streams and rivers in the area, and 33 percent fishing directly at the reservoir. Twenty-eight percent reported canoeing or kayaking. Other activities were non-water based such as hiking/walking (44 percent), wildlife viewing (42 percent) picnicking (31 percent) and photography (25 percent). Slab Creek reservoir has limited access at this time, no signing or other information to direct the public to the access points, and a lack of facilities and security. As these items are provided, recreational use is expected to increase considerably. The Slab Creek reservoir access plan and recreation plan would address these needs, consistent with Iowa Hill operations needs. The current low use should not be assumed into the future.

SMUD reports that the change in daily water level fluctuations at the Slab Creek reservoir during the operation of the Project would be 6 feet or more 95 percent of the time compared to current fluctuations of between 2 and just over 5 feet for the same proportion of the day. SMUD states that the reservoir levels will change more rapidly than what recreational visitors are used to and goes on to say that without properly informing visitors of this development, these fluctuations could pose a safety issue. The difference in overall levels, however, is not stark and in isolation will not impact swimming or other water-related activities at the site. Nor will they impact non-water-related activities at the site. SMUD does not provide empirical support on which to base this conclusion either through original research or published literature. And because SMUD does not believe recreation at Slab Creek reservoir would be affected, there is no accompanying socioeconomic impact statement.

Implicit in SMUD's conclusion is that the predicted fluctuations in water levels during operations are not materially different from current water level fluctuations at the site and further, that recreational activity at Slab Creek reservoir is relatively light and owing to Department of Homeland Security concerns, will likely be restricted going forward. Given the small amount of recreational activity at Slab Creek, SMUD's conclusion is reasonable. One could argue that even if there were to be a decline in recreational use at Slab Creek reservoir, the socioeconomic impact in monetary terms would be negligible because 78 percent of visits were from the local area and therefore do not contribute to El Dorado County's tourism services economy to any significant degree.

Impact on Camino Community Lifestyle

SMUD reaches the conclusion that because the population of the County and in particular, the city of Camino would be unaffected by the number of jobs created, there would be negligible impacts on public services and lifestyles in the community. This section describes the SMUD analyses and conclusions in more detail.

SMUD is concerned with the impact of the Iowa Hill development on the lifestyle of the Camino Community. The effects of the Iowa Hill development are measured against elements of the Camino Community Action Plan (CCAP) "that are relevant to the construction and operation of the [Project]." These include,

- Enhance the sense of community, maintain Camino's natural environmental qualities, and small town atmosphere;
- Minimize traffic hazards/impacts on local roads and on U.S. 50;
- Improve access to recreational services; and
- Growth should be slow and controlled.

SMUD reports that the Iowa Hill development is consistent with the relevant goals outlined in the CCAP. The Iowa Hill development would not draw increased population to the area nor would it cause current residents to leave the area. This conclusion is based on the relatively few numbers of workers required for construction and operation of the Project and further, that the construction and operation of the Iowa Hill development is not expected to induce commercial, industrial or residential development in the area. It follows that the Iowa Hill development would not alter Camino's population growth or composition, nor would it change Camino's rural, small town character.

SMUD also states that the Iowa Hill development would not significantly alter the topography, geology or vegetation of the area, except where the proposed upper reservoir and associated facilities and the proposed transmission line would be sited. This would preserve the Camino Community's natural environmental qualities.

Operation of the Iowa Hill development would not result in air emissions but during construction, expectations are that there will be air emissions in the form of dust particulates and hydrocarbons. However, the report states that emissions would be localized in the vicinity of the upper reservoir and along the dirt road portions of the access roads until such time as they are upgraded with gravelling. With respect to noise, as discussed in section 3.3.10.2, *Air and Noise* Quality, construction and operation of the Project would raise ambient noise levels but as in the case of air quality, it would be limited to the immediate vicinity of the site and would not affect the Camino community.

SMUD states that casual visitors to Camino or Apple Hill or motorists on U.S. 50 would not notice the changes in topography, geology or vegetation caused by the Iowa Hill development because intervening topography and vegetation would obscure many of the views. SMUD also states that although recreationists at Slab Creek reservoir would notice the facilities, these facilities would not stand in stark contrast to already existing man-made features of the area and thus would not have a drastic impact on the recreational experience.

Access to recreational services, particularly those at Slab Creek reservoir, could be impeded by traffic congestion during the construction phase. In the operations phase, upgrades to the road made during construction would improve access. Under those circumstances, we conclude that the Iowa Hill development would be inconsistent with CCAP objectives regarding recreational facilities in the short term, but would be consistent with these objectives over the long term.

SMUD states that traffic hazards would develop during the peak construction period (months 30-36), and that these hazards could adversely affect the quality of life in Camino. Specifically, SMUD indicates that construction traffic could have an impact on (1) children walking in the morning to their bus stops on roads that comprise the Project access routes (if they are walking at or before 6:30 a.m.); (2) vehicles on the roads that comprise the Project access routes between approximately 5:30 a.m. to

6:30 a.m., including those attempting ingress or egress to/from residences, those transporting children to the bus stops in the morning, and other vehicles on the road; (3) the local p.m. school bus trips (3:00 p.m. to 4:00 p.m.); (4) children walking home from their bus stops in the afternoon, if walking on roads that comprise the Project access routes; (5) vehicles on the roads that comprise the Project access routes between approximately 3:30 p.m. to 4:30 p.m., including those attempting ingress or egress to/from residences, those transporting children to their homes from the bus stops in the afternoon, and other vehicles on the road; and (6) the traffic congestion that occurs during the Apple Hill season.

Our Analysis

Assuming that the results of the IMPLAN model are correct, it is reasonable to state that given the small number and temporary nature of the construction workforce to be employed during construction of the Iowa Hill development and the even smaller workforce required for its operation, the conclusions drawn by SMUD regarding the impact on Camino's population are reasonable. Even the indirect and induced jobs generated by the construction would not be sufficient to alter the population of Camino because, similar to the directly created construction jobs, many indirect or secondary jobs would be filled by workers commuting from the Sacramento region while others would be sourced from other areas of El Dorado and perhaps even Placer counties. Traffic hazards created by the Project are clearly inconsistent with the objectives of the CCAP; however, SMUD is committed to minimize the impact in its Transportation Management Plan, which is to be submitted prior to the initiation of the construction phase.

3.3.10.3 Unavoidable Adverse Effects

The Iowa Hill development would have unavoidable adverse effects on property values adjacent to the site during both the construction and operational phases of the Project. Traffic congestion would have an unavoidable adverse effect during the construction phase of the Project, particularly in the peak months (30–36).

Property values in the area immediately adjacent to the site may decline in value by as much as 33 percent, and 15 percent for two properties just east of the Iowa Hill site. In the Apple Hill area, 16 properties would decline by 3 percent in value and in Swansboro, 22 properties would undergo a 5 to 10 percent decrease in value.

Traffic congestion on roads leading to the site would be likely to worsen during the construction phase and in addition, would create hazards for residents of Camino during this period. Traffic congestion during the construction phase could also adversely affect tourism in the area.

3.3.11 Air Resources

3.3.11.1 Affected Environment

The California Air Resources Board (CARB), as part of the California Department of Environmental Protection, is responsible for protecting public health and the environment from the harmful effects of air pollution. Pollutants associated with air emissions, such as ozone, particulate matter, and nitrogen dioxide, are associated with respiratory illness. Carbon monoxide, another air pollutant, can be absorbed through the lungs into the bloodstream and reduce the ability of blood to carry oxygen. Sources of air emissions include commercial facility operations, fugitive dust, on-road vehicles and trucks, aircraft, boats, trains, and natural sources such as biogenic and geogenic hydrocarbons and wildfires.

The topography and meteorology of the western slope of the Sierras are the important factors in the environmental effects of air quality emissions. Dispersion of high pollutant concentrations in downwind areas is hindered by the mountainous topography. Frequent inversions, in which warm air overlays cool air, trap pollutants close to the ground. In summer, long days, stagnant air, and high temperatures facilitate photochemical production of ozone (O_3) from precursor air pollutants such as volatile organic compounds (VOC) and oxides of nitrogen (NO_x). Regional transport of these precursors from the Sacramento Valley and the San Francisco Bay area result in high ozone concentrations. CARB has officially designated the western portion of El Dorado County as “ozone impacted” from transport from those areas.

To reduce harmful exposure to air pollutants, the federal Clean Air Act (CAA) requires the EPA to set outdoor air quality standards for the nation with the option for states to adopt additional or more protective standards if needed. CARB has adopted ambient (outdoor) air quality standards (AAQS) that are more protective than federal standards and has implemented standards for some pollutants not addressed by federal standards. An AAQS establishes the concentration above which the pollutant is known to cause adverse health effects to sensitive groups within the population such as children and the elderly. The goal is for a localized Project effects not to cause or contribute to an exceedance of the standards. Criteria pollutants for which AAQS have been established are ozone, carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulfur dioxide. California and federal AAQS for criteria pollutants are presented in table 3-73.

Table 3-73. California and federal ambient air quality standards. (Source: CARB, 2006).

Pollutant	Averaging Time	California Standards	Federal Standards Primary	Federal Standards Secondary
Ozone (O_3)	1 hour	0.09 ppm (180 μg/m^3)	-	Same as primary standard
	8 hour	0.07 ppm (137 μg/m^3)	0.08 ppm (157μg/m^3)	
Respirable Particulates (PM_{10})	24 hour	50 μg/m^3	150μg/m^3	Same as primary standard
	Annual mean	20 μg/m^3	--	
Fine Particulates ($PM_{2.5}$)	24 hour	No standard	35 μg/m^3	Same as primary standard
	Annual mean	12 μg/m^3	15 μg/m^3	
Carbon Monoxide (CO)	1 hour	20 ppm (23 μg/m^3)	35 ppm (40 μg/m^3)	None
	8 hour	9.0 ppm (10 μg/m^3)	9 ppm (10 μg/m^3)	
Nitrogen Dioxide (NO_2)	1 hour	--	--	Same as primary standard
	Annual mean	0.25 ppm (470 μg/m^3)	0.053 ppm (100 μg/m^3)	
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm (655 μg/m^3)	--	--
	3 hour	--	--	0.5 ppm (1300 μg/m^3)
	24 hour	0.04 ppm (105 μg/m^3)	0.14 ppm (365 μg/m^3)	_
	Annual mean	--	0.03 ppm (80 μg/m^3)	--

Existing Air Quality

To manage air quality problems, California is divided into 15 air basins, each of which is associated with an Air Quality Management District. The UARP study area is located across Sacramento and El Dorado counties, which are respectively within the Sacramento Valley Air Basin and Mountain Counties Air Basin. El Dorado has its own AQMD and Sacramento falls within the Sacramento Metropolitan AQMD. The proposed Iowa Hill development would lie in western El Dorado County. Chili Bar Project facilities are also located in El Dorado County, downstream of the UARP.

State and National Area Designations

Both the California and federal governments use ambient air monitoring data to classify areas according to their attainment status with respect to criteria pollutants. These designations are used to identify areas with air quality problems and help determine whether Project emissions would be considered significant under the NEPA and California Environmental Quality Act assessments. The three basic designation categories are:

- Attainment—indicates that ambient air quality is not in violation of the established standard for the specific criteria pollutant.
- Non-attainment—indicates that the ambient air quality violates the established standard for the specific criteria pollutant.
- Unclassified—indicates that there is currently insufficient data for determining attainment or non-attainment.

In addition to the above designations, the California includes a subcategory of the non-attainment designation:

- Non-attainment-transitional—given to non-attainment areas that are making progress and nearing attainment.

Sacramento and El Dorado counties are currently in attainment for nitrogen dioxide, sulfur dioxide, and lead, non-attainment for ozone (O_3) and particulate matters (PM), and in maintenance (previously non-attainment) for carbon monoxide (CO). Specifically, both the Sacramento Valley Air Basin exceed the national and state AAQS for ozone and the state AAQS for PM_{10}, the Sacramento Valley and PM_{10}. Table 3-74 presents the study areas' existing state air quality designations for criteria pollutants. State standards are presented as they are more protective than federal standards.

Table 3-74. California State area designations for criteria air pollutants.

Air Basin	**O_3**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**NO_2**	**SO_2**	**VRP**
Sacramento Metropolitan Air Basin (Sacramento County)	N	N	N	A	A	A	U
Mountain Counties Air Basin (Eldorado County)	N	N	U	U	A	A	U

Note: A – attainment
N – non-attainment
U – unclassifed
O_3 – ozone
PM_{10} – respirable particulate matter
$PM_{2.5}$ – fine particulate matter
CO – carbon monoxide
NO_2 – nitrogen dioxide
SO_2 – sulfur dioxide
VRP – visibility reducing particulates

The 1990 amendments to the CAA require federal agencies to conform to applicable State Implementation Plans (SIPs) for non-attainment areas. SIPs are state air quality regulations that provide for the implementation, maintenance, and enforcement of the National AAQS and include emissions limitations and control measures to attain and maintain the standards. The Sacramento Metropolitan Air Basin and the El Dorado Air Basin adopted the 1994 Sacramento Area Ozone Regional Clean Air Plan submitted as a SIP for ozone non-attainment. As of 2002, the Sacramento area has exceeded its goals for reduction of VOC and met its goal for reduction of NO_x (SMAQD, 2003).

EPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51, and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation plans. Since the proposed Project is a non-transportation project, only the general conformity rule applies.

The general conformity rule applies to federal actions occurring in air quality regions designated as being in non-attainment for the National AAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. The proposed Projects are currently designated as serious non-attainment for 8-hour ozone, and as CO maintenance (previously nonattainment) areas. Sacramento County is also designated as moderate nonattainment for PM_{10}. An air conformity analysis was prepared as a supplement to this EIS and is included in appendix B of this document.

3.3.11.2 Environmental Effects

Construction of the Iowa Hill development under the UARP would create additional air emissions. Operations of the UARP under the No-action, UARP-only, and Iowa Hill alternatives would also increase air emissions. The environmental effects of air emissions related to the implementation of UARP alternatives are presented in this section. A General Conformity Analysis includes all operational and construction emissions from each alternative is included Attachment Air-2.

The potential environmental effects of the Chili Bar Project were evaluated and examined for air emissions. The Chili Bar Project has limited reservoir and storage, and operation by PG&E is to manage flow releases from upstream of SMUD's White Rock powerhouse. PG&E proposes only minor modifications as needed to implement resource management measures, and does not propose changing existing Chili Bar operations, thus air emissions resulting from Chili Bar operation would continue to be negligible.

Effects of Construction

The No-action Alternative and the UARP-only Alternative do not involve construction of any kind and thus would not have air emissions effects related to construction activities. Only construction activities during development of Iowa Hill have potential environmental effects on ambient air quality.

Construction of the Iowa Hill development under SMUD's Proposed Action would potentially result in effects on air emissions. Short-term air quality may be affected by emissions of exhaust pollutants from construction equipment and dust from earthmoving activities. Both potential effects would be temporary (limited to the construction period) and local (only occurring in the immediate vicinity of the construction activity).

To assess potential short-term effects of construction emissions on ambient air quality, SMUD conducted a worst-case screening using an air quality dispersion modeling analysis.

The predicted worst-case construction impacts and ambient air quality concentrations are shown in table 3-75.

Table 3-75. Predicted total ambient concentrations during construction period.

Pollutant	Averaging Time	Maximum Construction Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Ambient Concentration ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1 hour	241	198	439	470	--
	Annual	16.9	16.9	33.8	--	100
SO_2	1 hour	2.7	83.6	86.3	650	--
	24 hour	0.3	45.9	46.2	109	365
	Annual	0.0	6.5	6.5	--	80
CO	1 hour	503	2,240	2,743	23,000	40,000
	8 hour	114	992	1,106	10,000	10,000
PM_{10}	24 hour	29.5	52	81.5	50	150
	Annual	6.6	16.8	23.4	30	50
$PM_{2.5}$	24 hour	9.0	40	49.0	--	65
	Annual	2.0	9.9	11.9	12	15

The air conformity analysis estimated construction-related emissions with the CARB's OFFROAD2007 model. The usage of equipment, likely duration of each activity, and labor estimates for each activity for the construction were determined by the Engineer. Results of this analysis are presented in table 3-76.

Table 3-76. Estimated air emissions from construction activities.

	Peak-Year Emissions (tons/year)					
Activity	**NO_X**	**CO**	**VOC**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-site heavy equipment and trucks	33.3	12.3	3.5	0.04	1.4	1.3
Fugitive dust	NA	NA	NA	NA	31.0	6.1
Vehicles for deliveries (on-road)	1.8	1.6	0.2	0.003	0.07	0.05
Worker travel vehicles (on-road)	1.0	9.9	1.0	0.01	0.09	0.05
Total construction emissions	36.1	22.8	4.7	0.18	32.56	16.9
De minimis emission levels significance	50	100	50	--	100	100

Our Analysis

Development of Iowa Hill would result in air emissions from construction equipment, earth moving activities, construction worker's commutes, material deliveries, and earth hauling. Fugitive dust during construction, particularly during excavation of the site, would contribute substantially to particulate matter emissions.

Table 3-75 indicates that maximum construction effects during the worst-case scenario would still be within the most stringent state standards, despite elevated short-term emissions at the site. Because PM_{10} emissions are predominantly caused by fugitive dust (table 3-76), staff recommends application of water or chemical dust suppressant on unpaved surfaces, combined with vacuum sweeping and water flushing of paved surfaces to minimize fugitive dust emissions during construction. Additionally, re-planting vegetation in disturbed areas as quickly as possible would further reduce fugitive dust emissions.

Off-road equipment would be required to follow the updated emission standards established by CARB to reduce exhaust emissions from construction engines. Staff also recommends limiting diesel engine idling, shutting off engines when not in use, and using preventative maintenance to keep engines running optimally to further minimize NO_x emissions.

Implementation of these measures would reduce the short-term air emissions effects from construction activities.

Effects of Operations

The existing UARP produces 1,835,000 MWh of renewable energy by utilizing the water cycle. Conventional hydroelectric generation is a reliable, efficient, economical, and less polluting source of energy resulting in zero air emissions. However, future demand calculations estimate a need for 2,696,000 MWh of energy, which would require simple cycle turbine, gas-fired generation to supply 861,000 MWh of on-peak generation. Annual emissions for a No-action Alternative have been estimated assuming gas-fired generation using a simple cycle turbine.

The required energy generation and overall emissions from the operation of the Proposed Action and UARP-only Alternative have been evaluated based upon best- and worse-case emission scenarios with the best-case being all electric generation supplied by gas-fired combined cycle turbines and the worst-case scenario being coal fired generation. Energy requirements and generation sources for all scenarios are summarized in table 3-77.

Table 3-77. Energy generation and requirements for all Project alternatives.

	Energy Generation (MWh)			
Scenario	**Hydroelectric**	**Simple Combustion Turbine**	**Combine Cycle Turbine or Coal**	**Total**
No-Action	1,835,000	861,000	--	2,696,000
UARP-Only	1,699,000	931,000	66,000	2,696,000
Iowa Hill	1,443,000	--	1,253,000	2,696,000

No-action Alternative

Under the No-action Alternative (Baseline Condition), the continued operation of existing UARP facilities will not result in any atmospheric emission of criteria pollutants or other hazardous material that can affect air quality. The continued operation of the existing facilities under the No-action Alternative will, on average, result in the annual generation of 1,835,000 MWh of clean energy.

Future demand need is estimated to be 2,696,000 MWh, which represents an increase of 861,000 MWh. This increased demand beyond the generation capacity of the hydroelectric project would have to be generated by an additional energy supply. In the case of no action, this supply would most likely be a simple combustion turbine, which is considered “state of the art” and is most easily permittable. Air emissions resulting from simple combustion turbine generation are presented in table 3-78.

UARP-Only Alternative

The UARP-only Alternative is identical to the Proposed Action with the exception of the Iowa Hill development. The UARP-only Alternative would reduce flows available for energy generation, resulting in the annual generation of 1,699,000 MWh of hydroelectric energy and a deficit of 136,000 MWh from the No-action Alternative. Because the Iowa Hill development would not be constructed under this alternative, the energy deficit from the new flow regime as well as future energy needs would be met by other energy sources, such as power purchase from the energy market, a mix of fuel generation sources, gas turbines, etc. These additional sources would create emissions that may result in environmental effects. The analysis presented here assumes that additional energy requirements would be met through a combination of simple combustion turbine and combined cycle turbine (best-case) or coal-fired (worst-case) generation. Air emissions resulting from the UARP-only Alternative are presented in table 3-78.

Table 3-78. Estimated air emissions from operational activities.

Scenario	Energy Source		Peak-Year Annual Emissions (tons/year) NO_X	CO	VOC	PM_{10}	SO_2
No-Action	Hydroelectric + On-Peak simple combustion turbine	--	71.9	35.3	20.7	8.6	10.3
UARP-only	Hydroelectric + On-Peak simple combustion turbine	Combined cycle turbine	81.0	39.5	23.6	10.0	12.0
		Coal	81.4	41.8	23.0	10.6	14.5
Iowa Hill	Hydroelectric Pumped-Storage	Combined cycle turbine	62.7	25.7	23.8	12.5	15.0
		Coal	69.5	68.3	12.5	24.4	63.9

Proposed Action-Iowa Hill Development

The Proposed Action would increase flows to Project-related streams during the spring, thereby decreasing the volume available to generate electricity at UARP facilities. SMUD proposed a pumped-storage facility to compensate for this reduction in energy generation. The reduction in energy from loss of flow combined with the increased energy demand to run the pump storage results in a loss of 392,000 MWh compared to the No-action Alternative. In this case, 931,000 MWh of on-demand energy provided by the Iowa Hill development would help meet future energy needs when coupled with 1,253,000 MWh from combined cycle turbine or coal-fired energy sources. The pumped-storage facility would not contribute air emissions because reversible turbines would use electricity from a transmission line tied in to the existing Camino-White Rock line to pump water into the upper reservoir. Additional air emissions would be added only through combine cycle turbine or coal-fired generation sources. Air emissions resulting from the Proposed Action are presented in table 3-78.

Our Analysis

Operation of the existing UARP with conventional hydroelectric generation would not contribute air emissions. Environmental effects of air emissions would result only from energy generation by additional sources such as simple combustion turbine, combined cycle turbine, and coal-fired generation, which are needed to meet estimated future demands. Table 3-79 presents net operational air emissions between No-action and the UARP-only alternatives and Proposed Action after the implementation of the

Iowa Hill development in 2014 and compares the net increase or decrease in emissions to thresholds levels established in 40 CFR 93.153.

Table 3-79. Net peak-year emissions due to the UARP-only Alternative and Proposed Action following operation of Iowa Hill Development (post 2014).

		Net Annual Emissions (tons/year)					
Scenario	**Additional Source**	**NO_X**	**CO**	**VOC**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
UARP-only	Combined Cycle Turbine	9.1	4.2	2.9	1.6	1.4	1.3
	Coal	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill	Combined Cycle Turbine	–9.2	–9.6	3.1	4.7	3.9	3.5
	Coal	–2.4	33.0	-8.1	53.6	15.8	14.2
De minimis		*50*	*100*	*50*	*100*[a]	*100*	*100*

[a] SO_2 *de minimis* level does not apply to the Projects, as located in attainment area.

Table 3-79 indicates that net emissions of all criteria pollutants would not exceed *de minimis* threshold levels compared to the No-action Alternative. Net increases of air emissions between the No-action Alternative and UARP-only Alternative would be substantially lower than threshold levels. In some cases, net emissions from the Proposed Action are lower than no action emissions. For instance, use of combined cycle turbine in the place of simple combustion turbine generation under the Proposed Action would reduce emissions of NO_x and CO. Coal-fired generation in the Proposed Action would increase emissions of CO, SO_2, and PM but would decrease emissions of ozone precursors NO_x and VOC compared to the No-action Alternative. In general, air emissions from additional energy generation would increase compared to zero emission conventional hydroelectric generation, net increases under proposed alternatives would not exceed thresholds and in some cases the Proposed Action would decrease emissions compared to no action.

3.3.11.3 Cumulative Effects

The cumulative effects on air quality for various Project Alternatives to include emissions and air quality effects resulting from all operational and construction activities of UARP and Chili Bar Project are evaluated, either quantitatively or qualitatively. The cumulative effects are mainly resulting from the UARP, while the Chili Bar Project has negligible effect on air resources.

3.3.11.4 Unavoidable Adverse Effects

Air quality analysis indicates construction of the Iowa Hill development would contribute to air pollutants levels of NO_x, CO, and PM_{10}. These effects would be limited to worst-case conditions during a short-term construction period. With on-site control measures, the air emissions would not exceed the *de minimis* levels.

Among the viable substitute resources to cover the energy supply shortage resulting from the Project alternatives, the gas turbine plants are likely to be used to supply peak energy because they can be started rapidly during periods of high demand. Air emissions resulting from these substitute plants can be controlled to meet the regulations and conformity requirements.

3.3.12 Noise Resources

3.3.12.1 Affected Environment

Noise is defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. The magnitude of noise is described by its sound pressure. Because the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, the decibel. Sound pressures described in decibels are called sound pressure levels.

Sound levels measured using an A-weighted decibel scale are expressed as dBA. Throughout this analysis, all noise levels are expressed in dBA. Several examples of noise pressure levels in dBA are listed in table 3-80.

The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- the amount and nature of the intruding noise;
- the relationship between the background noise and the intruding noise; and
- the type of activity occurring where the noise is heard.

In considering the first of these factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some people more than others, and some patterns of noise also enter into people’s judgment of whether or not a noise is offensive.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). The blowing of a car horn at night when background noise levels are approximately 45 dBA generally would be more objectionable than the blowing of a car horn in the afternoon when background noises might be 55 dBA.

Table 3-80. A-weighted (dBA) sound levels of typical noise environments. (Source: FICON, 1992, as modified by staff)

A-Weighted	Overall Level	Noise Environment
120	Uncomfortably Loud (32 times as loud as 70 dBA)	Military jet takeoff at 50 feet
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 feet
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 feet; diesel truck 40 mph at 50 feet
70	Moderately loud	Freeway at 50 feet from pavement edge; vacuum cleaner (indoor)
60	Relatively quiet (1/2 as loud as 70 dBA)	Air condition unit at 10 feet; dishwasher at 10 feet (indoor)
50	Quiet (1/4 as loud as 70 dBA)	Large transformers; small private office (indoor)
40	Very quiet (1/8 as loud as 70 dBA)	Bird calls; lowest limit of urban ambient sound
10	Extremely quiet (1/64 as loud as 70 dBA)	Just audible
0	Threshold of hearing	

Note: dBA – A-weighted decibel scale

The third factor is related to the interference of noise with activities of individuals. In a 60-dBA environment, normal work activities requiring high levels of concentration may be interrupted by loud noises, while activities requiring manual effort may not be interrupted to the same degree.

Time-averaged descriptors are utilized to provide a better assessment of time-varying sound levels. The three most common noise descriptors used in community noise surveys are the equivalent sound level (L_{eq}), percentile distributions of sound levels ($L_{\%}$), and the day-night average sound level (L_{dn}).

The L_{eq} is an energy-averaged sound level that includes both steady background sounds and transient short-term sounds. The L_{eq} is equivalent in energy to the fluctuating sound level over the measurement period. The L_{eq} is commonly used to describe traffic noise levels, which tend to be characterized by fluctuating sound levels.

The $L_{\%}$ indicate the sound level exceeded for a percentage of the measurement period. For example, the L_{90} is the sound level exceeded for 90 percent of the measurement period and is commonly used to represent background sound levels. The L_{10} is the sound level exceeded for 10 percent of the measurement period and represents the peak sound levels present in the environment.

The L_{dn} is another descriptor used to evaluate community noise levels. The L_{dn} is a 24-hour average sound level, which includes a 10 dBA penalty added to nighttime sound levels (10:00 p.m. to 7:00 a.m.) because people tend to be more sensitive to noise during the nighttime. The day-night average sound level is commonly used to describe aircraft and train noise levels.

For the state of California, noise intensity is also discussed in terms of Community Noise Equivalent Level, which presents a weighted average noise level that increases the relative significance of evening and nighttime noise. The Community Noise Equivalent Level descriptor is used to evaluate community noise levels, which includes a 5 and 10 dBA penalty added to evening (7:00 p.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) sound levels, respectively, in consideration of people's increased sensitivity to noise during the evening and nighttime periods.

Existing Noise Environment

The proposed Iowa Hill development is located in a remote and forested area near the communities of Mosquito/Swansboro and Camino, placing it in a rural area where a small number of privately-owned residential properties may be affected by a change in noise levels. Most of the nearby residences with potential to be affected by construction noise are located in Swansboro, approximately one mile northwest of the proposed upper reservoir, along the north canyon rim of the SFAR. There are also a few homes south of the upper reservoir site (along or near Copperton Road) within one mile of the upper reservoir, and several more homes are located approximately one mile southwest of the upper reservoir site. Residences closest to the upper reservoir site include a group of 28 privately-owned parcels along Iowa Hill Road. Some of these parcels abut the proposed Project boundary for the Iowa Hill development. There are no utility services (e.g., electricity, water) in the vicinity of Iowa Hill, therefore current and future development is limited.

Noise Standards

The El Dorado County General Plan has the following specific policy for construction noise:

- **Policy 6.5.1.11**—The standards outlined in table 3-81 shall apply to those activities associated with actual construction of a project as long as such construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends, and on federally recognized holidays. Exceptions are allowed if it can be shown that construction beyond these times is necessary to alleviate traffic congestion and safety hazards.

Table 3-81. Maximum allowable noise exposure for non-transportation noise sources in rural regions—construction noise.

		Noise Level	
Land Use Designation	Time Period	L_{eq}	L_{max}
All Residential (LDR)	7 a.m.–7 p.m.	50	60
	7 p.m.–10 p.m.	45	55
	10 p.m.–7 a.m.	40	50
Commercial, Recreation, and Public Facilities	7 a.m.–7 p.m.	65	75
(C, TR, PF)	7 p.m.–7 a.m.	60	70
Rural Land, Natural Resources, Open Space, and Agricultural Lands (RR, NR, OS, AL)	7 a.m.–7 p.m.	65	75
	7 p.m.–7 a.m.	60	70

3.3.12.2 Environmental Effects

Iowa Hill Development

Effects of Construction

The construction of the Iowa Hill development has the potential to generate noise levels that could be disturbing to residents living in the surrounding area and to recreational visitors at the informal boat launch site at the Slab Creek reservoir.

Under Proposed Article 1-48, *Construction Noise*, SMUD would provide a noise mitigation plan to minimize noise emissions from the construction site. The plan would address vehicle idling, and include provisions to provide advance notice of any materials transport and construction activities within 0.5 mile of the tract where construction is occurring; notices to residents indicating the nature, timing, and duration of all materials transport and construction activities occurring within 0.5 mile of their residences; a noise hot line telephone system for reporting construction noise disturbances; monitoring to address compliance with the above measures; and it would specify actions to mitigate violation of the above measures. SMUD would provide monthly monitoring reports to the Forest Service that includes lists of any complaints of noise disturbances.

Our Analysis

Noise at the construction sites would be intermittent and the intensity would vary. The degree of construction noise may vary depending on the construction phase and activities.

While a large portion of the construction activities for the water conduits and the powerhouse cavern would take place underground, construction of the upper reservoir atop Iowa Hill would generate noise as earth-moving equipment clear the site and build the reservoir berm. SMUD states that most construction work at the Iowa Hill development will begin at 6:30 a.m. in order to avoid traffic congestion. Starting construction work at this time would reduce local construction-related traffic congestion and safety hazards and is allowed under El Dorado County General Plan.

Blasting for the construction of the Iowa Hill development would exceed the El Dorado County General Plan maximum allowable noise limit (60 dB) at several noise sensitive sites; however, the blasting would meet federal and industry standards and be less disruptive over time as activities progress underground. Traffic due to the construction of the Iowa Hill development would not exceed General Plan traffic noise limits.

During the construction period, some of the sensitive sites that are close to the Project may be exposed to high noise levels. Effective noise control during the construction of a project means minimizing noise disturbances to the surrounding community. We would expect SMUD to use a combination of mitigation techniques including equipment noise controls and administrative measures to provide the most effective means to minimize effects of the construction activity noise on people living nearby or visiting the Iowa Hill area.

SMUD would use standard noise mitigation measures to comply with the El Dorado County General Plan noise limits. These measures would likely include ensuring that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine enclosures, and engine vibration isolators, intact and operational and that all construction equipment is inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding). Other typical measures would include limitations on the duration of certain construction/demolition activities, building temporary noise barriers, and planning truck routes to minimize backup alarms and keep trucks away from residences.

Development and implementation of a plan to control construction noise would minimize but not eliminate the potential effects of noise during construction. Neighboring residents and visitors to the Iowa Hill area would hear the construction activities during the daytime but to a lesser extent than would occur without implementation of noise abatement techniques.

Effects of Operations

Operation of the Iowa Hill development has the potential to increase ambient noise levels in the Iowa Hill area. Operational noise associated with the Iowa Hill development is unlikely to be an issue, however, because noise generating facilities (the powerhouse and intake structure) would be located underground.

Our Analysis

The stationary noise source (the turbine/generating units) at the proposed Iowa Hills development would be placed in an underground powerhouse and would not affect noise levels on the surface. Therefore, noise effects associated with operation of the proposed Project would not be significant.

Traffic noise would be limited two employees and periodic deliveries and maintenance activities and would be minor. Not many sensitive land uses would be in the proximity of the proposed Iowa Hills development and the proposed transmission alignment. As noted above, most of these areas are mountainous and desolate, except for a few small housing developments and ranch homes that are at least 1,000 feet away.

The higher voltages at which modern transmission lines operate have increased noise problems. Consequently, these lines are now designed, constructed, and maintained so that during dry conditions they would operate below the corona-inception voltage, meaning that the line would generate a minimum of corona-related noise. Under wet weather conditions, high-tension transmission lines may generate audible noises. The audible noise emitted from high-voltage lines is caused by the discharge of energy that occurs when the electrical field strength on the conductor surface is greater than the "breakdown strength" (the field intensity necessary to start a flow of electric current) of the air surrounding the conductor. This discharge is also responsible for radio noise, a visible glow of light near the conductor, an energy loss known as corona loss, and other phenomena associated with high-voltage lines. The degree or intensity of the corona discharge and the resulting audible noise are affected by the condition of the air—that is, by humidity, air density, wind, and water in the form of rain, drizzle, and fog. Water increases the conductivity of the air and in turn increases the intensity of the discharge. Also, irregularities on the conductor surface such as nicks or sharp points and airborne contaminants can increase the corona activity. Aging or weathering of the conductor surface generally reduces the significance of these factors.

For AC lines and voltages above 400-kV, noise levels of 60 dBA or less at the edge of right-of-way can be annoying to the receptors nearby. However, the short section of 230-kV line associated with the Iowa Hill development would be designed to ensure that corona noise does not exceed 50 dBA at the right-of-way.

3.3.12.3 Unavoidable Adverse Effects

During some phases of construction operations, exceedances to El Dorado County General Plan Noise Criteria are likely to occur. SMUD is committed to employing a combination of mitigation techniques including equipment noise controls and administrative measures to provide the most effective means to minimize effects of the construction activity noise on people living nearby or visiting the Iowa Hill area. However, with a large complex project, the information available during the preliminary engineering phase may not allow final decisions to be made on all specific mitigation measures, and the extent of these exceedances to noise criteria cannot be determined. But they will be temporary and less intrusive because of SMUD's mitigation plan.

3.4 NO-ACTION ALTERNATIVE

Under the No-action Alternative (Baseline Condition), the continued operation of existing UARP facilities will be of significant importance to air quality in the Sacramento region and foothill communities in Placer and El Dorado counties over the term of the new license. Operation of the existing UARP facilities does not result in any atmospheric emission of criteria pollutants or other hazardous material that can affect air quality. The continued operation of the existing facilities under the No-action Alternative will, on average, result in the annual generation of 1,835,000 MWh of clean energy.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Continued operation of the existing Projects would continue to commit lands and waters previously developed for energy production. Construction of the proposed Iowa Hill development would convert about 185 acres of existing forest land to energy production use. This commitment would not necessarily be irreversible or irretrievable because removal of the Project dams and restoration of disturbed areas could return the Projects' areas to near pre-Project conditions. However, given the substantial costs and loss of energy, recreational, and socioeconomic benefits, removal of the dams is unlikely in the foreseeable future.

3.6 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM USES

Under all alternatives considered, the Projects would continue to generate power for customers of SMUD and PG&E and provide recreation and socioeconomic benefits for the duration of any new licenses. The Proposed Actions with staff-recommended modifications would provide significant long-term protection and enhancement of biological, cultural, and recreational resources in the Upper American River Basin, although energy generation at the existing Projects would be somewhat reduced. Construction of the proposed Iowa Hill development would provide a new source of off-peak energy for use during high peak periods and improved the reliability of energy from SMUD.

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4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the Projects' use of the water resources of the Upper American River Basin to generate power, estimate the economic benefits of the SMUD and PG&E facilities, and estimate the cost of various environmental measures and the effects of these measures on Project operations.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

4.1.1 Economic Assumptions

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the Project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

For our economic analysis of the UARP alternatives, we used the assumptions, values, and sources shown in table 4-1. Similar information for the Chili Bar Project is presented in table 4-2.

Table 4-1. Staff assumptions for economic analysis of SMUD's UARP Project.

Assumption	Value	Source
Base year for costs and benefits	2007	Staff
On-peak power value (mills/kWh)	$73.80	SMUD
Off-peak power value (mills/kWh)	$55.80	SMUD
Pump-back power cost (mills/kWh)	$55.80	SMUD
Dependable capacity value ($/MW)	$95,960	SMUD
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	0 percent	SMUD
Local tax rate	0 percent	SMUD
Insurance rate[a]		Staff
Interest during construction rate	4.1%	SMUD
Discount rate	6.25%	SMUD

Assumption	Value	Source
Long-term bond interest rate	4.4%	SMUD
Return on Equity	6.6%	SMUD
Debt:equity ratio	80:20	SMUD

[a] Insurance is treated explicitly by SMUD, see table 4-3.

Table 4-2. Staff assumptions for economic analysis of PG&E's Chili Bar Project.

Assumption	Value	Source
Base year for costs and benefits	2007	Staff
On-peak power value (mills/kWh)[a]	$73.80	SMUD
Off-peak power value (mills/kWh)[a]	$55.80	SMUD
Dependable capacity value ($/MW)[a]	$95,960	SMUD
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	34 percent	PG&E
Local tax rate[b]	3.18 percent	PG&E
Insurance rate	0.25%	Staff
Discount rate	8.0%	PG&E
Long-term interest rate	7.2%	PG&E
Return on equity rate	11.9%	PG&E
Debt equity ratio	55:45	PG&E

[a] We adopted the SMUD power value estimates because it provided both peak and off-peak values.

[b] Calculated based on PG&E local tax of $87,000 divided by book value of $2,734,000.

4.1.2 Current Annual Costs and Future Capital Costs for the UARP and Chili Bar Project under the No-action Alternative

Total annualized current costs for the SMUD No-action Alternative amount to $40,749,000 (see table 4-3); the total annualized current costs for the PG&E No-action Alternative amount to $2,170,000 (see table 4-4).

Table 4-3. Summary of current annual costs and future costs for SMUD's UARP under the No-action Alternative. (Source: SMUD and PG&E, 2007)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment	$182,000,000		$12,081,300
Total relicensing cost	$24,000,000		$1,593,100
Total net investment	$206,000,000		$13,674,400
Future costs		$6,758,600	$6,758,600
Plant operations and maintenance		$16,896,500	$16,896,500
Administrative and general		$1,761,900	$1,761,900
Insurance		$1,657,600	$1,657,600
Subtotal annual costs			$27,074,600
Total			$40,749,000

Table 4-4. Summary of current annual costs and future capital costs for PG&E's Chili Bar Project under the No-action Alternative. (Source: PG&E, 2005)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment	$2,734,000		$398,900
Total relicensing cost	$4,600,000		$671,100
Total net investment	$7,334,000		$1,070,000
Future costs[a]		$554,800	$554,800
Plant operations and maintenance[a]		$358,200	$358,200
FERC fees		$187,000	$187,000
Subtotal annual costs			$1,100,000
Total			$2,170,000

[a] These costs were adjusted by 2.8 percent per year to convert from 2005 to 2007 dollars.

4.2 COST OF IOWA HILL DEVELOPMENT

SMUD estimates the cost to build the Iowa Hill development could range from a low of $552,716,000 to a high of $855,362,000. Staff adopted the midpoint of the low-end and high-end cost estimates for use in the developmental analysis. Capital costs and annual costs for the Iowa Hill development are summarized by major construction area in tables 4-5 and 4-6.

Table 4-5. Summary of Iowa Hill development capital costs under the Proposed Action. (Source: SMUD and PG&E, 2007, Staff)

Cost	Mid-Point Estimate
Mobilization and water handling	$32,136,000
Permanent access road (lower)	$2,764,000
Upper reservoir	$113,878,000
Waterways and intakes	$95,480,500
Powerhouse and access tunnels	$109,727,500
Equipment (installed)	$174,978,500
Transmission line	$18,354,500
Subtotal	$547,319,000
Licensing, SMUD project management and Geotechnical Exploration	$64,509,000
Interest during construction (4.1% annually for 4 years)	$63,364,000
Sales tax on equipment (El Dorado County rate 7.25%)	$28,848,000
Total Construction cost with contingencies	$704,040,000

Table 4-6. Summary of Iowa Hill development annual costs under the Proposed Action. (Source: SMUD and PG&E, 2007, Staff)

	Capital Cost ($)	Annual Cost ($)	Annualized Cost ($)
Iowa Hill development	$704,040,000		$47,536,100
Additional future costs		$1,153,400	$1,153,400
Additional operations and maintenance costs		$2,883,400	$2,883,400
Additional administrative and general costs		$300,700	$300,700
Additional insurance costs		$641,200	$641,200
Subtotal additional future annual costs			$4,978,700
Total annual cost			$52,514,800

4.3 COST OF ENVIRONMENTAL MEASURES

As proposed under the Settlement Agreement and as recommended by staff, the environmental measures for the UARP and Chili Bar Project would both reduce generation and increase annual O&M costs and capital costs. No effect on dependable capacity is anticipated by either utility.

4.3.1 Cost of Environmental Measures for UARP

SMUD provided costs for environmental measures in current dollars. Costs are taken from the Settlement Plan filed in January 2007, and a cost update reflecting the Settlement Agreement submitted on April 11, 2007 (SMUD and PG&E, 2007). Where cost information was inconsistent, staff estimated costs. Table 4-7 summarizes the costs by major resource area for the UARP-only Alternative.[42] No staff modifications are included in this alternative. Our detailed costs and energy benefit reductions for SMUD's UARP-only Alternative environmental measures are provided in appendix C. Additionally, certain costs identified as resulting from SMUD's 90 percent contribution to the implementation of overlapping-issue measures contained in the Chili Bar Project, as described in appendix 2 of the Settlement Agreement are summarized in appendix C.

Table 4-7. Summary of annualized costs for measures included in the UARP-only Alternative. (Source: Staff)

Resource Area	Capital Cost	Annualized O&M Cost	Total Annualized Cost
Geology and soils	$758,600	$18,800	$69,100
Water quantity	$3,311,900	$94,700	$314,500
Water quality	$256,600	$272,200	$289,400
Aquatic resources	$429,100	$89,400	$118,000
Terrestrial resources	$423,800	$249,700	$277,800
Recreation	$37,827,700	$1,457,000	$3,967,900
Land use and aesthetics	$5,820,400	$332,500	$718,600
Cultural resources	$16,400	$5,500	$6,600
Multidisciplinary	$16,400	$486,200	$487,300
Total	$48,860,900	$3,006,000	$6,249,200

[42]Under the UARP-only Alternative, the Iowa Hill development would not be constructed.

Table 4-8 summarizes the costs of the environmental measures by major resource area for the Proposed Action (with Iowa Hill development) and Proposed Action with Staff Modifications. Because we recommend only minor modifications to several proposed environmental measures, the cost of the Proposed Action with Staff Modifications for the UARP is similar to the Proposed Action (with Iowa Hill development).

Table 4-8. Summary of annualized costs for measures included in the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications.[a] (Source: Staff).

	Proposed Action (with Iowa Hill Development)			Proposed Action with Staff Modifications		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$758,600	$18,800	$69,100	$758,600	$18,800	$69,100
Water quantity	$3,311,900	$94,700	$314,500	$3,038,600	$94,700	$296,400
Water quality	$256,600	$272,200	$289,400	$256,600	$272,200	$289,400
Aquatic resources	$429,100	$89,400	$118,000	$429,100	$89,400	$118,000
Terrestrial resources	$423,800	$249,700	$277,800	$423,800	$280,000	$308,100
Recreation	$26,897,700	$1,457,000	$3,242,400	$26,897,700	$1,457,000	$3,242,400
Land use and aesthetics	$5,820,400	$332,500	$718,600	$5,820,400	$332,500	$718,600
Cultural resources	$16,400	$5,500	$6,600	$16,400	$5,500	$6,600
Multidisciplinary	$16,400	$486,200	$487,300	$16,400	$486,200	$487,300
Total	$37,930,900	$3,006,000	$5,523,700	$37,657,600	$3,036,300	$5,535,900

[a] The costs for the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications are very similar. Although costs are similar, certain reservoir level constraints at small reservoirs with no costs are not endorsed by staff as described in section 5.1.3, Rationale for Staff Recommendations in Comprehensive Development.

Table 4-9 summarizes the costs of the environmental measures by major resource area for the Iowa Hill development component of the Proposed Action. Again, the costs associated with the Iowa Hill development component of the Proposed Action with Staff Modifications for the UARP is similar to the Proposed Action (with Iowa Hill development). Our detailed costs for SMUD's Iowa Hill environmental measures are also provided in the last section of appendix C.

PG&E provided costs for environmental measures in current dollars. Costs are taken from the Settlement Agreement filed in January 2007, and a cost update reflecting the Settlement Agreement submitted on May 16, 2007 (SMUD and PG&E, 2007). Table 4-10 summarizes the costs by major resource area for both the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications for the Chili Bar Project. Our detailed costs and energy benefit reductions for PG&E's Chili Bar Project are provided in appendix B and include a single staff-recommended additional measure providing for a recreation plan.

Table 4-9. Summary of annualized costs for measures associated with the Iowa Hill component of the Proposed Action and Proposed Action with Staff Modifications.[a] (Source: Staff)

	Proposed Action (with Iowa Hill Development)			**Proposed Action with Staff Modifications**		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$0	$0	$0	$0	$0	$0
Water quantity	$54,700	$0	$3,600	$54,700	$0	$3,600
Water quality	$54,700	$2,600	$6,200	$54,700	$2,600	$6,200
Aquatic resources	$382,600	$16,400	$41,800	$382,600	$16,400	$41,800
Terrestrial resources	$546,500	$0	$36,300	$566,500	$0	$37,600
Recreation	$27,300	$0	$1,800	$27,300	$0	$1,800
Land use and aesthetics	$112,000	$3,900	$11,300	$112,000	$3,900	$11,300
Multidisciplinary	$0	$0	$0	$0	$0	$0
Socioeconomics	$0	$0	$0	$0	$0	$0
Total	$1,177,800	$22,900	$101,000	$1,197,800	$22,900	$102,300

[a] Staff adopted all Iowa Hill development measures and added one measure, so the two alternatives are very similar.

Table 4-10. Summary of annualized costs for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: Staff)

	Proposed Action			**Proposed Action with Staff Modifications**		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$1,100	$600	$800	$1,100	$600	$800
Water quantity	$40,000	$30,000	$35,900	$40,000	$30,000	$35,900
Water quality	$5,500	$6,600	$7,600	$5,500	$6,600	$7,600
Aquatic resources	$2,200	$11,500	$11,900	$2,200	$11,500	$11,900

Resource Area	Proposed Action			Proposed Action with Staff Modifications		
	Capital Cost	Annualized O&M Cost	Total Annualized Cost	Capital Cost	Annualized O&M Cost	Total Annualized Cost
Terrestrial resources	$12,200	$22,800	$24,700	$12,200	$22,800	$24,700
Recreation	$71,100	$8,500	$18,900	$71,100	$11,200	$21,600
Land use and aesthetics	$0	$0	$0	$0	$0	$0
Cultural Resources	$10,000	$2,000	$3,500	$10,000	$2,000	$3,500
Multidisciplinary	$25,000	$30,000	$33,600	$25,000	$30,000	$33,600
Total	$167,100	$112,000	$136,900	$167,100	$114,700	$139,600

4.3.2 Effect of Proposed Operations on UARP and Chili Bar Project

Several measures affect energy generation. Estimates were made of the effect of environmental measures and the Iowa Hill development by applying the CHEOPs operations model to optimize and simulate the system. Pulse flows are presented in section 3.3.1, *Geology and Soils*. The minimum instream flows, ramping rates and required reservoir levels are presented in section 3.3.3, *Aquatic Resources*. Recreational flows and levels are presented in section 3.3.6, *Recreational Resources*.

Staff notes that a reduction of 136,000 MWh[43] would result from flows needed for environmental and recreational flow requirements at the UARP as shown in table 4-11 and detailed in appendix C. The Iowa Hill development would add 931,000 MWh of super peak energy and 43,000 MWh of off-peak energy as compared to the UARP-only Alternative. Staff does not recommend measures beyond the Proposed Action that would affect energy generation. SMUD also computed the effect on pump-back energy, resulting in a loss of 1,230,000 MWh of off-peak energy. The development would therefore result in an incremental gross energy decrease of 256,000 MWh when compared to the UARP-only Alternative. This pumped-storage facility would be about 79 percent efficient and its value is in the ability to move blocks of off-peak energy into the on peak period along with other ancillary benefits described in section 4.4.

Under the UARP-only Alternative, PG&E estimates an energy reduction of about 709 MWh that would result from flows needed for environmental and recreational flow requirements at the Chili Bar Project relative to no action, as shown in table 4-12. If SMUD were to build the Iowa Hill development, energy generation would decrease by 1,000 MWh at Chili Bar relative to no action.

[43]SMUD estimated 136,000 MWh, including 70,000 MWh of lost on-peak generation and 66,000 MWh of lost off-peak generation.

Table 4-11. Summary of the energy and capacity effect[a] of environmental and engineering measures on the No-action, UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for SMUD's UARP. (Source: Staff)

UARP Power Benefits Effects	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Change in dependable capacity (MW)	0	0	400	400
Change in super peak gross energy generation (MWh)	0	0	931,000	931,000
Change in on-peak gross energy generation (MWh)	0	–70,000	–70,000	–70,000
Change in off-peak gross energy generation (MWh)	0	–66,000	–23,000[b]	–23,000[b]
Total change in gross energy generation (MWh)	0	–136,000	838,000	838,000
Total change in net energy generation (MWh)[c]	0	–136,000[d]	–392,000	–392,000

[a] Increases are shown as positive and decreases as negative.

[b] Computed as –66,000 MWh in previous column plus 43,000 MWh of new off-peak energy associated with the Iowa Hill development.

[c] Net energy change is computed by subtracting the pumping requirements from gross generation.

[d] SMUD identifies some level of uncertainty associated with the effect of environmental measures. The actual loss of energy generation could range from 127,000 to 136,000 MWh.

Table 4-12. Summary of the effect of environmental measures on energy[a] and capacity for the No-action, UARP-only, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: Staff)

Chili Bar Power Benefits Effects	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Lost dependable capacity (MW)	0	0	0	0
Lost on-peak energy generation (MWh)[a]	0	–666	–28	–28
Lost off peak energy generation (MWh)[a]	0	–43	–972	–972
Total lost energy generation (MWh)	0	–709	–1,000	–1,000

[a] PG&E has not revised its modeling of the energy effects since the draft EIS. These values are staff estimates as detailed in appendix C and are based on presently available information.

4.4 COMPARISON OF ALTERNATIVES

Table 4-13 compares the power value, annual costs, and net benefits of the No-action Alternative, UARP-only Alternative, Proposed Action (with Iowa Hill development), and the Proposed Action with Staff Modifications for the UARP. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the Proposed Action with Staff Modifications, and explain why we conclude the environmental benefits are worth these costs. The decrease in net benefits from $67.14/MWh to $41.45/MWh for the Proposed Action represents a decrease of 38.3 percent relative to the unit cost of the No-action Alternative. The decrease in net benefits from $67.14/MWh to $41.45/MWh for the Proposed Action with Staff Modifications represents a decrease of 38.3 percent relative to the unit cost of the No-action Alternative. There is a small difference in net benefit between the Proposed Action (with Iowa Hill development) and Proposed Action with Staff Modifications.

If we look at the incremental effect of building the Iowa Hill development by subtracting the UARP-only Alternative from the Proposed Action with Staff Modifications, we find that the $123,232,800 power benefits slightly exceed the $120,537,800 cost resulting in a net benefit of $2,695,000. Although the economic benefit of the Iowa Hill development may appear marginal, we agree with SMUD that the operational flexibility of pumped-storage projects provides an advantage compared to other types of generators that compete in the ancillary services market. This flexibility includes the ability for pumped-storage projects to start up quickly, rapidly increase load, switch from pumping to generating, and shape the Project's output to meet load requirements. These benefits take on increased importance given SMUD's role as a control area. Without the 400-MW of capacity from the Iowa Hill development, SMUD would have to meet future peak generation needs with simple cycle peaking plants or than power purchased from the energy market.

Costs associated with unanticipated geotechnical conditions, higher construction costs due to inflation or uncertainties associated with estimated quantities could all affect project economics. Similarly, on the benefits side, it is difficult to forecast energy prices and capacity values in the year 2015; however, our economic analysis is based on current power values. Although our estimate shows that the Iowa Hill development has a small positive net benefit, under the policies set relating to Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the utility takes on any financial risk, and the Commission Staff make no representation as to the Projects' ultimate economic viability.

Table 4-14 compares the power value, annual costs, and net benefits for the Chili Bar Project under of the No-action Alternative, UARP-only Alternative, the Proposed Action (with Iowa Hill development), and the Proposed Action with Staff Modifications. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the Proposed Action, as well as any staff modifications, and explain why we conclude the environmental benefits are worth these costs. The decrease in net benefits from $20.97/MWh to $15.38/MWh for the Proposed Action with Staff Modifications represents a decrease of 26.66 percent relative to the unit cost of the No-action Alternative. However, the Proposed Action with Staff Modifications for the Chili Bar Project has minimal effects (about $0.01/MWh) on net benefits when compared to the Proposed Action because staff modifications result in only a modest increase in Project costs associated with a single new environmental measure. If the Iowa Hill development were not constructed, net benefits for the Chili Bar Project would rise to $15.47/MWh or about $0.08/Mwh more than if it were constructed, excluding the effect of staff modifications.

4.5 OTHER ECONOMIC CONSIDERATIONS

In addition to the cost evaluated in sections 4.2 and 4.3, the applicants would incur costs associated with measures that are not part of a potential Commission license. Costs associated with these measures are external to our developmental analysis.

Table 4-13. Summary of annual net benefits for the No-action, UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for SMUD's UARP. (Source: Staff)

	No Action	**UARP-only Alternative**	**Proposed Action (with Iowa Hill Development)**	**Proposed Action with Staff Modifications**
Dependable capacity (MW)	400.0	400.0	800.0	800.0
Value of dependable capacity ($)	$38,384,000	$38,384,000	$76,768,000	$76,768,000
Super peak generation (MWh)	0	0	931,000	931,000
On-peak generation (MWh)	1,287,000	1,217,000	1,217,000	1,217,000
Off-peak generation (MWh)	548,000	482,000	525,000	525,000
Generation (MWh)	1,835,000	1,699,000	2,673,000	2,673,000
Value super peak generation ($)	--	--	$82,449,400	$82,449,400
Value on-peak generation ($)	$94,980,600	$89,814,600	$89,814,600	$89,814,600
Value off-peak generation ($)	$30,578,400	$26,895,600	$29,295,000	$29,295,000
Value of generation ($)	$125,559,000	$116,710,200	$201,559,000	$201,559,000
Annual power value ($)	$163,943,000	$155,094,200	$278,327,000	$278,327,000

	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Annual power value ($/MWh)	$89.34	$91.29	$104.13	$104.13
Pump-back energy requirements (MWh)	--	--	1,230,000	1,230,000
Annual cost pump-back energy ($)	$0	$0	$68,634,000	$68,634,000
Annualized cost of plant and current environmental measures	$40,749,000	$40,749,000	$40,749,000	$40,749,000
Annualized cost of new Iowa Hill development ($)[a]	$0	$0	$52,514,800	$52,514,800
Annualized cost of new environmental measures ($)[b]	$0	$6,249,200	$5,624,700	$5,638,200
Annual cost ($)	$40,749,000	$46,998,200	$167,522,500	$167,536,000
Annual cost ($/MWh)	$22.21	$27.66	$62.67	$62.68
Annual net benefit ($)	$123,194,000	$108,096,000	$110,804,500	$110,791,000
Annual net benefit ($/MWh)	$67.14	$63.62	$41.45	$41.45

[a] Excluding environmental measures.

[b] Note that SMUD incorrectly includes the cost of Iowa Hill development environmental measures in table 1 of its April 11, 2007, submittal for the UARP-only Alternative, thus our environmental mitigation costs are lower. Other minor differences are explained in appendix C.

Table 4-14. Summary of annual net benefits for the Chili Bar Project under the No-action, UARP-only Alternative, Proposed Action, and Proposed Action with Staff Modifications. (Source: Staff)

	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Dependable capacity (MW)	7.0	7.0	7.0	7.0
Value of dependable capacity ($)	$672,000	$672,000	$672,000	$672,000
Generation				
On-peak generation (MWh)	20,736	20,070	20,708	20,708
Off-peak generation (MWh)	11,555	11,512	10,583	10,583
Generation (MWh)	32,291	31,582	31,291	31,291
Value on-peak generation ($)	1,530,300	1,481,200	1,528,300	1,528,300
Value off-peak generation ($)	644,800	642,400	590,500	590,500
Value of generation ($)	$2,175,100	$2,123,600	$2,118,800	$2,118,800
Annual power value ($)	$2,847,100	$2,795,600	$2,790,800	$2,790,800
Annual power value ($/MWh)	$88.17	$88.52	$89.19	$89.19
Annualized cost of plant and current environmental measures	$2,170,000	$2,170,000	$2,170,000	$2,170,000
Annualized cost of new environmental measures ($)	$0	$136,900	$136,900	$139,600
Annual cost ($)	$2,170,000	$2,306,900	$2,306,900	$2,309,600
Annual cost ($/MWh)	$67.20	$73.04	$73.72	$73.81
Annual net benefit ($)	$677,100	$488,700	$483,900	$481,200
Annual net benefit ($/MWh)	$20.97	$15.47	$15.46	$15.38

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5.0 STAFF'S CONCLUSIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE[44]

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreational, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

This section contains the basis for and a summary of our recommendations to the Commission for relicensing the UARP and Chili Bar Project. To decide which alternative to recommend, we compare the costs and environmental benefits of the alternatives.

Based on our independent review and evaluation of the proposed Projects and the No-action Alternative, we select the Proposed Action (including most of the terms of the Settlement Agreement that are within the Commission's ability to enforce), with some modifications by staff, as the preferred alternative.

We recommend this alternative because (1) issuance of new licenses would allow SMUD and PG&E to continue to operate the Projects as a dependable source of electric energy for their customers; (2) the electricity generated by the UARP and Chili Bar Project (total installed capacity of 1,088 MW and 7 MW, respectively) would avoid the need for an equivalent amount of fossil-fuel fired electric generation and capacity, continuing to help conserve these nonrenewable energy resources while reducing atmospheric pollution; and (3) the recommended environmental measures would protect and enhance aquatic and terrestrial resources, improve public use of recreational facilities and resources, and maintain and protect historic and archaeological resources within the area affected by Project operations.

The Proposed Action includes the construction and operation of the Iowa Hill development. Construction of the Iowa Hill development would disturb the majority of the 283-acre parcel, including 185 acres of lands in the Eldorado National Forest, and introduce new visual elements to the landscape. SMUD proposes in-kind replacement of habitat and construction of an underground powerhouse to minimize the effects on wildlife and neighboring land owners. Though pumped-storage projects use more

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[44] In this section "we" means the Commission staff. This is a standard section for the Commission's NEPA documents that presents the Commission staff's preferred alternative and rationale in support of the preferred alternative; it does not necessarily reflect the Forest Service's conclusions.

energy than they generate, we recommend inclusion of the Iowa Hill development in the preferred alternative because the pumped-storage operations would provide flexibility within SMUD's generating system by using off-peak energy to help meet on-peak energy needs,

We recommend approving most of the Settlement Agreement terms with some minor modifications and making these terms conditions of the licenses to be issued for the UARP and Chili Bar Project.[45] However, we recommend that many of the plans and specific measures for implementation as proposed in the Settlement Agreement be filed with the Commission for approval. This would allow Commission staff to monitor compliance with the conditions of the licenses and review the results of many of the proposed studies and measures.

By letters dated January 30, 2007, and January 31, 2007, respectively, the Forest Service and Interior filed revised preliminary terms and conditions, under section 4(e) of the FPA. The revised preliminary terms and conditions are consistent with the provisions of the Settlement Agreement, and we discuss them in the context of our discussions of the Settlement Agreement measures throughout this final EIS. However, some of the revised preliminary section 4(e) conditions that have been included in the Settlement Agreement are inconsistent with the Commission's policies.

The Forest Service specifies in revised preliminary condition no. 47 that SMUD provide $1,000,000 annually to the Forest Service for the operation, maintenance, and administration of the developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of the Project reservoirs and facilities listed in preliminary condition nos. 44 and 45 consistent with Proposed Articles 18 and 19 in the Settlement Agreement. Although we agree that the developed recreational sites and facilities listed in preliminary condition nos. 44 and 45 are needed Project recreational facilities, the $1,000,000 limit is contrary to the Commission's policy on the imposition of funds and cost caps. SMUD would be responsible under any license issued for ensuring the safe and useful condition of Project recreational sites regardless of the cost. Therefore, we include a measure for SMUD to implement the proposed maintenance activities in our recommended alternative, noting that the collection agreement between SMUD and the Forest Service would serve to define the O&M activities related to Project recreational facilities. We recognize some of the recreation occurs at undeveloped sites surrounding the reservoirs and that the Settlement Agreement includes SMUD's share of the Forest Service's cost of servicing these areas. However, because these costs are incurred for

[45]The precise wording of these staff recommendations may differ from similar recommendations made by SMUD and PG&E, or as presented in the Settlement Agreement. These wording changes are primarily the result of summarization and are not intended to change any of the Settlement Agreement terms that we recommend.

tasks done outside the project's boundary, we would not recommend the Commission require SMUD to reimburse the Forest Service for these costs

Forest Service specifies in revised preliminary condition no. 56 that SMUD develop and implement a transportation system management plan for roads on or affecting National Forest System lands addressing SMUD's primary responsibility for non-system roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads consistent with Proposed Article 1-30 in the Settlement Agreement. We understand that the Forest Service seeks to ensure that the roads accessing Project recreational facilities are maintained. However, as written, the measure could involve roads not directly related to Project operations or facilities. We modified this measure by clarifying that the transportation system management plan focus on Project access roads that are primarily used for Project purposes within the UARP boundary and would be included in the Project boundary.

BLM specifies in revised preliminary condition Article 2-14 that PG&E pay BLM $15,000 annually to provide a Project recreation brochure/map and an interpretive, education, and public information plan. We conclude that PG&E should identify the available whitewater recreational facilities and make the public aware of when and how they can access these facilities; however PG&E can choose to have BLM prepare and distribute the brochure and associated public information. We do not recommend adopting a cost limit. Such cost caps, as noted above, are contrary to Commission policy.

The following discussion summarizes our recommendations and some of our rationale for these recommendations. We first list the recommended measures by Project, and then we discuss our rationale.

5.1.1 Upper American River Project

We evaluate numerous recommendations in the resource sections of this final EIS and, given the environmental benefits, we recommend including the following measures that SMUD proposes in any license issued by the Commission for the UARP. Our recommended modifications to SMUD's proposed measures are *italicized.*

1. Maintain minimum streamflows in Rubicon River below Rubicon dam, Little Rubicon River below the Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, SFAR below Slab Creek dam, SFAR (as shown in tables 3-4 through 3-10) within 3 days of determining base water year types and operations consistent with DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. (Proposed Article 1-1)

2. Release an additional block of water into Silver Creek below Junction dam and below Camino dam annually in the months of July, August, and

September in Wet water years and not to exceed 1,044 acre-feet in July, 491 acre-feet in August, and 475 acre-feet in September as directed by the Agencies. (Proposed Article 1-1)

3. Provide annual pulse flow events within 3 months after license issuance but not before implementation of the proposed minimum flows in the Rubicon river below the Rubicon dam during BN, AN, and Wet water years, using the existing flashboards at the Rubicon tunnel headworks. The goal is to provide 600 cfs for 3 days that coincides with winter storm events or spring snowmelt runoff in the Rubicon River Watershed if a natural spill of 3,600 acre-feet or more within 3 consecutive days does not occur. Parties will meet annually to coordinate tunnel gate operation, and may develop a tunnel gate operation plan for future pulse flows. *File a report with the Commission by July 31 of each year stating the dates when the pulse flows were provided or an explanation of why they were not provided that year.* (Proposed Article 1-2)

4. Provide annual pulse flow events (as shown below) in Gerle Creek below Loon Lake dam. Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type, below. *File a report with the Commission by July 31of each year, stating the dates when the pulse flows were provided or an explanation of why they were not provided that year* (Proposed Article 1-2)

Day	BN	AN	Wet
Day 1	125	200	600
Day 2	125	200	600
Day 3	180	250	740*
Day 4	125	200	600
Day 5	125	200	600

* or maximum capacity of outlet works, whichever is less.

5. Prior to implementing pulse flows in Gerle Creek below the Loon Lake reservoir dam, complete a sensitive site investigation that includes additional permanent cross-sections that characterize the upper and middle Rosgen Level 3 analysis reaches, and mapping unstable banks and downed logs that are obstructing streamflow and test pulse flows at levels up to 740 cfs, or the maximum capacity of the outlet works, to determine the appropriate pulse flows to meet desired channel conditions. (Proposed Article 1-2)

6. Provide annual pulse flow events within 3 months after license issuance, but not prior to the implementation of the new minimum streamflows, as shown below in SFSC below Ice House dam. *File a report with the Commission by July 31 of each year, stating the dates when the pulse flows were provided or an explanation of why they were not provided that year.* (Proposed Article 1-2)

Day	**BN**	**AN**	**Wet**
Day 1	450	550	600
Day 2	450	550	600
Day 3	550	650	780*
Day 4	450	550	600
Day 5	450	550	600

* or maximum capacity of outlet works, whichever is less.

7. Implement a ramping rate of 1 foot per hour for pulse flow releases in Gerle Creek below Loon Lake dam and SFSC below Ice House reservoir dam; minimum streamflow releases in Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam; and recreational streamflow releases in SFSC below Ice House dam and SFAR below Slab Creek dam. (Proposed Article 1-3)

8. Develop and file a plan to coordinate operations with the licensee of the Chili Bar Project to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects. Consult and coordinate with the licensee of the Chili Bar Project in the implementation of Proposed Articles 2-1 (minimum streamflows), 2-2 (ramping rates), 2-4 (monitoring program), 2-5 (adaptive management program), 2-6 (sediment management plan), 2-14 (public information services), and 2-15 (recreational streamflows). (Proposed Article 1-4)

9. Implement a monitoring program including filing a final monitoring plan for each element listed in items 10 through 22 below and filing an annual report describing the monitoring efforts by June 30 of each year. (Proposed Article 1-5)

10. Develop a plan to (a) monitor rainbow trout fish populations by electrofishing and/or snorkeling during late summer/fall in 10 river reaches; (b) monitor hardhead by snorkel surveys in SFAR below Slab Creek reservoir dam, only, from immediately downstream of Mosquito Road Bridge to, and including site SCD-F2; and (c) monitor brown trout in the Gerle Creek below Loon Lake reservoir dam. (Proposed Article 1-5)

11. Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at: Rubicon river below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFFR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam. (Proposed Article 1-5)
12. Develop a plan to (a) monitor foothill yellow-legged frogs in Silver Creek below Junction dam, Silver Creek below Camino dam, SFAR below Slab Creek dam, and Rock Creek (tributary upstream of White Rock powerhouse) and (b) monitor mountain yellow-legged frogs in Rubicon reservoir, Rockland lake, and Buck Island reservoir. (Proposed Article 1-5)
13. Develop a plan to visually monitor for foothill yellow-legged frogs in Silver Creek below Camino dam in June through September when streamflows are 100 cfs or less and flows fluctuate more than 40 cfs or more over 1 week's time. (Proposed Article 1-5)
14. Develop a plan to conduct aerial photo flights and Greenline method at the 15 intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community. (Proposed Article 1-5)
15. Develop a plan to collect, identify, and archive samples of the species of algae in Silver Creek below Junction reservoir dam and additional baseline samples in SFRR below Robbs Peak dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam and add additional sites or reaches if it is determined that the algal species have negative effects on the aquatic ecosystem. (Proposed Article 1-5)
16. Monitor Gerle Creek fluvial, geomorphic properties below Loon Lake dam at LL-DG1 and LL-G2 in years 1 and 2 and develop a Gerle Creek geomorphology mitigation plan that includes channel stabilization recommendations. (Proposed Article 1-5)
17. Develop a geomorphology monitoring plan providing for establishing permanent transects and monitoring channel cross-sections, longitudinal profiles, substrate composition, and other geomorphic properties (Rosgen Level 3) in representative areas, including the in Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam. (Proposed Article 1-5)
18. Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 17 locations immediately above and below Project dams and at the confluence with tributaries and monitor stream temperatures from March 15 to September 30 in all years or until it can demonstrated that operation of

the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies. (Proposed Article 1-5)

19. Develop a water quality monitoring plan addressing water chemistry, bacterial content, and metal bioaccumulation, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. (Proposed Article 1-5)
20. Develop a Robbs Peak powerhouse entrainment monitoring plan to determine when and at what flows flow migration is occurring. (Proposed Article 1-5)
21. Develop a bear management plan. (Proposed Article 1-5)
22. Develop a bald eagle monitoring plan. (Proposed Article 1-5)
23. Implement an Ecological Resources Adaptive Management Program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Proposed Article 1-5, above) and specific adaptive management measures. (Proposed Article 1-6)
24. Develop and implement a stabilization plan for the Gerle Creek channel below Loon Lake dam. (Proposed Article 1-7)
25. *Develop and implement a Gerle Creek fish passage plan with measures to* maintain the reservoir level at Gerle Creek at an elevation sufficient to provide fish passage into Gerle Creek from August through October 31, *and implement channel modifications within the delta, if needed, to maintain passage for brown trout.* (Proposed Article 1-8)
26. Continue to move mobile, instream large woody debris greater than both 20 centimeters wide and 12 meters in length downstream beyond Robbs, Junction, Camino, and Slab Creek reservoir dams. (Proposed Article 1-9)
27. Develop and file a Streamflow and Reservoir Elevation Gaging Plan that meets USGS standards and includes include a minimum of 10 streamflow gage locations, 9 reservoir elevation compliance gaging locations, and provides for simple staff gages at the Slab Creek and Ice House recreational boating put-ins and the installation of telemetry equipment if such equipment is economically and technologically feasible, and can be installed in a manner consistent with the laws, regulations, and policies applicable to the congressionally-designated Desolation Wilderness. (Proposed Article 1-10)
28. Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made

to minimize potential adverse water quality impacts when the release points are used. (Proposed Article 1-11)

29. Maintain and operate in working condition all devices and measures for wildlife protection along Project canals, provide an annual report of deer or other wildlife found in Project canals, and, should wildlife mortality exceed 3 individuals, develop and implement a wildlife exclusion plan. (Proposed Article 1-12)

30. Before commencing any new construction or maintenance (including but not limited to proposed recreational developments), ensure that a *draft* biological assessment is prepared for the relevant federal agency (FWS or NMFS) *and filed with the Commission*. (Proposed Article 1-12)

31. Immediately notify agencies if occurrences of sensitive plants or wildlife species are detected prior to or during ongoing construction, operation, or maintenance of the Project and develop and implement appropriate protection measures if directed by the responsible agencies. (Proposed Article 1-12)

32. Annually review the current list of special status plant and wildlife species (federal ESA or Eldorado National Forest Watch List) and develop and implement a study plan to assess the effects of the Project on the species as necessary. (Proposed Article 1-12)

33. Consult with BLM, FWS, and CDFG prior to undertaking maintenance under transmission lines within the Pine Hill Rare Plant Preserve. (Proposed Article 1-12)

34. Develop and implement an avian protection plan that addresses retrofitting transmission lines as described in the Bird-Powerline Associations Technical Report to meet APLIC design and siting standards. (Proposed Article 1-12)

35. Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations *for all land within the Project boundary affected by Project activities.* (Proposed Article 1-13)

36. Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed *for all land within the Project boundary affected by Project activities.* (Proposed Article 1-13)

37. Annually schedule and facilitate a meeting with the Agencies to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year. (Proposed Article 1-14)

38. Develop and implement a recreation implementation plan including a construction schedule for the recreational facilities specified in Proposed Article 1-19, and other issues including but not limited to signing and sign placement, dissemination of public information, and a schedule for the design of facilities to be reconstructed. (Proposed Article 1-15)

39. Conduct a recreational survey and prepare a report on recreational resources every 6 years from the date of license issuance, including, but not limited to, changes in use and use patterns, levels of use, user preferences, kinds and sizes of recreational vehicles, carrying capacity information sufficient to indicate change in capacity and recreational user trends in the Project area. (Proposed Article 1-16)

40. *Identify* an individual for liaison with the Forest Service whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place with the National Forest. (Proposed Article 1-17)

41. Schedule a meeting with the Forest Service every 6 years to review all Project recreational facilities described in Proposed Articles 1-18 and 1-19 and to agree upon the need and timing for maintenance, rehabilitation, construction, and reconstruction work. (Proposed Article 1-18)

42. Keep or include Project recreational facilities within the Project boundary as shown in Attachment 1 and include the listed 34 recreational facilities constructed or reconstructed by SMUD in the future within the Project boundary. (Proposed Article 1-18)

43. Complete the construction, reconstruction, and restoration to meet current Forest Service design standards and the requirements of the ADA including all the pre-construction survey, design, permitting, analysis, and specifications for the initial recreational Projects identified at the time of license issuance, including Buck Island development; High Country area trails; formal recreational facilities in Crystal Basin at Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs; recreational facilities in the Canyonlands at Junction, Brush Creek and Slab Creek reservoirs (as shown in table 3-65, in section 3.3.6.2, *Recreational Resources*). (Proposed Article 1-19).

44. Develop and implement a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities identified as lacking such facilities. (Proposed Article 1-19)

45. Maintain, rehabilitate, and reconstruct, including the costs of design and administration, and otherwise provide the heavy maintenance necessary to keep existing Project recreational facilities in serviceable condition as determined through the Review of Recreation Developments. (Project Article 20)

46. Provide for the operation, maintenance, and administration of those developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of the Project reservoirs and facilities listed in Proposed Articles 1-18 and 1-19. (Proposed Article 1-21)

47. Provide *recreation use* data *on* carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of "desired conditions," user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience. (Proposed Article 1-22)

48. Meet or exceed the end-of-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs (as shown in table 3-25, section 3.3.2.1. *Water Resources*, *Reservoir Levels*). (Proposed Article 1-23) and follow procedures and protocols for super dry water years, interim modification, conferences on abnormal water years, and reservoir level monitoring and adjustments. (Proposed Article 1-23)

49. Based on the determination of water year type, provide recreational streamflows in the SFAR below Slab Creek in BN, AN, and wet water years and in Silver Creek below Ice House dam (as shown in table 3-65 in section 3.3.6.2, *Recreational Resources, Whitewater Boating*) and in Slab Creek below Slab Creek reservoir dam, and if construction of Iowa Hill development has not commenced within 5 years of license issuance, prepare and implement a whitewater boating recreation management plan to address the whitewater recreation needs in reach from the Slab Creek dam to White Rock powerhouse. Provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 *with or without the construction of the Iowa Hill development only* if environmental and use triggers are met. (Proposed Article 1-24)

50. Provide real-time streamflow information for 10 reaches via a toll-free telephone number and web site and real-time reservoir level information 10 reservoirs including two simple staff gages for use by the public at each reservoir. (Proposed Article 1-25)

51. Provide a Project recreation brochure/map that describes the recreational opportunities, facilities, rule, and responsibilities for the Project area. (Proposed Article 1-25)
52. Develop and implement an interpretive, education, and public information plan. (Proposed Article 1-25)
53. Provide up to a total of 50,000 pounds of fish per year but not less than 25,000 pound of fish per year to be distributed among Loon Lake, Union Valley, and Ice House reservoirs as determined by CDFG. (Proposed Article 1-26)
54. Meet every 5 years with the Forest Service to review opportunities to improve how well Project facilities blend in with the surrounding landscape and prior to any new construction or maintenance of facilities, prepare and implement a plan for the protection and rehabilitation of National Forest System visual resources affected by the Project as directed by the Forest Service. (Proposed Article 1- 27)
55. Implement 10 specific enhancement measures (e.g., painting) to existing facilities to improve visual quality. (Proposed Article 1-27)
56. Implement the final HPMP including unanticipated discovery protocols. (Proposed Articles 1-28 and 1-29)
57. Develop and implement a transportation system management plan for *Project* roads *used primarily for Project purposes* on or affecting National Forest System lands addressing SMUD's primary responsibility for non-*National Forest S*ystem roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads. (Proposed Article 1-30)
58. Develop and implement a trails system management plan for trails that are needed for Project *purposes* and are located on or affect National Forest System lands, including a map; the seasons and amount of SMUD's use of the trails, trail conditions of the trails, and a provision for identifying maintenance and reconstruction needs for trails required for Project operations every 5 years. (Proposed Article 1-31)
59. Develop and implement a facility management plan including a map showing all Project facilities, the type and season of use of each structure; the condition of each structure, and (4) provision for a plan every 5 years identifying the maintenance, reconstruction, and removal needs of Project facilities. (Proposed Article 1- 32)
60. Prepare vegetative management plan prior to any ground disturbing activities. (Proposed Article 1-33)

61. Develop and implement a fire prevention and response plan developed in consultation with appropriate state and local fire agencies that sets forth SMUD's responsibility for the preventing, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations. (Proposed Article 1-34)
62. Reserve the Commission's authority to require fishways as may be prescribed by NMFS and FWS under Section 18 for the construction, operation, and maintenance of fishways including measures to determine, ensure, or improve the effectiveness of the fishways. (Proposed Article 1-35)
63. Develop a schedule for implementing the articles included in any license issued for the Project. (Proposed Article 1-37)
64. Protect hardhead in the Slab Creek reservoir from the Iowa Hill development operations by monitoring populations and entrainment, monitoring edgewater temperatures between May and September, maintaining a temperature of at least 12°C during the months of June and August in the SFAR Slab Creek dam reach below Mosquito Bridge, preventing pumped storage related flow fluctuations in the SFAR below Slab Creek. (Proposed Article 1-40)
65. Prior to initiating construction of the Iowa Hill development, purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license (Proposed Article 1-41)
66. File a storm water pollution prevention plan at least 90 days prior to ground-disturbing activities for construction of the Iowa Hill development. (Proposed Article 1-42)
67. Develop and implement a plan for managing groundwater inflows during construction and for groundwater monitoring and management once construction is completed. (Proposed Article 1-43)
68. Develop a design for the Iowa Hill development that meets the VQOs or the Eldorado National Forest Land and Resource Management Plan. (Proposed Article 1-44)
69. Develop and implement a plan to address construction noise to vehicle idling and advance notification of any material transport and construction activities within 0.5 mile of the parcels, including a noise hot line telephone system for reporting construction noise disturbances and monitoring compliance with the provision of the plan. (Proposed Article 1-48)
70. Develop and implement a plan for recreational access to the Slab Creek reservoir during the construction of Iowa Hill reservoir and the tunnel

connecting to Slab Creek reservoir and when Iowa Hill is operational. (Proposed Article 1-49)

71. Development and implement a final transportation management plan for the Iowa Hill development *in consultation with the Advisory Committee that identifies preferred access routes for construction traffic and heavy equipment to access the upper and lower reservoir construction sites using the criteria or similar criteria employed in the Transportation Route Technical Report.* (Proposed measure not included in the Settlement Agreement)

In addition to the applicant-proposed Project-related environmental measures listed above, we recommend including the following staff-recommended environmental measures in any license issued for the UARP.

- Provide an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats in the vegetation management plan.
- Develop and implement a wildlife lands mitigation plan for the construction of the Iowa Hill development that identifies the locations of wildlife mitigation lands, management goals and objectives, management activities that would be implemented and measures to ensure that the management goals would be met and include these lands in the Project boundary.

5.1.2 Chili Bar

We evaluate numerous recommendations in the resource sections of this final EIS and, given the environmental benefits, we recommend including the following measures that PG&E proposes in any license issued by the Commission for the Chili Bar Project. Our recommended modifications to PG&E's proposed measures are *italicized.*

1. Maintain minimum streamflows in the SFAR below Chili Bar dam provided that of inflow to the Chili Bar Project reservoir and the Chili Bar reservoir elevations are sufficient, within 3 days of determining base water year types and operations consistent with DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. The minimum streamflow schedule, the specific factors to be applied, and the compliance point for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*. (Proposed Article 2-1)

2. When the inflow to the Chili Bar Project and the Chili Bar reservoir elevations are sufficient, implement up ramping rates for licensee-controlled streamflow releases of 500 cfs per hour for flows between 150 cfs and 1,000 cfs and 1 foot per hour for flows between 1,000 cfs and 1,950 cfs and

down ramping rates of 1 foot per hour for flows between 1,950 and 1,000 cfs, 500 cfs per hour for flows between 1,000 cfs and 600 cfs and 250 cfs for flows between 600 cfs and 150 cfs. (Proposed Article 2-2)

3. Develop and file a plan to coordinate operations with the licensee of the UARP to enable PG&E to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects. (Proposed Article 2-3)

4. Implement a monitoring program including a final monitoring plan for each element as described in items 5 through 10 below and file annual report describing the monitoring efforts by June 30 of each year. (Proposed Article 2-4)

5. Develop a plan to (a) monitor rainbow and brown trout populations by electrofishing and/or snorkeling at SFAR below Chili Bar dam and note any hardhead detected. (Proposed Article 2-4)

6. Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at SFAR below Chili Bar dam. (Proposed Article 2-4)

7. Develop a plan to monitor foothill yellow-legged frogs, western pond turtles, and California red-legged frogs in the SFAR below Chili Bar dam (entire reach from CB-AI5 to Ponderosa Campground on right and left banks). (Proposed Article 2-4)

8. Develop a plan to conduct aerial photo flights and Greenline method at the five intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community. (Proposed Article 2-4)

9. Develop a water temperature monitoring plan to install and maintain continuous recording devices at four locations in the SFAR immediately below Chili Bar dam, upstream of Dutch Creek confluence, upstream of Camp Lotus, and upstream of Greenwood Creek and monitor stream temperatures from March 15 to October 15 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies. (Proposed Article 2-4)

10. Develop a water quality monitoring plan addressing water chemistry, bacterial content, metal bioaccumulation and algae, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. (Proposed Article 2-4)

11. Implement in coordination with SMUD an adaptive management program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Article 2-4, above) and specific Commission-approved adaptive management measures. (Proposed Article 2-5)
12. Develop a geomorphology monitoring plan in coordination with SMUD including profile measurements at three cross-sectional transects, longitudinal profiles, substrate composition, and other geomorphic properties three sampling sites (CB-G1, CB-G2, and CB-G3) to be performed every 5 years. (Proposed Article 2-6)
13. Ensure that mobile instream large woody debris in Chili Bar reservoir of sizes greater than both 20 centimeters wide and 12 meters in length continues downstream beyond Chili Bar dam using reasonable means that include short-term spill flows at the dam (Proposed Article 2-7)
14. Develop and implement a streamflow and reservoir elevation gaging plan that meets USGS standards and approved by the Water Board at a minimum addressing compliance gaging at SFAR below Chili Bar dam (existing USGS gage no. 11444500 or its successor) and in the Chili Bar reservoir. (Proposed Article 2-8)
15. Annually review the current list of special status plant and wildlife species (federal ESA or BLM sensitive) and develop and implement a study plan to assess the effects of the Project on the species as necessary. (Proposed Article 2-9)
16. Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations *for all land within the Project boundary affected by Project activities.* (Proposed Article 2-10)
17. Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed *on all land within the Project boundary affected by Project activities.* (Proposed Article 2-10)
18. Annually schedule and facilitate a meeting with the Agencies and BLM to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year. (Proposed Article 2-11)

19. *Identify* an individual for liaison with the BLM whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place on BLM lands with the Chili Bar Project boundary. (Proposed Article 2-12)

20. Construct or install *and maintain* (1) a gravel parking area for three to four vehicles off Rock Creek Road, (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir, (3) a kiosk sign along the trail near the beginning, explaining the rules of the area, and (4) one picnic table of coated wire mesh material in a level upland area that is outside of the floodplain. (Proposed Article 2-13)

21. In conjunction with SMUD, provide real-time lake stage height and storage information for Chili Bar reservoir, install up to two simple staff gages for use by public, real-time streamflow and reservoir level information via a toll-free telephone number and web site, and collect streamflow information consistent with the standard USGS gaging practices for the existing stream gage facilities downstream of Chili Bar reservoir dam. (Proposed Article 2-14)

22. Provide a Project recreation brochure/map and an interpretive, education, and public information plan. (Proposed Article 2-14)

23. Based on the determination of water year type, provide recreational streamflows in the SFAR below Chili Bar dam (as shown in table 3-67 in section 3.3.6.2, *Recreational Resources, Whitewater Boating*), provided that inflows to the Project are sufficient. (Proposed Article 2-15)

24. Meet every 5 years with BLM to review opportunities to improve how well Project facilities blend in with the surrounding landscape and prior to any new construction or maintenance of facilities, prepare and implement a plan for the protection and rehabilitation of BLM visual resources affected by the Project as directed by BLM. (Proposed Article 2-16)

25. *Finalize* and implement a HPMP including unanticipated discovery protocols *within1 year of license issuance*. (Proposed Articles 2-17 and 2-18)

26. Reserve the Commission's authority to require fishways as may be prescribed by NMFS and FWS under section 18 for the construction, operation, and maintenance of fishways, including measures to determine, ensure, or improve the effectiveness of the fishways. (Proposed Article 2-19)

27. Develop a schedule for implementing the articles in any license issued for the Project. (Proposed Article 2-21)

In addition to the applicant-proposed Project-related environmental measures listed above, we recommend including the following staff-recommended environmental measures in any license issued for the Chili Bar Project.

- Provide an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats in the vegetation management plan.
- Develop and implement a recreation plan.

5.1.3 Rationale for Staff Recommendations

This section describes the rationale for some of our recommendations on measures that we conclude should be included as conditions of any licenses issued, as well as any measures that we do not recommend as license conditions. This section is arranged by major resource topic, and within each topic we discuss each of the Projects or provide our rationale for recommending or not recommending specific measures.

Aquatic Resources

Project operations could affect aquatic habitats and sediment transport in the stream reaches. The Settlement Agreement includes a set of measures (Proposed Articles 1-1 through 1-6 for the UARP and 2-1 through 2-5 for the Chili Bar Project) focused on the ecological health and suitability of reaches downstream of the Project dams to support native fish, amphibian, and reptile populations. A major goal of the proposed streamflows and pulse flows is to simulate the natural hydrograph as much as possible during important times of the years to benefit species that are cued to spring/early summer snowmelt runoff patterns, lower base flows in the late summer/early fall, and winter flows that would provide habitat in most years.

Minimum Flows

The minimum streamflow schedules in Proposed Articles 1-1 for UARP and 2-1 for the Chili Bar Project are major parts of the Settlement Agreement and would enhance native fisheries in the stream reaches. In most reaches where accretion flows are low and spawning gravels are present, the proposed increase in minimum stream flows and associated reduction in water temperature (mean temperatures below 20°C in the summer months) are expected to benefit the native fish populations by creating either more available spawning habitat or juvenile habitat during critical life stages in the spring or fall. Increasing flows and lowering temperatures during these seasons should also result in habitat conditions that are less favorable for California roach and speckled dace consistent with Agency objectives.

The most significant increases in WUA for various life stages of rainbow and brown trout would occur in the five reaches already having plentiful or modest amounts of spawning gravels. The proposed minimum flows in the Rubicon River downstream of Rubicon dam, where spawning gravels are plentiful, would result in 84 percent of available WUA for rainbow trout spawning in BN water years and 48 percent in CD water year. The slightly reduced temperature in May and June would benefit the preferred trout species while creating less favorable habitat for California roach and speckled dace, consistent with resource agency objectives. In the Gerle Creek reaches downstream of Loon Lake dam and Robbs Peak dam, where the trout fishery is robust, the proposed minimum flows would increase the WUA for all life stages, with the greatest increase in spawning habitat for trout. In the SFSC downstream of Ice House dam, the increased minimum flows would increase WUA for trout adult and spawning life stages and the cooler temperatures would benefit rainbow trout population in this reach. Finally, in Brush Creek downstream of Brush Creek dam, the proposed minimum flows will increase the WUA for all life stages of rainbow and brown trout.

The Settlement Parties indicate that the proposed minimum streamflows would benefit a variety of amphibians, including the foothill yellow-legged frog. However, we question some of these potential benefits. In the upper reaches, including Rubicon, Gerle Creek, and Robbs Peak, the cooler temperatures that would result from the increased streamflow would increase potential habitat for mountain yellow-legged frog populations. The proposed minimum streamflows may also provide potential habitat for foothill yellow-legged frogs in the lower end of these reaches. However, these reaches are not within the optimal elevation ranges for these species (too low for mountain yellow-legged frogs and too high for foothill yellow-legged frogs) and the proposed minimum flows would also provide more habitat for predatory trout.

Further, the colder temperatures that would result from increased minimum streamflows in the lower elevation reaches, including Camino, Slab Creek, and Chili Bar, may not be beneficial to foothill yellow-legged frog tadpole development and would also provide more habitat for predatory trout. However, the increased minimum streamflows in the spring could benefit foothill yellow-legged frogs and western pond turtles by dislodging second-year bullfrog tadpoles from pools. Bullfrogs are natural predators of foothill yellow-legged frogs and young western pond turtles. Therefore, if higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

Increased minimum streamflows during the spring months would also result in inundation of stream margin habitats and primary floodplain terraces that would occur under an unimpaired flow regime. These variations in streamflows and inundation would improve the health of riparian vegetation and increase the functioning of the riparian ecosystem by promoting stream bank stability and improved water quality, reducing the potential for erosion, increasing storage of nutrients and water, and providing forage and habitat for wildlife.

Reserving a block of water, monitoring water temperatures at the lower end of the Junction dam reach and Camino dam reach, and developing a plan for notification protocols and ecological monitoring needs associated with the block of water would facilitate informed decision-making of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary.

Pulse Flows and Ramping Rates

Based on geomorphology studies, SMUD and the Agencies identified reaches that would benefit from periodic pulse flows (Proposed Article 1-2) to mobilize and flush sediments downstream. Coordinating the provision of pulse flows with natural high flow events is reasonable. Our analysis shows that in the reaches where pulse flows are proposed (the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam) naturally occurring spring storm events would be mimicked, scouring floodplain soils, redistributing sediment, and reducing encroachment. We conclude that implementation of the pulse flows would help improve instream habitat for fish and facilitate increased production toward the desired biomass goals.

Effects associated with ramping are variable, depending on species, life-stage, and, in some case, time of day of the ramping event. The proposed minimum flows, in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in the Chili Bar dam reach to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. When controlled ramping rates are successfully implemented, they would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement. Implementation of the proposed ramping rates in Proposed Articles 1-3 for the UARP and 2-2 for the Chili Bar Project would also reduce the effects of flow fluctuations on other sensitive aquatic species that are vulnerable to sudden changes in flow and would reduce the potential for stranding of fish.

For the UARP, the major costs for these aquatic resource measures include the physical modifications and installation of a larger valve at Rubicon dam and Slab Creek dam to facilitate the provision of minimum streamflows, pulse flows, and ramping rates. The total annual costs for implementing the minimum flow releases, including the capital cost for the modification to the two Project dams and periodic adjustments to the minimum release valves at all 10 Project dams, would be about \$185,100 and implementation of the pulse flows would cost about \$26,000 annually. The proposed minimum streamflow schedule for the UARP would result in a total foregone power production cost of \$7,821,000. The proposed pulse flows for the UARP would result in an additional foregone power cost of \$478,000. The improvements to the 60 miles of riverine aquatic and riparian habitat and native fish and amphibian populations in the eleven downstream reaches would be worth the cost. For the Chili Bar Project, we estimate that the annual capital cost and energy losses for the implementation of the proposed minimum flow regime and ramping rates would be \$19,400 and a foregone power production cost of $56,300; the improvement to the aquatic habitat in the Chili Bar reach would be worth the cost.

Large Woody Debris

The lack of woody debris could affect aquatic habitat in the stream reaches. Currently, SMUD collects and stockpiles woody debris to reduce interference with recreational boating and prevent debris jams at the dams. Proposed Articles 1-9 for the UARP and 2-7 for the Chili Bar Project provide for transporting woody debris that collects in the Project reservoirs to the natural stream downriver. Ensuring that large woody debris is allowed to move downstream through the Projects would enhance the aquatic habitat for native fish populations in each of the Project reaches included in the plans. The measures to pass large woody debris downstream of the dams also would benefit foothill yellow-legged frogs and other amphibians and reptiles by providing substrate for macroinvertebrates, trapping organic material and sediment, creating pools, and slowing the water velocity during peak flows. We estimate that the annual cost for implementing the woody debris plan for the UARP would be about $14,000 and $10,000 for the Chili Bar Project. Implementation of woody debris plans at both Projects would be reasonable measures and worth the cost to ensure boater safety and improve the habitat for fisheries and sensitive amphibian species in the downstream reaches.

Coordination between the UARP and Chili Bar Project Operations

Better coordination of Project operations between SMUD and PG&E could result in fewer spills downstream of the Chili Bar Project and positive effects on special status amphibians. Proposed Articles 1-4 and 2-3 provide for coordination between the UARP and Chili Bar Project. The whitewater runs between Chili Bar dam and Folsom reservoir are of regional, if not national importance. These river sections are the most heavily boated in California, in part because the flows are relatively dependable and extend well into the summer and fall months and because of their proximity to large population centers. Historically, SMUD and PG&E have had limited coordination, where PG&E calls SMUD plant operators shortly before upstream releases for PG&E to decide how low to draw down Chili Bar reservoir. Often, this coordination has not worked well, causing Chili Bar reservoir to spill and providing unpredictable flows in the whitewater runs downstream of the Chili Bar dam. As proposed, coordination would occur more frequently and would allow PG&E to improve access to its recreational facilities by allowing boaters and other recreational users to more closely predict the timing and magnitude of flows and would help PG&E avoid losing opportunity to generate. Coordination between UARP and Chili Bar Project would also help ensure effective implementation of the Proposed Articles and protection of special status amphibians in the Chili Bar dam reach. Development and implementation of the plan with detailed protocols to coordinate operations and implement license conditions affecting both Projects would have annual cost of $13,100 for SMUD and $10,000 for

PG&E. Implementation of the plan would be worth the cost because it would not only enhance whitewater boating opportunities in the Chili Bar reach and avoid unnecessary harm to special status amphibians but also would increase the power generation at Chili Bar.

Reservoir Levels

UARP water level fluctuations affect both boaters and fisheries resources in Project reservoirs. Proposed Articles 1-1, *Minimum Streamflows,* 1-8, *Fish Passage at Gerle Creek*, and Proposed Article 1-23, *Reservoir Levels,* for the UARP provide for specific water level elevations for protecting fish populations, ensuring the availability of boat launch facilities, or enhancing the visual experience at these Project reservoirs. Loon Lake, Ice House, and Union Valley reservoirs are large lakes with heavy recreational use in the summer months. Meeting end-of-month water surface elevation targets at these reservoirs in July, August, and September, as called for in Proposed Article 1-23, would ensure that at least one public boat launch would be available at each reservoir during the peak recreation season and would enhance the overall recreational experience of users of these popular reservoirs. Our analysis shows that water surface elevation targets proposed in the Settlement Agreement are within the historical range of water surface elevations at these large reservoirs for all except SD water years, and we conclude that SMUD would be able to meet the end-of-month elevations. Therefore, we recommend inclusion of the proposed elevations along with the proposed procedures for agency consultation in SD water years, when SMUD would have difficulty meeting the end-of-month water surface elevations. Operating the Project to attain the end-of-month target elevations at Loon Lake, Ice House, and Union Valley reservoirs as specified in the Settlement Agreement would not involve any additional cost to SMUD because they are within the existing range of reservoir fluctuations.

Although our analysis indicates that SMUD could meet the proposed end-of-month elevations at the larger reservoirs, our analysis of water surface elevations at smaller storage reservoirs (Rubicon and Buck Island) indicates that SMUD might have difficulty controlling water surface elevations during May and June. The high elevation Rubicon and Buck Island reservoirs have limited storage capacity and are greatly affected by changes in the inflow to the reservoirs, normally driven by snowmelt. Further, the manual control gates are not typically installed until June or early July because these high elevation reservoirs are remote and difficult to access. The conditions make it difficult for SMUD to control water levels for part of the summer. However, once the gates are installed, they can maintain a relatively stable water surface elevation during low inflow conditions, which normally start during July and extend through the recreation season. We also conclude that SMUD would be able to maintain an overwintering minimum pool at elevation 6,527 feet in the Rubicon reservoir.

Fluctuations of the water levels of Gerle Creek reservoir would still occur, partly because this reservoir operates as a afterbay for Loon Lake powerhouse and as a forebay for the canal leading to Robbs Peak reservoir and powerhouse. Again, many of the variations in the early part of the May 1 to September 10 period are the result of limited storage capacity and rapid variations in inflow similar to the Rubicon and Buck Island reservoirs. However, we expect that SMUD would use the Gerle Creek canal headworks gates to maintain the elevation of Gerle Creek reservoir at or above elevation 5,225 feet during the summer recreation season. In the draft EIS we recommended that SMUD operate Gerle Creek reservoir to maintain water levels at 5,228 feet in the fall to allow upstream passage of brown trout. In comments on the draft EIS, SMUD, the Forest Service, Interior, and American Rivers all stated that upstream fish passage into Gerle Creek may not be a function of reservoir levels and could be affected by sediment barriers at the upper end of Gerle Creek reservoir. SMUD also commented that maintaining Gerle Creek reservoir at elevation 5,228 feet in the fall would constrain operations and would not guarantee fish passage. Instead, SMUD proposed that continued studies and consultation with the agencies would result in a more practical solution. Therefore, we now recommend that SMUD develop and implement a Gerle Creek fish passage plan because the new information that SMUD provided indicates that fish passage would not be guaranteed even if Gerle Creek reservoir were maintained at elevation 5,228 feet in the fall. The plan could involve measures, such as channel modifications, if needed, to ensure continued fish passage into Gerle Creek during the August through October period so that brown trout can access spawning areas in Gerle Creek. Our recommended Gerle Creek fish passage plan would allow SMUD to determine in consultation with the Agencies how they will ensure fish passage given the potential barriers that they identified at the upper end of Gerle Creek reservoir The estimated annual cost of preparing and implementing the plan to allow fish passage into Gerle Creek would be $6,800 and the benefit to fisheries would be worth the cost.

We also note that the terminology in the Settlement Agreement to make a "good faith effort" or "to make every reasonable effort" or implement a measure "as early as reasonably practicable" relative to water surface elevations at the smaller reservoirs (Rubicon, Buck Island, and Slab Creek) is difficult for the Commission to enforce. Attempting to maintain water surface elevations within an historical range (1975 to 2000) as proposed for the Junction and Brush Creek reservoirs would also be difficult for the Commission to enforce. Further, other than noted above, we do not find any biological or recreational use basis for meeting the proposed elevations at these small reservoirs. For these reasons, we do not recommend including these measures in any license issued for the UARP.

Streamflow and Reservoir Elevation Gaging

Proposed Articles 1-10 for the UARP and 2-8 for the Chili Bar Project, *Streamflow and Reservoir Elevation Gaging*, provide for a plan to monitor streamflows and reservoir elevations. SMUD and PG&E already monitor or, in some cases, provide assistance to USGS for monitoring and recording many hydrological indicators, such as reservoir water level and stream gaging sites, in the Project area. Daily and, in many cases, hourly or shorter interval data recordings allow SMUD and PG&E to manage their facilities for hydroelectric generation and document environmental compliance within the terms of its existing license.

As discussed in section 3.3.2.2, SMUD would install new gages or otherwise find a means to measure the increased minimum streamflows downstream of Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Junction dams. Developing a coordinated gage installation plan, in consultation with resource and land management agencies, as well as USGS, would ensure that any new gages necessary to measure the flows and water levels that may be specified in a new license would provide accurate data consistent with applicable USGS standards. SMUD's and PG&E's proposals, including gaging and publication of flow information, would provide current flow and lake level data for the benefit of recreational visitors in planning flat water, whitewater boating, and fishing trips. Flow data would also be used to monitor the potential effects of Project operations on foothill yellow-legged frogs that are vulnerable to sudden changes in flow. We estimate that the annual cost for upgrading the gaging stations would be $98,200 for SMUD and $6,500 for PG&E. Implementation of streamflow and reservoir elevation gaging plans would be worth the cost to ensure compliance with recommended minimum flow and water surface elevation provisions.

Currently, real-time reporting is not available on any Project tunnel or powerhouse or on any non-project diversion structures located within the upper Rubicon River watershed. Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, does not include gaging at these diversion structures as recommended by the Placer County Water Agency. Gaging of these diversion structures is not necessary to ensure compliance with proposed minimum streamflow schedules or reservoir levels; therefore, we do not recommend it.

Wildlife and Plant Protection Measures

Project operations could potentially affect special status plant and wildlife species such as black bear, mule deer, osprey, and northern goshawk within the UARP Project boundaries. Proposed Article 1-12 provides for the protection of these wildlife and plant species through the implementation of wildlife safety measures at UARP canals and transmission lines and rare plant protection measures within the Pine Hill Preserve. Additionally, Proposed Articles 1-12 for the UARP and 2-9 for the Chili Bar Project provide for review, notification, and/or evaluation of potential effects of the UARP and Chili Bar Project on special status species, in consultation with the Forest Service or BLM, depending upon which agency lands would be affected. Although it appears that Project facilities do not directly cause deer mortality or impede migration, monitoring wildlife mortality would identify any future need for preventive measures at Project canals and ensure that any fencing or crossing structures are functional and would minimize potential harm to mule deer and other small game in the Project area. Implementation of the wildlife and plant measures specified in Proposed Article 1-12 for the UARP would cost $29,900 annually and the benefit to wildlife would be worth the cost. An Avian Protection Plan that would address retrofitting UARP transmission lines so that they meet the current APLIC standards would minimize avian electrocution or collision once all transmission lines meet these standards. The development of the plan and retrofitting of existing transmission lines would cost $20,300 annually, and the benefit to raptors would be worth the cost.

UARP transmission lines, which require occasional maintenance clearing, cross through sections of the Pine Hill Preserve. Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species. Additionally, consultation with the Forest Service, FWS, and CDFG prior to any new construction or maintenance and identifying any potential effects, would protect any special status species that occur either within the Pine Hill Preserve or elsewhere within the Project boundary. To protect sensitive species, we would add to both SMUD's and PG&E's proposed measures annual employee awareness programs to educate employees and key personnel about the known locations of special status species and habitat. Although not specifically included, including an awareness program as part of the vegetation management plan in Proposed Articles 1-13, *Vegetation and Invasive Weed Management Plans*, for the UARP would effectively protect species, such as valley elderberry longhorn beetles and elderberry shrubs, within the Project boundary from any transmission line maintenance activities by clearly delineating them as areas to be excluded from maintenance. We estimate that the annual cost for development and implementation of the invasive weed and vegetation management plans to be $57,600 for the UARP and $6,500 for the Chili Bar Project. The benefits of protecting sensitive plant and wildlife species, reducing noxious weeds, and educating personnel about protocols for identifying and protecting Project-related sensitive species would be worth the cost of these plans.

No known special-status species would be affected by the Chili Bar Project. Consulting with the BLM, however, annually to update the special-status species list and prior to any ground-disturbing activity, as discussed in Proposed Article 2-9, would ensure that special status plant or wildlife species that either currently occur or could occur in the Project boundary are protected. The benefit of protecting special status species would be worth the estimated annual cost of $5,000.

Monitoring Programs

Aquatic Resources

Proposed Articles 1-5 for the UARP and 2-4 for the Chili Bar Project, *Monitoring Program*, set forth a comprehensive program of monitoring to document the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoirs and stream reaches. The Settlement Parties have agreed to use trout biomass as an indicator of the ecological health of stream reaches and would use the baseline biomass values for monitoring the effectiveness of the proposed flows in achieving the trout biomass objectives for each stream reach. They also have established permanent monitoring transects for the channel geomorphology monitoring to determine the long-term effects of the increased flow in sediment transport and channel width.

Fish, Amphibians, and Aquatic Reptile Populations

Project operations could affect fish and amphibian populations in the stream reaches. Monitoring the response of native fish populations to the increased minimum streamflows over the term of the license would provide information that can be used to inform resource managers whether or not the stated resource goals are being met. Monitoring the response of all life stages of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles over time would be necessary to evaluate potential effects of the proposed flow changes, along with effective adaptive management changes, as needed. Mountain yellow-legged frogs have not been found in the Project-affected reaches or reservoirs despite suitable habitat, perhaps due to populations of predatory fishes and bullfrogs. However, mountain yellow-legged frogs may use Project-affected reaches as migratory corridors. Monitoring would determine the presence/absence and distribution of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles in Project-affected reaches, and help identify potential migration/dispersal barriers. The proposed monitoring would also document the potential effects of the proposed changes in minimum flows, operational spills, channel maintenance pulse flows, ramping rates, and the recreational streamflow releases on all foothill yellow-legged frog life stages.

Riparian Habitats and Algae

Riparian habitat could be affected by flow alterations and large water level fluctuations resulting from the proposed Projects' operations. Monitoring riparian vegetation every 5 years for the first 15 years of a new license, followed by subsequent monitoring every 10 years, as proposed, would allow the riparian vegetation to respond to the proposed flow regimes without being confounded by short-term changes caused by rare events such as a large flood. The algal species identification and monitoring plan for the Junction dam, Camino dam, Slab Creek dam, and Robbs Peak dam reaches would assess the distribution and possible adverse affects of alga(e) in the Project-affected reaches. Because of the extent of algae growth in the Junction dam reach and the potential for *D. geminata* to adversely affect water quality and the aquatic community, including preventing successful reproduction of foothill yellow-legged frogs, it is important to establish baseline information for the new flow regime as to species and potential adverse effects that could result from abnormally high densities of algae. This information could be used to determine whether the new streamflow releases effectively reduce the extent of algae in the Junction dam reach and help determine whether there are algae-related problems in other UARP-affected stream reaches. Because of the extent of algae growth in the Chili Bar dam reach and the potential for *D. geminata* to adversely affect water quality and the aquatic community, it also is important to periodically evaluate whether *D. geminata* has become established in this reach.

Geomorphology

Project operations could affect sediment deposition in some of the Project stream reaches. Monitoring changes in sediment deposition as specified in Proposed Article 1-5 for the UARP and 2-6, *Sediment Management Plan*, for the Chili Bar Project would allow SMUD and PG&E, in consultation with the Agencies and BLM, to determine if and when to dredge the reservoirs and where to deposit the dredged materials. Based on our review of the studies, we conclude in section 3.3.1.2 that pulse flows in the reaches where sediments are trapped or deposited would help to transport these sediments downstream. The downstream reaches are where sediment most likely would have traveled if the impoundment did not exist; however, because any added material could threaten the resources of the reach, the development of a sediment management plan for the Chili Bar Project would minimize these potential effects and would be worth the estimated annual cost of $800 for PGE and $6,500 annual cost for SMUD. This is one of several monitoring programs where SMUD would share the cost of implementation.

Water Quality

Development and implementation of the water temperature monitoring plan in Proposed Articles 1-5(9) and 2-4(5) would document spring through summer water temperatures in the UARP bypassed reach and temperatures of water passing through or over Chili Bar dam and facilitate a determination of whether the fish and amphibian communities are supported. Monitoring water temperature immediately downstream of the dams, as proposed, would document thermal conditions at the upper end of the bypassed reaches and provide insight into conditions throughout reaches that experience little change in temperature (e.g., Buck Island dam). Monitoring at the other sites listed in table 3-27 along with up to five additional UARP sites and two additional Chili Bar Project sites would document thermal conditions downstream of confluences, and in critical locations within the Ice House dam, Camino dam, Slab Creek dam, and Chili

Bar dam reaches where it is not clear whether the proposed minimum streamflow schedule would achieve the temperature objectives.

Monitoring temperature in the Ice House dam reach just upstream of Junction reservoir and in the SFAR immediately downstream of Slab Creek dam would provide the temperature data necessary to determine whether scheduled high flow releases to these reaches may need to be adaptively managed.

The results of SMUD's 2002 to 2004 monitoring of reservoir temperatures provides evidence that there is virtually no cold water available in the Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino reservoirs. Because substantial temperature data were collected within the past 10 years, sufficient data likely already exist to answer most questions about coldwater availability in the other UARP reservoirs. Therefore, the existing temperature data could be used, as appropriate, to evaluate the availability of cold water prior to collecting any additional reservoir temperature data. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 1-5(9), *Monitoring Program*, would document spring through summer water temperatures in UARP bypassed reaches under any new Project operations and help confirm that desired fish and amphibian communities are supported, although we question the benefit of monitoring temperatures in UARP reservoirs.

Monitoring water temperature immediately downstream of the Chili Bar dam, as proposed in Proposed Article 2-4(5), *Monitoring Program*, would document thermal conditions at the upper end of the Chili Bar reach under any new Project operations. Monitoring at the other three designated sites downstream of the Chili Bar dam with up to two additional sites would document thermal conditions in critical locations within the Chili Bar dam reach. Because this reach is not managed for coldwater fishes and results of PG&E's 2002 to 2004 temperature monitoring study show that little cold water is available in Chili Bar reservoir, we question the need for additional monitoring of Chili Bar temperatures. However, development and implementation of the water temperature monitoring plan referred to in Proposed Article 2-4(5), *Monitoring Program*, would confirm that desired fish communities and amphibians are supported under any new Project operations.

Proposed Articles 1-5(10) and 1-6(8) for the UARP and 2-4(6) for the Chili Bar Project would provide data to document consistency with water quality standards. We conclude in section 3.3.2.2 that geologic and hydrologic characteristics primarily control the concentrations of minerals, and many of the waters affected by the UARP and Chili Bar Project have little potential for contamination from petroleum products. Therefore, we question the need for these parameters at each monitoring location. SMUD and PG&E's proposed approach to select and monitor bioaccumulation of the specified metals in aquatic organisms at 5-year intervals would ensure that results of this sampling effort are consistent with the Water Board's approach and would facilitate evaluation of changes in fish body burdens of these metals. However, we conclude that the proposed UARP and Chili Bar Project operations would not likely have any significant effect on mercury methylation or bioaccumulation in the Projects reservoirs.

Sampling near swimming beaches at the popular recreational sites, such as those at Union Valley reservoir and in the whitewater reach downstream of the Chili Bar dam, shows exceedances of bacteria. SMUD and PG&E's proposed approach to select and monitor 15 shoreline recreational locations within the Project boundary would document near worst-case bacteria concentrations at locations of greatest concern.

Once data have consistently documented that specific water quality parameter(s) support the corresponding desired aquatic resources, there may no longer be a need for monitoring those parameters/sites. Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, include clauses that address this issue and would potentially allow SMUD and PG&E to reduce monitoring of minerals, nutrients, metals, petroleum products, hardness, and bacteria. We conclude that Proposed Articles 1-5(10) and 2-4(6) would provide data to document any unanticipated effects on water quality under any new Project operations and identify any trends in risks to the health of humans and wildlife. We note that monitoring through the entire new license term may not be necessary and recommend reducing or ceasing monitoring of water quality parameters and sites where data consistently demonstrate little or no effect on water quality standards.

Entrainment at Robbs Peak

Proposed Article 1-5(12) provides for monitoring entrainment at the Robbs Peak development. We conclude in section 3.3.4.2 that there is little evidence of fish entrainment at the Robbs Peak powerhouse. Studies performed by the licensee showed that the population of rainbow trout in the SFFR upstream of the powerhouse is naturally limited by intermittent summer flow, sub-optimal water temperatures, and unfavorable winter conditions. Fish that transit the Gerle Canal from Gerle reservoir may also become entrained in the powerhouse. However, the canal provides very little suitable habitat for trout. Although studies performed during relicensing showed that the potential for fish to become entrained at Robbs Peak Powerhouse is extremely low, the adaptive management program nevertheless calls for development of mitigation measures if monitoring indicates fish are being entrained there. The development of mitigation to minimize any entrainment at the Robbs Peak afterbay through the adaptive management program would likely protect the few native trout currently in the SFRR, where populations appear to be declining.

Terrestrial Resources—Bear Interactions and Bald Eagles

Human-bear interactions are infrequent but are increasing in the UARP area. The proposed upgrades at many of the recreational facilities include bear-resistant containers. Implementation of the bear management plan monitoring plan proposed in Articles 1-5(13) for the UARP would determine if the proposed bear-proof lockers and trash bins are successfully keeping bears away from campgrounds or if additional measures would be needed.

Bald eagles nest at UARP's Union Valley and Loon Lake reservoirs and wintering eagles occur throughout the UARP area. Neither nesting nor wintering bald eagles have been observed at the Chili Bar Project. UARP operations, maintenance, and recreation all have the potential to disturb or injure the federally threatened bald eagle. Proposed Article 1-5(13) for the UARP, which calls for SMUD to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS, would allow nest productivity numbers to be assessed to determine if Project recreation is adversely affecting bald eagle fledging success. If monitoring shows Project activities are adversely affecting the bald eagle, the adaptive management program proposed in Proposed Article 1-6 would allow Project activities to be changed.

Summary

The overall Monitoring Program for the UARP is expensive, totaling about $448,100 annually, with the development and implementation of most of the individual monitoring plans ranging from $6,200 for the monitoring plan for bioaccumulation in fish to $110,000 for water quality monitoring. However, noting some exceptions, the monitoring program is well-designed, provides specific metrics on which to base the effectiveness of proposed fish and wildlife protection measures, and ties directly to adaptive management measures by showing whether proposed measures are having the intended results.

We estimate the cost of the monitoring programs specified for the Chili Bar Project would be $12,700 annually for PG&E and $102,000 for SMUD's share of the costs of monitoring programs resulting from the overlapping studies. We would expect some of these costs to be reduced if the monitoring results demonstrate that Project operations consistently meet water quality standards or other monitoring objectives and monitoring is no longer required.

Adaptive Management Programs

Proposed Articles 1-6 and 2-5, *Adaptive Management Programs,* provide specific steps that would be taken if the monitoring program and other scientific information indicate that it is likely the intended results of the fish and wildlife measures would not be met without adaptive management changes. The specific adaptive management changes identified in the Settlement Agreement mostly represent a balancing of interests between the protection of native fish, amphibian, and reptile populations and recreational boating use within the framework of maintaining good water quality in several reaches. Overall, the Proposed Articles provide a reasonable set of steps that could be implemented if the proposed measures fail to achieve intended results in these reaches. In some cases, implementation of the adaptive management measures would reduce energy losses, and in other cases, costs would depend on the specific measures developed in response to the monitoring results (e.g., measures to address entrainment).

Vegetation and Invasive Weed Management

Invasive weeds occur throughout both Project boundaries. For both Projects, operations, maintenance, and recreation can act as a method of seed dispersal and create disturbed areas favorable to the spread of invasive weeds. Proposed Articles 1-13 for the UARP and 2-10 for the Chili Bar Project, *Vegetation and Invasive Weed Management Plans,* provide for the control of noxious weeds and address vegetation management, including soil and erosion control, revegetation, and transmission line vegetation maintenance. Implementing these plans would control current populations and future infestations of noxious weeds within the Project boundary on Forest Service and BLM lands at the UARP and Chili Bar Project, respectively.

We understand the proposed invasive weed management plan for UARP to be intended for lands within the Project boundary that are adjacent to Project features directly affecting National Forest System lands, including about 150 miles of transmission lines upstream of the proposed Iowa Hill development. Because not all Project-related noxious weed infestations occur on Project lands that affect National Forest System lands, expanding the invasive weed and vegetation management plan to all lands that are affected by Project operations or maintenance within the Project boundary would result in more complete control of noxious weeds that are affected by the proposed Projects. This expansion would benefit local plants and wildlife, including rare plants such as the federally listed Pine Hill endemic species that occur outside of National Forest System lands. In its comments on the draft EIS, SMUD indicated that the lower 30 miles of transmission lines traverse private lands making it difficult to determine which infestations result from project activities. SMUD says that these uncertainties could potentially increase SMUD's responsibilities and would increase the cost of its proposed invasive weed management plan. We now recognize that about 30 miles of Project transmission line from the proposed Iowa Hill development downstream to the Folsom Junction are outside of National Forest System lands, which would result in an additional cost to SMUD. To minimize this additional cost, we recommend conducting annual monitoring in conjunction with annual inspections and Project maintenance in the transmission line rights-of-way. We now estimate the annual cost of SMUD's vegetation management plan and invasive weed plan with our expansion to include the 30 miles of transmission lines on non-National Forest System lands to be $87,900, or about $30,000 more than SMUD's more limited plan. Overall, increasing the invasive management and vegetation management plans to include infestations on Project lands would be worth the added cost.

Significant populations of the noxious weeds Scotch broom and Himalayan blackberry occur on the Chili Bar reservoir shoreline and along roadsides. Project operations and maintenance activities create conditions that are favorable to the existence of noxious weeds. Implementing the proposed invasive weed and vegetation management plans as proposed by PG&E at the Chili Bar Project would control current populations and future infestations of noxious weeds within the Project boundary on BLM lands. Because not all Project-related noxious weed infestations occur on BLM lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary would result in more complete control of noxious weeds that are affected by Project operations and maintenance. The proposed vegetation management plan would establish practices that would minimize conditions favorable to the establishment of noxious weeds. The costs associated with these plans for PG&E would be $6,500. The benefit of controlling noxious weeds at the UARP and Chili Bar Project would justify the costs of these plans.

Recreation Enhancements

Recreation Implementation Plan

The Settlement Agreement includes a suite of proposed articles (Proposed Articles 1-15 through 1-26 for UARP and 2-13 through 2-15 for the Chili Bar Project) that focus on upgrading, expanding, operating and maintaining recreational facilities and services in response to user demands; monitoring future use; providing additional whitewater boating opportunities; providing public information; and fish stocking (at the UARP) within the framework of a recreation plan. Proposed Article 1-15, *Recreation Implementation Plan*, would increase and formalize SMUD's responsibilities to provide and update formal and dispersed recreational facilities that provide access to the Project lands and waters. The proposed plan reflects the unique character and management responsibilities of public recreational sites around the Projects and recognizes that although SMUD has no legal authority to redevelop public access sites owned or managed by others, it has the responsibility to ensure reasonable public access to Project lands and waters for those portions of the recreational sites currently within the Project boundary or proposed to be within the Project boundary. The assistance and funding included in the plan would improve delivery of recreational services by streamlining implementation of the improvement measures and providing a mechanism for earmarking licensees' funds to specific Project-related improvements.

Monitoring recreational use over time in a manner consistent with the Commission's recreational use and needs assessment (Form 80) would provide environmental and recreational use data that would allow SMUD to modify the type and quantity of recreational facilities to be commensurate with demonstrated users preferences and demand. As proposed, the recreational measures would provide substantial benefits to recreational visitors and the proposed recreational streamflows are generally planned to mimic natural conditions and enhance terrestrial and aquatic resources within and downstream of the Project developments. Based on what is known about the Projects, the proposal appears to simultaneously protect and enhance environmental resources while continuing to provide and enhance recreational opportunities. However, as with any complex system, changes in recreational use patterns or Project operations could have unanticipated adverse effects on aquatic or terrestrial resources. The proposed adaptive management measures would provide a means to address these effects over the term of any new license issued. As proposed, SMUD would file reports with the Commission summarizing monitoring results. If any recreation-related adaptive measures are required during the term of any new license, SMUD would file an amendment to the proposed recreation implementation plan with the Commission for approval.

The Settlement Agreement does not provide for a recreation plan for the Chili Bar Project nor does PG&E propose to prepare a plan. However, PG&E proposes a few specific recreational measures to improve recreational access to the Project. In its license application, PG&E contends that recreational use is low, safe public access is best achieved at the upstream end of the reservoir, and Project operations limit recreational opportunities near Chili Bar dam. In subsequent sections, we generally agree with this assessment. However, we expect that recreational use and needs would change over the term of any new license issued for the Chili Bar Project. Development of a recreation plan for the Project, based on periodic monitoring, would help the licensee manage these changes in recreational demand and provide a structure to evaluate the adequacy of Project recreational facilities to meet future recreational demand. Such a plan would be designed to achieve the following objectives: (1) promote public safety and increase public awareness of recreational opportunities at the Chili Bar Project; (2) maintain reasonable health and safety standards through a litter and sanitation management; (3) provide safe and reasonable access to the Project reservoir; (4) address congestion and conflicts among visitors and resources related to recreational activities, if any; (5) provide reasonable recreational facilities for a range of recreational opportunities; (6) reduce recreational effects on cultural, terrestrial, and aquatic resources; and (7) provide a forum for public and agency input into recreational facility needs at the Project. We estimate that the annualized cost for the development of a recreation plan for the Chili Bar Project would be $2,700, and the benefit of coordinating recreational enhancements through such a plan would be worth the cost.

Project Boundary and Recreational Facilities

Proposed Article 1-18, *Review of Recreational Developments,* lists 34 recreational facilities and specifies including these facilities within the Project boundary. Most of the recreational facilities proposed to be included in the Project boundary are immediately adjacent to the existing Project boundary and directly associated with recreational sites that provide access to the lands and waters used for hydroelectric operations. However, two of the sites—Airport Campground and Big Hill Communication Site—are well outside the current boundary.

SMUD built Airport Flat Campground in 1996 as part of the exhibit R amendment to the license, and it is one of the few licensee-developed facilities away from a main reservoir. SMUD developed the site in lieu of expanding Gerle Creek Campground as a result of concerns that an expanded Gerle Creek Campground would lead to crowding conditions and degradation of the recreational experience. As such, the Airport Flat Campground was developed to handle existing and future recreational demand associated with the Project. Big Hill Communication Site was also built by

SMUD under the existing license; it is primarily used as a communication, fire observation and fire staging area for the Forest Service and includes the Big Hill Vista. Visitors to the area often drive to the top of Big Hill to overlook Crystal Basin, a vista that includes UARP facilities, and the high Sierra Mountains to the east. Although the principal purpose of the site is for Forest Service operations, including those specific public accessible facilities on top of Big Hill within the Project boundary would ensure that the site is maintained for public use for the term of any new license issued. We find it reasonable to include these facilities within the Project boundary.

SMUD’s proposal to enhance, expand and formalize the sites listed in table 3-65 (Proposed Article 1-19) would substantially improve public access in the Project area. The proposed improvements to recreational facilities within the Project boundary are site-specific, derived from a recreational needs assessment, prepared in consultation with the Forest Service and stakeholders, and targeted at either improvements to existing facilities or development of informal facilities. In addition, the proposal considers recreational needs from a geographical perspective and recommends site improvement measures based on the overall need in the Project area. The total annualized costs of SMUD's proposed upgrades at the 34 developed and proposed recreational sites would be $1,720,800. Although upgrading the Project recreational facilities would be costly, the improvements are scheduled to be implemented during the next 20 years, are supported by user data projecting increased use over the term of any new license, and would benefit the hundreds of thousands of annual visitors to the Project area.

PG&E's proposal to provide a parking area off Rock Creek Road, a trail that leads from the Rock Creek Road to Chili Bar reservoir, an informational kiosk along the trail, and a picnic table at the reservoir (Proposed Article 2-13) would address the demand for day-use recreation opportunities identified in the recreation needs study. The annual cost for providing this improved access to the Chili Bar reservoir and reach would $15,200 and would be worth the cost by formalizing the existing informal use of this popular area. PG&E also proposes to exclude about 152 acres of land from the existing Project boundary. Our preliminary analysis suggests that this proposed boundary change would have minimal environmental effects; however PG&E has not demonstrated that the lands it proposes to exclude are no longer needed for Project purposes and therefore, absent this, we recommend these lands remain in the Project boundary.

Recreation Operation, Maintenance, and Administration

Operation and maintenance are essential components of any recreational development to ensure that the facilities are maintained at a level that provides reasonable public access for the term of any new license issued. In addition to the proposed maintenance activities included in Proposed Article 1-20, Proposed Article 1-21 specifies that SMUD address sanitation along with other recreation use-related issues by annually paying the Forest Service $1,000,000 to provide operation, maintenance, and administration of developed recreational sites, facilities, or activities that are within, adjacent to, or in the vicinity of UARP reservoirs and facilities. These activities include picking up litter, providing public information, enforcing rules and regulations, maintaining signage, and other activities associated with the effects of recreational use at Project recreation facilities within and on adjacent Forest Service lands. After examining the Settlement Agreement rationale document, we concluded in the draft EIS that the cost of work done by Forest Service for maintenance, operations, and administration of project recreation sites equals or exceeds the $1,000,000 annual cost in the Settlement Agreement. However, following the Commission's policy on setting caps, we did not recommend SMUD's share of these costs be set at a maximum of $1,000,000 as specified in the Settlement Agreement.

In comments on the draft EIS, SMUD expressed concern that without the cap specified in the Settlement Agreement that the cost to SMUD to off-set Forest Service's administering developed recreation sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities could be far higher. The Forest Service suggests that the annual collection agreement with SMUD would be the appropriate document to provide clear direction and definition to ensure SMUD's payments to the Forest Service directly contribute to Project and Project-related operations, maintenance, and administration. We note that SMUD has been and continues to be responsible for the operation and maintenance costs associated with its recreation facilities within the project boundary. We agree with the Forest Service that the collection agreement between SMUD and the Forest Service described in preliminary section 4(e) Condition No. 47 (and associated annual amendments) would be an appropriate way to clearly define and direct what O&M tasks would be done, estimate the cost, and clarify which funds directly contribute to project related O&M.

At the same time we recognize some of the recreation occurs at undeveloped sites surrounding the reservoirs and that the Settlement Agreement includes SMUD's share of the Forest Service's cost of servicing these areas. The Forest Service comments that the costs associated with administering dispersed recreation adjacent to and in the vicinity of UARP reservoirs and facilities are very minor relative to the total costs to operation, maintain, and administer developed and project recreation on behalf of SMUD. Nevertheless, because these costs are incurred for tasks done outside the project's boundary, following the Commission's recent settlement policies on project boundaries, we would not recommend the Commission require SMUD to reimburse the Forest Service for these costs.

Recreational Streamflows

The whitewater run below Slab Creek reservoir of Class IV rapids is currently used between Ice House and Chili Bar. The Settlement Agreement proposes that SMUD use existing facilities and spill at Slab Creek dam to make whitewater flow releases in the spring. The Settlement Agreement also calls for more extensive releases[46] if: (1) the Iowa Hill development is built, or (2) Iowa Hill is not built and the trigger for use of the whitewater flows is met by year 10 after license issuance. If SMUD does not commence construction of Iowa Hill, it would monitor whitewater use during the first 10 years after the license issuance to determine if the use triggers set in year 5 are exceeded. The Settlement Agreement notes that the proposed October flow releases would not occur if after 5 years of monitoring the data shows that releasing the whitewater flows would have significant effect on environmental resources. If October flows cannot be provided because of operational, aquatics, or other reasons, then the equivalent flow volume would be added to the spring flow releases.

Given that the reach already draws visitation at the expert level (Class IV), we would expect, with interest by outfitters, more use in the reach. However, currently there are no recreational use data available to gage how much use would occur. The cost of providing the more extensive recreational boating flows below Slab Creek would be considerable. While SMUD says that the use of the Iowa Hill development would help them make these releases without the expensive reconfiguration of White Rock tunnel adit, the recreational streamflow releases would result in $322,000 in foregone energy production annually at the UARP. The estimated cost for providing recreational streamflow releases downstream of Ice House dam would be an additional $108,000, for a total cost of $430,000 in forgone energy.

If the construction of the Iowa Hill development has not commenced by year 5 after license issuance, the Settlement Agreement calls for SMUD to consult on a Whitewater Boating Recreation Plan describing whitewater recreational use and impacts and setting triggers that would determine if SMUD should modify Project facilities to allow SMUD to deliver the more extensive recreational flows set in the agreement. We agree with the Settlement Agreement's use of triggers to help the parties decide if the more extensive whitewater releases should be provided. The estimated annual cost for preparing and implementing the Whitewater Boating Recreation Plan including the necessary access and support facilities would be $48,600.

Because of the foregone energy that would result from releasing the more extensive recreational flows set in the Settlement Agreement and the unknown level of whitewater use this stretch of the river will get, we recommended in the draft EIS that in year 10 after license issuance, and based upon the Whitewater Boating Recreation Plan, SMUD, after consulting with the interested parties, file for Commission approval the whitewater releases they recommend for the remainder of the license, with or without the Iowa Hill development. In comments on the draft EIS SMUD, the Forest Services, and many others requested that we adhere to the streamflow releases provided for in the

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[46]The more extensive table of releases would require boating releases during both dry and critically dry water years and include up to12 springtime releases and 6 October releases.

Settlement Agreement as representing a hard fought balancing of interests between the development and nondevelopment uses of the river. We recognize the effort that went into determining the proposed streamflow releases and agree that little would gained from revisiting or renegotiating the proposed streamflow releases. However, we continue to recommend that the more extensive recreational streamflow be provided only if the recreational demand triggers are met. If after 10 years of monitoring in year 15, the recreational use is sufficient to justify the additional cost, then we would agree that the flow volume should be consistent with Settlement Agreement.

Public Information Services

The proposed brochures and map and the interpretive, education, and public information plan (Proposed Articles 1-25 for the UARP and 2-14 for the Chili Bar) would improve upon existing public education and interpretation information with updated materials that complement the Forest Service and BLM publications. The proposal would help expand recreational opportunities by providing visitors with easily accessible information about Project resources. Real-time information for all streamflow and reservoir elevation locations normally can be easily and inexpensively be collected in either 1-hour or 15-minute intervals and be made available to the public. Based on this information, the public, operators of downstream projects, such the Middle Fork American River Project, and others would be able to coordinate their activities and operations. Providing the public with this information to enable them to coordinate whitewater activities and having real-time flow data would benefit public recreation use and would justify our estimated annual cost of $34,600 for the interpretive, education, and public information plan and brochures and $13,100 for the upgrading gages and providing real-time flow data.

Flow compliance monitoring for releases from Chili Bar reservoir would necessitate the continuing operation of gage no. 11444500, located downstream of Chili Bar dam. Currently, this is not a real-time USGS gage, but flows and gage heights are available at 1-hour intervals on the CDFG web site for this streamflow gage. Reservoir level compliance would likely entail upgrading the current system that PG&E uses to monitor the water level within Chili Bar reservoir. The annual cost associated with public information services as specified in Proposed Article 2-14 would be $1,700 for PG&E, plus SMUD's share of $14,200, and would be worth this modest cost.

Fish Stocking

Reservoir-related angling is one of the most important recreational activities associated with the Project, particularly in the large storage reservoirs, including Loon Lake, Union Valley, and Ice House reservoirs. Assisting CDFG in fishing stocking (Proposed Article 1-26 for the UARP) would help ensure that the recreational fishery is maintained for the term of any license issued. We note that recreational fish stocking could adversely affect mountain yellow-legged frogs if populations were to become established in Loon Lake (elevation 6,410 feet) and may also adversely affect foothill yellow-legged frogs in the reaches downstream of these reservoirs, particularly Ice House dam reach, due to escapement. However, the level of proposed stocking, which is similar to the existing CDFG stocking program, would not be expected to result in any additional effect on frogs over existing conditions. The $106,100 annual cost of fish stocking is justified based on the large angler demand at these popular reservoirs.

Trails System Plan

As proposed by SMUD and PG&E, the trail-specific measures in Proposed Article 1-31 would allow SMUD to continue to access the Project developments at the higher elevations in Crystal Basin where there are no access roads. Although the proposed measure would substantially benefit recreational visitors by extending and formalizing trial access to Project facilities, we would limit SMUD's responsibility to those trails that are used primarily for Project operations and that are within the Project boundary. SMUD's proposed trail plan as modified by staff would help to ensure that the condition of the portion of the trail system used by SMUD is maintained at an adequate level over time. In addition, the plan would help ensure that trail users are educated about allowed and prohibited activities and that use is zoned in a manner to avoid adverse effects on aquatic and terrestrial resources in the area.

PG&E's proposal to develop a trail on BLM lands to access the Chili Bar reservoir in Proposed Article 2-13 would formalize recreational use that already occurs on these lands. Currently, anglers, picnickers, and other visitors follow an old logging road part way into the canyon and follow a user-made trail to the water's edge. Formalizing this trail would help ensure that it is designed to follow natural contours and would reduce erosion and other effects that can be associated with informal trials. The estimated annual cost of $15,200 would be justified based on existing use of the informal trail.

Transportation Management System

Proposed Article 1-30 for the UARP, *Transportation Management System,* provides for a plan to establish SMUD's level of responsibility for improving and maintaining Project access roads and perform several specific improvements, including reconstructing and surfacing several Forest Service roads that provide access to Project recreational facilities. Upgrading drainages to meet 100-year storm events and implementing erosion control measures during maintenance activities, including snow removal, would minimize the potential for road erosion into streams. Upgrading existing roads used for access to Project facilities and Project recreational facilities would enhance public safety and access at several highly used recreation facilities. Developing and implementing the plan, including annual snow plowing, would cost about $279,800 annually. Reconstructing Forest Service access roads would be relatively expensive with an annual cost of $290,900 annually but would address several public safety concerns affecting thousands of visitors to the recreational facilities at Union Valley and Ice House reservoirs. We note that it is the Commission's practice to include only those roads used primarily for Project purposes that are located within the Project boundary. Therefore, the transportation management system plan should clearly identify the roads either already within or proposed to be included in the Project boundary that are necessary to access the Project recreational facilities and limit SMUD's responsibilities to those access roads or portions of roads that are primarily used for Project purposes. If the identification of the roads or portions of roads that SMUD would be responsible for involves fewer roads than envisioned in the proposed measure, we would expect a corresponding reduction in the annual cost for repair and maintenance.

Visual Resource Protection

Proposed Articles 1-27 for the UARP and 2-16 for the Chili Bar Project provide for the development and implementation of visual management plans consistent with the Forest Service VQCs for the UARP as well as the BLM visual resource standards for the Chili Bar Project. The Proposed Articles also provide for meetings with the land managing agencies every 5 years to review opportunities to improve how the facilities blend with the surrounding landscapes. These plans would provide for short-term maintenance activities including painting facilities and for review of future maintenance activities to ensure that the facilities do not significantly detract from the natural landscape of the area. The annualized capital cost associated with the measures to improve the visual quality of existing facilities at the UARP would be $77,200 and the annualized for preparation and implementation of the visual resources plan would be $5,500 for the UARP. The benefit to the aesthetic resources of the Project of implementing both the capital measures and the plan would be worth the costs.

Cultural Resources

Proposed Articles 1-23 for the UARP and 2-17 for the Chili Bar Project provide for the continued protection of cultural resources through finalization of HPMPs for the UARP and Chili Bar Project. Proposed Articles 1-24 for the UARP and 2-18 for the Chili Bar Project provide protocols for unanticipated discoveries over the term of any licenses issued for the Projects. SMUD drafted an HPMP in 2005 that was reviewed by the Forest Service in June 2006. On February 11, 2008, the Commission issued the draft PA and draft HPMP for review within a 30-day comment period and directed SMUD to file a revised HPMP within 90 of the close of the comment period. Finalization and implementation of SMUD's or PG&E's HPMP in consultation with the SHPO, Tribes, and the Forest Service in the case of UARP or BLM in the case of Chili Bar would ensure that adverse effects on historic properties arising from UARP or Chili Bar Project operations or Project-related activities over the term of the licenses would be avoided or satisfactorily resolved. We estimate that implementation of the final HPMPs would cost SMUD about $6,600 annually and PG&E about $3,500 annually and the benefit of protecting cultural resources would outweigh the costs of these plans.

Iowa Hill Development

The Settlement Agreement includes a series of Proposed Articles (1-37 through 1-50) that set forth SMUD's commitments for resource protection during the construction and operation of the proposed Iowa Hill development. These measures would address potential effects of the proposed development on native fish in Slab Creek reservoir and other environmental resources of the Eldorado National Forest and surrounding landscape. In written and oral comments on the draft EIS, many local residents expressed concerns about traffic congestion and the damage that heavy equipment would cause on local roads, many of which are unimproved one-lane country roads. They also were concerned about the potential for fire and the damage that a fire cause on Iowa Hill and in the adjacent canyon. Many of the individuals who commented on the draft EIS also attended meetings of the Advisory Committee and questioned why various mitigation measures being considered by SMUD were not included in the draft EIS. In response to these concerns, SMUD indicated that it was working on a Transportation Route Technical Report and an Addendum to the 2005 Visual Resources Technical Report. We asked SMUD to file these reports which they did on January 31, 2008. We have incorporated the results of these revised studies into the final EIS. We also note that the draft EIS did not provide a description of the draft transportation management plan that SMUD included in its license application. We have added information from this draft plan and include the measure in SMUD’s proposed action in the final EIS.

Storm Water Pollution Prevention Plan and Erosion Control

Construction of the Iowa Hill development could affect water quality. Proposed Article 1-42, *Water Quality and Water Pollution*, provides for a plan identifying the best management practices for erosion and sediment control and the method of installation and removal of a temporary coffer dam in Slab Creek reservoir to prevent any construction disturbance to the water quality in the reservoir. We reviewed the technical reports and the physical conditions of the reservoir shoreline and conclude that the shoreline attributes and location of the intake combined with the use of an impermeable liner in the upper reservoir would minimize sediment mobilization and shoreline erosion in the Slab Creek reservoir. The proposed storm water pollution prevention plan would provide reasonable assurance that water quality and aquatic habitat are not directly or indirectly adversely affected by SMUD’s construction activities. SMUD also would have an environmental monitor onsite to observe conditions. The annual costs associated with the storm pollution prevention plan would be $3,600 and would be necessary to protect aquatic resources.

Groundwater Monitoring

Proposed Article 1-43, *Groundwater,* provides for the development and implementation of a plan for monitoring groundwater during and after construction of the Iowa Hill development. Operation of the Iowa Hill development could result in seepage along the tunnel resulting in soil instability and affecting water quality in the water table. SMUD indicates that eliminating all groundwater from entering and exiting the water conveyance tunnels would be infeasible. Therefore, implementation of this plan would provide information on the effects of the development on groundwater and allow SMUD to recommend mitigation to remedy identified effects on groundwater. The annualize cost of the groundwater monitoring plan would be $3,600 and would be worth the cost to control the effects of the Project on groundwater.

Water Temperature and Fisheries in Slab Creek Reservoir

Proposed Article 1-40, *Aquatic Resources*, includes several provisions to protect native fish (hardhead) populations in Slab Creek reservoir. These provisions include monitoring hardhead populations before and after construction of the pumped-storage facilities, monitoring water temperatures in the shallow water areas of Slab Creek reservoir, ensuring that water surface fluctuations do not occur as a result of Project operations, and monitoring the entrainment of hardhead. Simulations of the operation of the proposed development suggest that the pumping operations could lead to slightly cooler conditions in Slab Creek reservoir. We would not expect increases of less than 1◦C to affect hardhead populations. Monitoring water temperatures along the edge of the reservoir would provide data that could be used along with information about the distribution of hardhead to document if pumped-storage operations are not affecting the distribution of hardhead.

Project operations would typical result in at least 35 feet of water above the Iowa Hill intake. As discussed in section 3.3.3.2, *Aquatic Resources,* because most of the hardhead are at shallower depths and/or near the reservoir margins, entrainment into the intake would likely be minimal. Furthermore, the highest frequency of occurrence of hardhead was at shallow depths near the reservoir margin and juvenile hardhead are not expected to occur at the depth of the intake. Monitoring hardhead distribution and whether entrainment of these fish (or others) occurs as a result of Project operations for 2 years as proposed by SMUD would be justified to document whether this expectation is borne out. The annualized cost of monitoring hardhead populations and monitoring temperature in the shallow water areas of Slab Creek reservoir would be $25,400 and $2,600, respectively.

Terrestrial

Construction of the Iowa Hill development would require the clearing of the majority of the 283-acre site, about 141.5 acres of land. Proposed Article 1-41, *Terrestrial Resources*, provides for in-kind replacement of permanently disturbed vegetation. The upper reservoir, berm, and switchyard would result in the loss of upland mixed-conifer forest, and the transmission line would result in the conversion of mixed conifer forest to non-forested montane shrubland habitat. No riparian vegetation or wetlands would be affected by construction of the proposed development.

Although we concur with the proposed measure, we note that the specific parcels of land that would be purchased, the habitat types they contains, or the wildlife management goals that would be applied to the properties have not yet been determined. Therefore, we recommend that SMUD develop a wildlife lands mitigation plan that identifies the locations of wildlife mitigation lands, management goals and objectives, management activities that would be implemented, and measures to ensure that the management goals would be met. In comments on the draft EIS, SMUD asked that our recommended plan allow for alternative approaches to land conservation such as transfer of lands to conservation organizations. We would have no problem with the inclusion of alternatives that would achieve the same objective to conserve these lands for the benefit of wildlife. Because the wildlife lands would be maintained for the life of the Project, whether managed by SMUD or a third-party, these lands should be included in the Project boundary. Our estimated annual cost of $1,300 for such plan would be justified to ensure that the objectives of the wildlife mitigation are met. In addition, the wildlife and plant protection measures for sensitive plant and wildlife species, bald eagles, vegetation, and invasive weed management would also apply to the Iowa Hill development. Implementing the proposed measure, with Staff's additional recommendation for a final plan, would ensure that the habitat lost due to construction of the Iowa Hill development would be mitigated. The annual cost associated with the acquisition of lands or easements to replace the permanently disturbed wildlife habitat at Iowa Hill would be $36,300.

Slab Creek Recreation Access Plan

Proposed Article 1-49 provides that SMUD address access to Slab Creek for recreation during and after construction. Public access the Slab Creek whitewater run is difficult. The steep terrain and landowner constraints limit suitable sites for parking at the put-in and potential take-out locations. Developing an access plan to help provide a reasonable level of public access to these facilities would help ensure that boaters could use recreational releases. We estimate that the annualized cost of the Slab Creek recreation plan would be $1,800, and the benefit of safe access to the proposed whitewater releases would be worth the cost.

Visual Quality Standards

Proposed Article 1-44 calls for SMUD to provide the Forest Service with the design specifications for the proposed Iowa Hill development that would meet the VQOs of the Eldorado National Forest. Provision of plan specifications and simulated views of the proposed facilities would help ensure that Project facilities, including the earthen berm of the upper reservoir, the intake/outtake structure, and the transmission lines, blend with the surrounding landscape of the Eldorado National Forest. In comments on the draft EIS local residents indicated that SMUD was performing additional visual resource simulations including more viewpoints and requested that the results be included in the final EIS. The study results reinforce our general conclusions that project facilities would introduce new linear elements to the landscape but would not dominate the landscape and do not cause use to change our recommendation for the development of a visual resources protection plan. The annualized cost associated with the visual resource protection plan for Iowa Hill would be $1,800, and the benefit of protecting the Project's aesthetic resources would be worth the cost.

Cultural Resources

Proposed Article 1-45 provides that SMUD comply with the NHPA, section 106, procedures prior to commencing construction on National Forest System lands and to follow unanticipated discovery procedures during the construction and operation of the Project. Unanticipated discovery protocols would protect sites that might be discovered during the construction and operation of the development from unnecessary damage or destruction. The annual cost for compliance with cultural resource regulations at the Iowa Hill development would be included in the cost for the UARP HPMP, and a separate plan for Iowa Hill would not be necessary.

Construction Noise

Proposed Article 1-48 provides measures to address construction noise. Although a large portion of the construction activities for the water conduits and the powerhouse cavern would take place underground, construction of the upper reservoir atop Iowa Hill would generate noise as earth-moving equipment clear the site and build the upper reservoir. SMUD states that most construction work at the Iowa Hill development would begin at 6:30 a.m. to avoid traffic congestion. Starting construction work at this time would reduce local construction-related traffic congestion and safety hazards and is allowed under El Dorado County General Plan. Development and implementation of a plan to control construction noise, as proposed by SMUD, to meet El Dorado County General Plan noise level limits and Forest Service standards would minimize, but not eliminate, the potential effects of noise during construction. Neighboring residents and visitors to the Iowa Hill area would hear the construction activities during the daytime but to a lesser extent than would occur without implementation of noise abatement techniques. The stationary noise source (the turbine/generating units) at the proposed Iowa Hills development would be placed in an underground powerhouse and would not affect noise levels on the surface. Therefore, noise effects associated with operation of the proposed Project would not be significant. Traffic noise, which would be limited to two employees and periodic deliveries and maintenance activities, would be minor. We estimate the annualize cost for the development of a noise abatement plan would be $3,600 and would be necessary to minimize adverse effects of Iowa Hill construction on noise levels.

5.2 CUMULATIVE EFFECTS SUMMARY

The relicensing of the UARP and Chili Bar Project and the licensing of the Iowa Hill development would cumulatively affect water resources, fish and wildlife, recreational opportunities, and cultural resources in the American River Basin and the SFAR Basin. In addition to the diversions in the UARP and Chili Bar Project, the EID operates the El Dorado Project No, 176, which diverts up to 165 cfs of water around a 22-mile section of the SFAR to its consumptive water system and the El Dorado powerhouse, located a short distance downstream of the SFAR's confluence with Silver Creek. This has resulted in an incremental increase in spring through summer temperatures in the river between the confluence and the El Dorado powerhouse. The UARP and Chili Bar Project-proposed increased minimum streamflows, along with the increased minimum streamflows at the El Dorado Project, would tend to reduce spring through summer temperatures in most of the UARP- and Chili Bar Project-affected stream reaches. The operation of the proposed Iowa Hill development would reduce water temperatures emanating from Slab Creek reservoir by less than 0.5°C. This change would have no observable effect on water temperatures in Chili Bar reservoir or the Chili Bar dam reach. Under the Proposed Action, these cumulative effects are expected to provide a thermal regime that would support the designated beneficial uses, including a coldwater habitat for resident fish and amphibians.

Water quality in the UARP and Chili Bar Project-affected reaches is generally good, although it currently does not always satisfy the Basin Plan water quality objectives for bacteria and some chemical parameters. Numerous factors, including land management, development, and water-oriented recreation, all have incrementally adversely affected water quality, particularly fecal coliform concentrations in heavily-used areas of reservoirs and in the Chili Bar dam reach. In contrast, expansion of the Hangtown Creek Wastewater Treatment Plant in Placerville is expected to somewhat reduce bacteria and nutrient loadings from Weber Creek to the SFAR. The cumulative effects of these actions would be an overall improvement in water quality.

Private land development, public land use, and hydropower development have cumulatively affected the California red-legged frog, foothill yellow-legged frog, and mountain yellow-legged frog in the American River Basin due to road construction, multiple land use practices, facilities and operations, and other development that fragment breeding populations and create habitat for species, such as bullfrogs, that prey on California red-legged frogs, foothill yellow-legged frogs, and mountain yellow-legged frogs. Flow releases to benefit coldwater fisheries during the summer and early fall and Project reservoirs may isolate foothill yellow-legged frog breeding populations. For example, it is likely that the foothill yellow-legged frog in lower Slab Creek dam reach and lower Camino dam reach are reproductively isolated by coldwater water releases in upper Slab Creek dam reach and the Slab Creek reservoir (Kupferberg, 2006). However, the proposed minimum flow releases would not increase or decrease the current population fragmentation.

The recreational measures proposed by SMUD and PG&E would improve recreational opportunities throughout much of the SFAR Basin. Each proposed measure is incrementally small. However, together, the recreational measures would improve opportunities in the region, allowing the Projects to adapt to change recreational use over time, better using existing recreational resources, and developing new resources that address current and foreseeable recreational activities, such as hiking and biking.

If SMUD uses Cable Road for access for construction traffic, improvements to this road could stimulate additional residential development in the vicinity of Iowa Hill and could cumulatively affect land use in combination with the land and resource management plan for Eldorado Forest. However, an alternative route suggested by SMUD in its Transportation Route Technical Study (SMUD, 2008x) on the southwest side of Iowa Hill for construction traffic to access the construction site could minimize use of other local roads and reduce the amount of road improvements that would be necessary for construction, thereby also reducing effects on the developmental potential.

The UARP and Chili Bar Project are among a large number of hydroelectric projects in central California that affect prehistoric and historic archaeological resources located along the American River and its tributaries. These projects attract recreational use around the reservoirs. The increased recreational use resulting from the availability of the reservoirs has contributed to both inadvertent and intentional destruction of prehistoric and historic archaeological resources and of TCPs. Although continued erosion and recreational use of the American River area would be expected to continue to affect archaeological resources and TCPs, the measures included in HPMPs for the UARP and Chili Bar Project, as well as measures being or already developed and implemented at other hydroelectric projects in the area, would cumulatively reduce the rate of destruction of these cultural resources.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the Project.

Section 10(j) of the FPA states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to the Commission's notice soliciting final terms and conditions for the UARP and the REA notice for the Chili Bar Project issued on July 28, 2006, as extended for both Projects by notice issued on November 16, 2006, NMFS, Interior, and

CDFG filed letters of comment that included section 10(j) recommendations.[47] These agencies are also parties to the Settlement Agreement.[48] In their letters containing their 10(j) recommendations, Interior, and CDFG recommend that the Commission approve the Settlement Agreement and all the provisions thereof. NMFS did not file revised section 10(j) recommendations. Commission staff also recommends that the Settlement Agreement provisions that are within the scope of section 10(j) be included as terms of any new licenses.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving waterways affected by a project. We reviewed 56 plans for the state of California that have been filed with the Commission and determined that the following 23 are relevant to the UARP and Chili Bar Project. The proposed Iowa Hill development of the UARP does not meet the VQOs of the Eldorado National Forest land and resource management plan. Under Proposed Article 1-44, SMUD would develop a visual resources protection plan that would include final designs for the Iowa Hill development that would meet the Forest Service VQOs for the Eldorado National Forest. There are no other conflicts with the proposed Projects:

- California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, California. 84 pp.
- California Department of Fish and Game. 1979. Rubicon River wild trout management plan. Sacramento, California. July 1979. 46 pp
- California Department of Fish and Game. 1979. South Fork Merced River wild trout management plan. Sacramento, California. July 1979. 26 pp.
- California Department of Fish and Game. 1979. Nelson Creek wild trout management plan. Sacramento, California. July 1979. 27 pp.
- California Department of Fish and Game. 1981. Yellow Creek wild trout management plan. Sacramento, California. August 1981. 18 pp. and appendix.
- California Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Bureau of Reclamation. 1988.

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[47]All three agencies filed letters in response to the initial notice dated October 18, 2006; October 17, 2006; and October 18, 2006. In its filing, NMFS indicated that Interior and CDFG filed revised terms and conditions on January 31, 2007.

[48]The Settlement Agreement was filed with the Commission on February 1, 2007.

Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River Basin. Sacramento, California. May 20, 1988. 10 pp. and exhibit.

- California Department of Fish and Game. 1990. Central Valley salmon and steelhead restoration and enhancement plan. Sacramento, California. April 1990. 115 pp.
- California Department of Fish and Game. 1993. Restoring Central Valley streams: A plan for action. Sacramento, California. November 1993. 129 pp.
- California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February 1996. 234 pp.
- California Department of Parks and Recreation. 1998. Public opinions and attitudes on outdoor recreation in California. Sacramento, California. March 1998.
- California Department of Parks and Recreation. 1980. Recreation outlook in Planning District 2. Sacramento, California. April 1980. 88 pp.
- California Department of Parks and Recreation. 1980. Recreation outlook in Planning District 3. Sacramento, California. June 1980. 82 pp.
- California Department of Parks and Recreation. 1994. California outdoor recreation plan, 1993. Sacramento, California. April 1994. 154 pp. and appendices.
- California Department of Water Resources. 1983. The California water plan: Projected use and available water supplies to 2010. Bulletin 160–83. Sacramento, California. December 1983. 268 pp. and attachments.
- California Department of Water Resources. 1994. California water plan update. Bulletin 160–93. Sacramento, California. October 1994. Two volumes and executive summary.
- California Department of Water Resources. 2000. Final programmatic environmental impact statement/environmental impact report for the CALFED Bay-Delta Program. Sacramento, California. July 2000. CD Rom, including associated plans.
- California State Water Resources Control Board. 1975. Water quality control plan report. Sacramento, California. Nine volumes.
- California—The Resources Agency. Department of Parks and Recreation. 1983. Recreation needs in California. Sacramento, California. March 1983. 39 pp. and appendices.

- California—The Resources Agency. 1989. Upper Sacramento River fisheries and riparian habitat management plan. Sacramento, California. January 1989.
- Forest Service. 1988. Eldorado National Forest land and resource management plan. U.S. Department of Agriculture, Forest Service, Placerville, California. December 1988. 752 pp.
- State Water Resources Control Board. 1999. Water quality control plans and policies adopted as part of the state comprehensive plan. April 1999.
- U.S. Fish and Wildlife Service, California Department of Fish and Game, California Waterfowl Association, and Ducks Unlimited. 1990. Central Valley habitat joint venture implementation plan: A component of the North American waterfowl management plan. Department of the Interior, Portland, Oregon. February 1990.
- U.S. Fish and Wildlife Service. 2001. Final restoration plan for the anadromous fish restoration program. Department of the Interior, Sacramento, California. January 9, 2001.

5.5 RELATIONSHIP OF LICENSE PROCESS TO LAWS AND POLICIES

5.5.1 Water Quality Certification

Pursuant to 401(a)(1) of the Federal Water Pollution Control Act (Clean Water Act) and Commission regulations, SMUD and PG&E are required to file as part of their license application a copy of the water quality certificate provided by the state of California or proof that such a certificate has been applied for or the requirements waived. SMUD and PG&E applied for section 401 Water Quality Certification for their Projects on September 22 and 18, 2006, respectively, following the Commission's notice for final terms and conditions (UARP) and REA notice (Chili Bar), which were issued on July 28, 2006. Both applicants subsequently withdrew their applications for Water Quality Certification. PG&E submitted a new application for Water Quality Certification in a letter dated May 1, 2007, that was acknowledged as received by the Water Board on May 22, 2007. SMUD resubmitted its application on October 23, 2007. State action on the Water Quality Certification applications will be required before October 22, 2008, for the UARP and before May 1, 2008, for the Chili Bar Project. If the state does not act on the two applications by these dates, respectively, certification of the two Projects will be deemed waived.

5.5.2 Endangered Species Act

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or cause the destruction or adverse modification of the critical habitat of such species.

The FWS lists three plant and three wildlife species potentially occurring in vicinity of the UARP and Chili Bar Project that are federally designated as threatened or endangered and therefore protected under the ESA. These include the endangered Pine Hill ceanothus (*Ceanothus roderickii*) and Pine Hill flannelbush (*Fremontodendron decumbens*), as well as the threatened Layne's butterweed (*Seneco layneae*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and California red-legged frog (*Rana aurora draytonii*).

Our analyses of Project effects on these species are presented in section 3.3.5, *Threatened and Endangered Species*, and our final recommendations are presented in section 5.1, *Comprehensive Development and Recommended Alternative*.

We conclude that relicensing the UARP with the fish and wildlife habitat protection and enhancement measures proposed in the Settlement Agreement would be likely to adversely affect the Pine Hill ceanothus, Pine Hill flannelbush, the Layne's butterweed, and the valley elderberry longhorn beetle, but would not likely adversely affect the California red-legged frog. By letter dated September 25, 2007, we initiated formal consultation with FWS on the three plant species and valley elderberry longhorn beetles, and requested concurrence on the California red-legged frog. By letter dated October 23, 2007, FWS determined that the information in the draft EIS was insufficient for the FWS to consult on the UARP and requested additional information on the potential effect of the Proposed Actions on the Pine Hill plants, the valley elderberry longhorn beetle, and the California red-legged frog. By letter dated December 12, 2007, we provided the information requested by FWS. Subsequently, on December 13, 2007, FWS indicated that it had only recently learned of the El Dorado-SMUD Cooperative Agreement of 2005 and asked for a full assessment of the prospective development that could be stimulated by the water supply agreement. FWS reiterated this request by letter dated February 7, 2008, without mention of the documentation we provided in response to the original request. FWS maintains the position that it cannot initiate consultation on the relicensing of the UARP without a full assessment of the effects on ESA species of the water supply agreement.

We conclude that relicensing the Chili Bar Project with the fish and wildlife habitat protection and enhancement measures proposed in the Settlement Agreement would have no effect on the Pine Hill endemic plants and the valley elderberry longhorn beetle and would not likely adversely affect the California red-legged frog. By letter dated September 25, 2007, we requested concurrence from FWS on the California red-legged frog. By letter dated October 19, 2007, FWS determined that the information in the draft EIS was insufficient for the FWS to make a determination about the California red-legged frog and requested additional information. On November 2, 2007, we provided the information requested by FWS. On December 6, 2007, FWS concurred with our determination that the relicensing of the Chili Bar Project is not likely to adversely affect the California red-legged frog.

5.5.3 National Historic Preservation Act

The NHPA (16 U.S.C. 470 et seq.) (as amended) requires federal agencies to manage cultural resources under their jurisdiction and authorizes the Secretary of the Interior to maintain a National Register. The law also provides for the creation of SHPOs to facilitate the implementation of federal cultural resource policy at the state level, and for the responsible federal agency (i.e., agency official) to consult with Native American tribes who attach religious or cultural importance to cultural resources under their jurisdiction. Section 106 of the Act requires federal agencies to take into account the effect of any proposed undertaking on properties listed in, or eligible for listing in the National Register. If the agency official determines that the undertaking may have adverse effects on properties listed in or eligible for listing in the National Register, the agency official must afford an opportunity for the Advisory Council to comment on the undertaking. The relicensing of the UARP and Chili Bar Project is considered an undertaking, and the Commission acts as the agency official.

SMUD and PG&E, under the authority of the Commission, have conducted section 106 consultations with the California SHPO, and other interested parties since 2001. This consultation included scheduled collaborative cultural resource workgroup meetings, as well as individual meetings conducted by the applicants. Commission staff will be continuing Section 106 consultations. On February 11, 2008, Commission staff circulated a draft PA and the draft HPMP for the UARP for comment and directed SMUD to file a revised HPMP within 90 days of the close of the comment period. Under the Proposed Action, UARP would implement the final HPMP that would be attached to the executed PA. On January 15, 2008, the Commission circulated a draft PA for comments. Under the Proposed Action PG&E would finalize its HPMP within one year of license issuance. Each HPMP would provide specific guidance to applicant personnel about the treatment of historic, archaeological, and traditional cultural resources during the terms of the new licenses.

5.5.4 Americans with Disabilities Act

Public recreation facilities must comply with the Americans with Disabilities Act of 1990 (ADA, Public Law 101-336) to the extent possible. The Commission, however, has no statutory role in implementing or enforcing the ADA as it applies to its licenses. A licensee’s obligation to comply with the ADA exists independent of its Project license. As recreation facilities are updated, expanded, or newly developed, SMUD and PG&E propose to ensure that access needs of the disabled are addressed and comply with ADA standards. The proposed recreational measures included are consistent with this Act.

5.5.5 Clean Air Act

The 1990 amendments to the Clean Air Act (CAA) and the Conformity Rules require federal agencies to conform to State Implementation Plans (SIPs). EPA and federal agencies have established requirements and procedures to ensure that federally sponsored or approved actions will comply with the National Ambient Air Quality Standards (NAAQS), and conform to the appropriate SIPs. The conformity rules apply to designated non-attainment or maintenance areas for criteria pollutants regulated under NAAQS. The SIPs are the approved state air quality regulations that provide policies, requirements, and goals for the implementation, maintenance, and enforcement of the NAAQS. SIPs include emission limitations and control measures to attain and maintain the NAAQS. The EPA has developed two conformity regulations for transportation and non-transportation projects. Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51 and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Since the proposed Project is a non-transportation project, the general conformity rule applies. We prepared a general conformity determination and applicability analysis using the EPA NONROAD model and provided the results in the draft EIS. In response to the California Air Resources Board (CARB), we prepared another general conformity determination and analysis using the CARB EMFAC and OFFROAD2007 models and provided the report to the CARB for review. Under the EPA NONROAD model, SMUD proposed to adjust its construction schedule to eliminate exceedances of oxides of nitrogen. However, under the CARB OFFROAD model, emissions would be below the *de minimis* for all pollutants such that an adjustment to the construction schedule would not be needed.

6.0 LITERATURE CITED

APLIC (Avian Power Line Interaction Committee). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute. Washington, DC.

APLIC. 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, DC.

BEA (U.S. Bureau of Economic Analysis). 2007. Regional economic accounts. Available at: http://www.bea.gov/bea/regional/reis/, accessed August 29, 2007. U.S. Bureau of Economic Analysis, Washington, DC.

Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers. Fish Passage Development and Evaluation Program, North Pacific Division, Portland, OR.

BLM (U.S. Bureau of Land Management). 2004. The South Fork American River—A management plan, and decision record. U.S. Bureau of Land Management, Folsom Field Office, Folsom, CA. (not seen, as cited in DTA and Goodavish, 2005a)

CARB (California Air Resources Board). 2006. Ambient air quality standards (AAQS). http://www.arb.ca.gov/research/aaqs/caaqs. California Air Resources Board, Sacramento, CA.

California Department of Finance, El Dorado County Economic Forecast 2004 web page. http://www.video.dot.ca.gov/hq/tpp/offices/ote/El%20Dorado04.pdf. September 6, 2005.

CDEC (California Data Exchange Center). 2007. California Data Exchange Center for the California Department of Water Resources. Sacramento, CA. Accessed from http://cdec.water.ca.gov/reservoir.html on February 13, 2007.

CDFG (California Department of Fish and Game). 2007. Rationale document for Settlement Agreement, base case. Filed on January 31.

CDFG. 2006a. PHABSIM analysis for Rubicon River below Rubicon reservoir dam.

CDFG. 2006b. Composite WUA analysis for Gerle Creek below Loon Lake dam and SF Silver Creek below Ice House dam.

CDFG. 2004. Bear hunting, final environmental document. State of California, the Resources Agency, CDFG Wildlife Programs Branch, Sacramento, CA.

CDFG. 2003. California stream bioassessment procedure (protocol brief for biological and physical/habitat assessment in wadeable streams) web page. http://www.dfg.ca.gov/cabw/csbp_2003.pdf, updated 2003, accessed on August 2, 2006. California Department of Fish and Game, Water Pollution Control Laboratory, Aquatic Bioassessment Laboratory.

CDHS (California Department of Health Services). 2002. Incomplete blue book regulations only, March 11, 2002 web page. http://www.dhs.ca.gov/ps/ddwem/publications/Regulations/Bluebook3-11-02.pdf, updated 2004, accessed on August 2, 2006. California Division of Drinking Water and Environmental Management.

CEC (California Energy Commission). 2007. 2007 Integrated energy policy report. California Energy Commission, Sacramento, CA. November 2007.

CEC. 2004. Integrated energy policy report 2004 update. Sacramento, CA. November

Central Valley Water Board (California Regional Water Quality Control Board, Central Valley Region). 2004. The water quality control plan (Basin Plan) for the California Regional Water Quality Control Board, Central Valley Region, The Sacramento River Basin and the San Joaquin River Basin, Fourth Edition, Revised September 2004 (with approved amendments). Central Valley Regional Water Quality Control Board web page. http://www.waterboards.ca.gov/centralvalley/available_documents/basin_plans/SacSJR.pdf, updated May 4, 2006, accessed May 5, 2006. Central Valley Regional Water Quality Control Board.

Central Valley Water Board. 2003. 2002 CWA Section 303(d) list of water quality limited segment, Central Valley Regional Water Quality Control Board, Approved by EPA July 2003 web page. http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf, updated August 7, 2003, accessed June 14, 2006.

CH2M HILL. 2008a. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101), Iowa Hill pumped-storage development visual resources technical report addendum no. 1. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by CH2M HILL, Inc., Sacramento, CA. January 2008.

CH2M HILL. 2008b. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101), Iowa Hill pumped-storage development transportation route technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by CH2M HILL, Inc., Sacramento, CA. January 2008.

CH2M HILL and DTA (Devine Tarbell & Associates, Inc.). 2005a. Socioeconomic assessment of Iowa Hill construction and operations technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. January 2005.

CH2M HILL and DTA. 2005b. Iowa Hill pumped storage development property value assessment technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. January 2005.

CH2M HILL and DTA. 2004. Socioeconomic impact technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. October.

Cole, T.M. and E.M. Buchak. 1995. CE-QUAL-W2: A two-dimensional, laterally averaged, hydrodynamic and water quality model, Version 2.0. Prepared for U.S. Army Corps of Engineers, Washington, D.C. Instruction Report EL-95-1.

DTA (Devine Tarbell & Associates, Inc.). 2005a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Water temperature technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. May 2005, Version 3. 73 pages plus appendices.

DTA. 2005b. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Water quality technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. May 2005, Version 5. 98 pages plus appendices.

DTA. 2004a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) riparian vegetation and wetlands technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, San Francisco, CA. October 2004.

DTA. 2004b. Mule deer technical report. Prepared for SMUD’s UARP FERC no. 2155. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004c. Bird-powerline associations technical report. Prepared for SMUD’s UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004d. Black bear technical report. Prepared for SMUD’s UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004e. Valley elderberry longhorn beetle technical report. Prepared for SMUD’s UARP FERC No 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004f. Bald eagle and osprey technical report. Prepared for SMUD’s UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. October, 2004.

DTA. 2004g. Iowa Hill wetlands technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Devine Tarbell & Associates, Inc., Sacramento, CA. October 2004.

DTA and EES (EES Consulting). 2005. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) Iowa Hill pumped storage development water temperature technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and EES Consulting, Seattle, WA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. February 2005. 32 pages plus appendices.

DTA and Goodavish (Devine Tarbell & Associates, Inc. and Martha Goodavish Planning and Design). 2005a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) UARP land use technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. February 2005.

DTA and Goodavish. 2005b. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101), Iowa Hill pumped storage development visual resources technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. January 2005.

DTA and Goodavish. 2004. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) visual assessment of Upper American River Project features technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. September 2004.

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DTA and Louis Berger. 2004a. Recreation demand technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and The Louis Berger Group, Oakhurst, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. September 2004.

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DTA (Devine Tarbell & Associates, Inc.) and Stillwater Sciences. 2004a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Fish passage barriers technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. August 2004, Version 1. 32 pages plus figures and appendices.

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Devine Tarbell & Associates, Inc. (DTA) and Stillwater Sciences. 2004c. Amphibian habitat test flow technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA.

EPA (U.S. Environmental Protection Agency). 2006. Special Session on *Didymosphenia geminata* Western Division American Fisheries Society Meeting May 15-16, 2006 Bozeman, Montana, United States, Revised post meeting update web page. http://www.epa.gov/region8/water/monitoring/may06meeting.html, last updated September 13, 2006, accessed on February 5, 2007.

EPA. 2000. Guidance for assessing chemical contaminant data for use in fish advisories, Volume 1: Fish sampling and analysis, Third edition. EPA 823-B-00-007. U.S. Environmental Protection Agency, Office of Water, Washington, DC. November 2000.

FERC (Federal Energy Regulatory Commission). 2006. El Dorado Irrigation District, Project No. 184-065, order issuing new license (October 18, 2006). Federal Energy Regulatory Commission, Washington, DC.150 pp.

FERC. 2003. Final environmental impact statement for the El Dorado Irrigation District FERC Project No. 184. Federal Energy Regulatory Commission, Washington, DC.

FICON (Federal Interagency Committee on Noise). 1992. Federal Agency review of selected airpoint noise analysis issues. Federal Interagency Committee on Noise, Washington, DC. August 1992.

FWS (U.S. Fish and Wildlife Service). 2007. National bald eagle management guidelines. Available at: www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. Accessed February 19, 2008. U.S. Fish and Wildlife Service. May 2007.

FWS. 2006. Endangered and threatened wildlife and plants; 12-month finding for a petition to list the California spotted owl as threatened or endangered. Federal Register, Vol. 71, No. 100, p. 29886–29908. May 24, 2006.

FWS. 1999. Conservation guidelines for the valley elderberry longhorn beetle. U.S. Fish and Wildlife Service, Sacramento, CA. July 9, 1999. 13p.

FWS. 1986. The Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, OR. 160pp.

GANDA (Garcia and Associates). 2006. Identifying climatic and water flow triggers associated with breeding activities of a foothill yellow-legged frog (*Rana boylii*) population on the North Fork Feather River, California. Prepared for California Energy Commission Public Interest Research Program. Garcia and Associates, San Anselmo, CA. August 2006. Final.

GANDA. 2004. Results of the 2004 study evaluating impacts of elevated flows on foothill yellow-legged frog (*Rana boylii*) habitat in the Poe Reach, North Fork Feather River. Prepared for PG&E. Garcia and Associates, San Anselmo, CA. December 2004. Final.

Gerstung, E.G. 1973. Fish population and yield estimates from California Trout Streams. Cal-Neva Wildlife.

Howe, P.D. and S. Dobson. 2002. Silver and silver compounds: environmental aspects, Concise International Chemical Assessment Document (CICAD) 44. Available at: http://www.inchem.org/documents/cicads/cicads/cicad44.htm, accessed April 5, 2004. International Programme on Chemical Safety.

Institute for Bird Populations. 2007. BBS habitat classification: Classifying and photographing habitat at breeding bird survey (BBS) point count locations throughout the Sierra Nevada web page. http://www.birdpop.org/Sierra/bbshab.htm. The Institute for Bird Populations, Point Reyes Station, CA.

IUCN (International Union for the Conservation of Nature and Natural Resources). 2007. Global invasive species database web page. http://www.issg.org/database/species/ecology.asp?si=775&fr=1&sts=, last updated November 28, 2006, accessed on February 5, 2007. IUCN, The World Conservation Union.

Kilroy, C. 2004. A new alien diatom, *Didymosphenia geminata (Lyngbye) Schmidt*: its biology, distribution, effects and potential risks for New Zealand fresh waters. National Institute of Water & Atmospheric Research Ltd., Christchurch, New Zealand. NIWA Client Report: CHC2004-128, November 2004. 34 pp.

Kupferberg, S. J. 2006. Final letter report regarding *Rana boylii* in the UARP. Letter to J. O. Williams, Fisheries Biologist, Eldorado National Forest, Placerville, CA. October 5, 2006.

Lipton, D. 2007a. Biological evaluation of terrestrial species for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 2007.

Lipton, D. 2007b. Terrestrial management indicator species report for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 2007.

Mount, J., S. Yarnell, S. Kupferberg, and A. Lind. 2006. Pulsed flow effects on foothill yellow-legged frog (*Rana boylii*): Integration of empirical, experimental and hydrodynamic modeling approaches. Prepared for the California Energy Commission by U.C. Davis Center for Watershed Sciences. Contract No. 500-01-044.

Moyle, P.B. 2002. Inland fishes of California. Revised edition. University of California Press, Berkeley, CA. 502 pp.

MWH (Montgomery Watson Harza). 2004. Socioeconomic study data needs. June 29. (not seen, as cited in CH2M Hill and DTA, 2005a)

NAS (National Academy of Sciences). 1991. Seafood Safety. Committee on Evaluation of the Safety of Fishing Products, National Academy Press, Washington, DC. (not seen, as cited in EPA, 2000)

PG&E (Pacific Gas and Electric Company). 2005. Application of Pacific Gas and Electric Company for the Chili Bar Project, FERC Project No. 2155. Sacramento, CA. June 21.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, CO.

SDGFP (South Dakota Department of Game, Fish, and Parks). 2006. Troublesome diatom spreads in Black Hills streams. http://www.sdgfp.info/GFPnews/News06/07-14-06.htm, accessed on February 5, 2007. South Dakota Department of Game, Fish, and Parks. July 14, 2006.

Siegel, R.B. and D.F. DeSante. 1999. The draft avian conservation plan for the Sierra Nevada Bioregion: conservation priorities and strategies for safeguarding Sierra bird populations. Version 1.0. Available at: http://www.prbo.org/calpif/htmldocs/sierra.html. Institute for Bird Populations report to California Partners in Flight.

SMAQD (Sacramento Metropolitan Air Quality District). 2003. Sacramento area regional 2002 milestone report. Sacramento Metropolitan Air Quality District, Sacramento, CA. May 2003.

SMUD (Sacramento Municipal Utility District). 2006. Response to the Federal Energy Regulatory Commission's December 20, 2005 Request for Clarification and Additional Information, Upper American River Project (FERC Project No. 2101). Sacramento Municipal Utility District, Sacramento, CA. March 17, 2006. 159 pp.

SMUD. 2005. Application of Sacramento Municipal Utility District for the Upper American River Project, FERC Project No. 2101. Sacramento Municipal Utility District, Sacramento, CA. July 7, 2005.

SMUD. 2004. Fish community assessment metrics. A handout to the Aquatic Working Group. Sacramento Municipal Utility District, Sacramento, CA. (not seen, cited in Settlement Agreement Rationale Report).

SMUD (Sacramento Municipal Utility District) and PG&E (Pacific Gas and Electric Company). 2007. Relicensing Settlement Agreement for the Upper American River Project and Chili Bar Project. Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. January 2007.

Stillwater Sciences. 2008. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101) technical report on Iowa Hill pumped-storage development turbidity analysis. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by Stillwater Sciences, Sacramento, CA. January 2008.

Taylor, M. 2007. Biological evaluation for sensitive plants for the proposed Upper American River Project (UARP), FERC special use permit for the Iowa Hill pumping station. U.S. Forest Service, Eldorado National Forest.

Theurer, F.D., K.A. Voos, and W.J. Miller. 1984. Instream water temperature model. Instream Flow Information Paper 16. U.S. Fish and Wildlife Service FWS/OBS-84-15.

Thurow, R.F. and D.J. Schill. 1996. Comparison of day snorkeling, night snorkeling, and electrofishing to estimate bull trout abundance and size structure in a second-order Idaho stream. North American Journal of Fisheries Management 16(2):314-323.

Tollefson, L. 1989. Methylmercury in fish: Assessment of risk for U.S. consumers. In: The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies. D.J. Paustenback (ed). John Wiley & Sons, New York, NY. (not seen, as cited in EPA, 2000)

U.S. Census Bureau. 2005. American Community Survey 2005 web page. http://www.census.gov/acs/www/index.html. Last modified March 5, 2007.

USGS (United States Geological Survey). 2007. USGS Surface-Water Data for California. Reston, VA. Accessed from http://nwis.waterdata.usgs.gov/ca/nwis/sw, on January 15, 2007.

USGS. 2005. Water Resources Data, California, water year 2004. Volume 4, Northern Central Valley Basins and The Great Basin from Honey Lake Basin to Oregon State Line. Water Data Report CA-04-4. April 2005.

Water Board (State Water Resources Control Board). 2005. Notice of application to appropriate water by permit, Applications 31595 and 31596, El Dorado County, Rubicon and South Fork American Rivers, California. State Water Resources Control Board, Sacramento, CA. May 24, 2005.

WECC (Western Electricity Coordinating Council). 2005. 10-year coordinated plan summary: Planning and operation for electric system reliability. June.

Wells, S.A. 2000. CE-QUAL-W2 Version 3: Hydrodynamic and water quality river basin modeling Proceedings, HydroInformatics 2000, IAHR, CDROM_EM5.

Williams, J. 2007a. Aquatic management indicator species report for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 28, 2007.

Williams, J. 2007b. Biological evaluation for aquatic species for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 28, 2007.

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APPENDIX A

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE UPPER AMERICAN RIVER HYDROELECTRIC PROJECT PROJECT NO. 2101-084 AND THE CHILI BAR HYDROELECTRIC PROJECT PROJECT NO. 2155-024

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ACRONYMS AND ABBREVIATIONS

Advisory Committee	Iowa Hill Joint Advisory Committee
CARB	California Air Resources Board
Commission	Federal Energy Regulatory Commission
DO	dissolved oxygen
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
HPMP	historic properties management plan
Interior	U.S. Department of the Interior
PG&E	Pacific Gas and Electric Company
Reclamation	U.S. Bureau of Reclamation
SFAR	South Fork of the American River
SMUD	Sacramento Municipal Utility District
TCP	traditional cultural property
UARP	Upper American River Project
VQO	visual quality objective

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The U.S. Environmental Protection Agency's (EPA) notice of availability of the draft environmental impact statement (EIS) was issued on September 21, 2007, and comments on the draft EIS were due on November 13, 2007. In addition, the Federal Energy Regulatory Commission (Commission) staff conducted a public meeting in Placerville, California, on November 5, 2007.

About 20 people spoke at the public meeting. Two individuals who are signatories to the Settlement Agreement and several recreational boaters expressed concern about the modifications that staff made in the draft EIS to the proposed recreational streamflows downstream of Slab Creek dam. They stated that staff misunderstands the connection between the construction of the Iowa Hill development and the enhanced whitewater boating flows and request that the staff adopt the language of the Settlement Agreement in the final EIS. The majority of speakers, however, were local residents, participants on the Iowa Hill Joint Advisory (Advisory Committee), or representatives of the Apple Hill Growers Association, and they raised numerous concerns about the effects associated with the construction of the Iowa Hill development. These speakers cited blasting, heavy equipment damage to county roads, dust, threat of fire, the potential effects of fire, loss of habitat, and ultimately fewer visitors to the area as major concerns. With regard to use of roads during construction, many speakers asked if traffic studies were done; noted that Cable Road is only one lane; and cited safety concerns for the children, walkers, bicyclists, and pets that use the roads that would be upgraded to handle the construction traffic. Many speakers indicated that they attended meetings of the Advisory Committee with Sacramento Municipal Utility District (SMUD) representatives and requested that the final EIS consider the many mitigation measures that were identified by the Advisory Committee. Many of the points raised by the speakers at the public meeting are also raised in letters filed in response to the draft EIS and are addressed in our responses to those comments.

At the public meeting as well as by teleconference on November 15, 2007, Commission staff requested that SMUD file any new studies and modifications to its proposed action resulting from consultation with the Advisory Committee. In its response filed on December 7, 2007, SMUD indicated that it is conducting preliminary analyses of mitigation measures proposed by the Advisory Committee and has not adopted any new measures beyond what is proposed in the license application and Settlement Agreement. Several local residents including Jim and Nancy Summers, Mike DeBord, and Steve Speth also filed correspondence with SMUD from 2005 through 2007 that contains feedback and recommendations from Advisory Committee members on SMUD draft plans. Because the information contained in these filings relate to discussions between SMUD and the Advisory Committee that are not part of the public record and because SMUD has not modified its proposed action in response to the feedback, we do not provide point by point responses to these comments. However, we have taken the feedback into consideration in our recommendations in the final EIS.

In this appendix, we[49] summarize the written and oral comments received; provide responses to those comments; and indicate, where appropriate, how we modified the text in the final EIS. We grouped the comment summaries and responses by topic for convenience. We did not summarize statements that are simply in support of or against the Settlement Agreement or Staff Alternative measures without providing any new information. We did not summarize comments that point out minor edits to the draft EIS; however, we have made these edits in the final EIS. The following entities filed comments on the draft EIS.

Commenting Entity	Filing Date
UARP and Chili Bar Project	
Christa Campbell	November 5, 2007
Hilde Schweitzer	November 6, 2007
American Whitewater[50]	November 9, 2007
Teresa Simsiman	November 9, 2007
U.S. Department of the Interior	November 9, 2007
U.S.D.A. Forest Service	November 9, 2007
Lois Bailey-Hacker	November 8, 2007
California Department of Fish and Game	November 12, 2007
Friends of Slab Creek	November 13, 2007
David Maurier	November 13, 2007
Pacific Gas and Electric Company	November 13, 2007
Chuck Seidler	November 13, 2007
Sacramento Municipal Utility District	November 13, 2007
U.S. Environmental Protection Agency	November 13, 2007
Bryant Burkhardt	November 14, 2007

[49]In this section "we" means the Commission staff. This is a standard section for the Commission's NEPA documents that presents the Commission staff's preferred alternative and rationale in support of the preferred alternative; it does not necessarily reflect the Forest Service's conclusions.

[50]Filed on behalf of American Whitewater, California Outdoors, Friends of the River, California Sportsfishing Protection Alliance, American River Recreation Association and Camp Lotus, and Hilde Schweitzer

Commenting Entity	Filing Date
Jane Arteaga	November 19, 2007
U.S. Army Corps of Engineers	November 19, 2007
UARP Only	
Christa Campbell	November 5, 2007
Annamarie Clark	November 5, 2007
Mike DeBord	November 5, 2007
Richard Morris	November 5, 2007
Bob Penn	November 5, 2007
Hilde Schweitzer	November 5, 2007
Chris Shackleton	November 7, 2007
Jeffery Hansen	November 13, 2007
Jim and Nancy Summers	November 13, 2007
Michael and Eleanor Kuehn	November 21, 2007

PROCEDURAL AND GENERAL

Comment-1: Mr. Hansen and several individuals who commented at the public meeting questioned the Commission's decision to include SMUD's Iowa Hill development in the EIS for the relicensing of the Upper American River Project (UARP) and Chili Bar Project. These individuals request that environmental effects of the Iowa Hill development be considered in a separate EIS.

Response: SMUD proposes the Iowa Hill development as part of its application for a new license for the UARP to improve its ability to provide energy during peak demand periods. Because the operations of the proposed Iowa Hill development would affect the operation and environmental effects of the existing UARP, it is reasonable and appropriate to consider the Iowa Hill development at the same time that we are assessing the environmental effects associated with the relicensing of the UARP. Commission staff analyzed the potential effects of relicensing the UARP with and without the construction and operation of the proposed Iowa Hill on environmental resources in the draft EIS. In response to comments, we updated information about the use and improvements of local roads for construction and added more analysis of fire threats. However, we do not agree that a separate EIS is required for the Iowa Hill development.

Comment-2: Mr. Hansen and several individuals who commented at the public meeting noted that the draft EIS is completely silent about an extensive set of proposed Iowa Hill development construction and operation mitigation measures generated during the past several months by the Advisory Committee. The Advisory Committee includes representatives from SMUD, El Dorado County, El Dorado Irrigation District, Apple Hill Growers Association, Camino Community Action Committee, and the Iowa Hill Action Committee. Mr. Hansen states that these proposed measures will not be reviewed and adopted by SMUD until it decides to proceed with the development. Nevertheless, Mr. Hansen points out that these measures represent a significant effort in identifying meaningful mitigation and therefore should be included and analyzed in the final EIS.

Response: We requested that SMUD provide us with information about the role of the Advisory Committee as well as any changes to the license application or proposed measures based on discussion with the Advisory Committee. SMUD filed the requested information on December 7, 2007. We incorporated the information into the final EIS. According to that letter, SMUD has not adopted any of the recommendations contained in the Advisory Committee's matrices but is conducting preliminary analyses of the proposed mitigation measures. Some of these measures may be included in our recommended final Transportation Management Plan to be developed in consultation with the Advisory Committee.

Comment-3: Mr. Penn states that the EIS should include a detailed review of alternative power plant sites for the Iowa Hill development. He asks that such a review at a minimum include consideration of two sites (Deer Knob and Big Hill) bordering the Union Valley reservoir that have favorable features, easy access roads, in-place power lines, adequate elevation, no residential or commercial development, and much less exposure to fire.

Response: We added a discussion of the alternative sites analysis performed by SMUD in section 2.4.5, *Alternative Sites Analysis,* of the final EIS.

Comment-4: Interior notes that the proposed UARP operational changes, as described in the draft EIS, would change the seasonality of inflow from the South Fork of the American River (SAFR) into Folsom reservoir that is operated by the U.S. Bureau of Reclamation (Reclamation). Reclamation reserves the right to review the effects of the proposed UARP operational changes on Folsom dam and reservoir operations relative to its current contracts with SMUD and the city of Sacramento.

Response: The Commission's standard reopener article would be included in any license as the vehicle for making changes to the license if unforeseen and unanticipated adverse environmental effects occur in the future. The Commission can address any unintended changes in inflow to Folsom reservoir through the standard license reopener.

Comment-5: Pacific Gas & Electric (PG&E) points out that the word *Project* is used inconsistently in the draft EIS and requests that the final EIS clearly distinguish when a reference is in regard to both Projects or only the UARP or Chili Bar Project. PG&E further points out that virtually all of the Project-related reaches are outside of the Project boundaries and terminology in the final EIS should clarify this fact.

Response: In the draft EIS, staff used the capitalized term *Projects* to refer to both the UARP and Chili Bar Project and used the lower case term *project* or *projects* to refer to projects other than the UARP and Chili Bar Project. We searched on these terms to ensure that they are used consistently in the final EIS. We also clarified in the final EIS that the Project reaches are generally outside of the Project boundaries.

NEED FOR POWER

Comment-6: Mr. and Mrs. Summer raise numerous questions about the *Need for Power* discussion in section 1.0 of the draft EIS. First, they observe that the net rate of efficiency would be closer to 60 percent rather than the 80 percent projected by SMUD and that a lower net rate of efficiency would result in greater annual losses of energy than estimated. Second, they question the statement that SMUD and possibly other utilities would use the electricity from the Project to displace the use of gas-fired energy during on peak hours. Third, they comment that the statement in the draft EIS that California utilities and generators have some options for shifting power supplies from off-peak to on-peak periods through the use of pumped storage implies that was a conclusion cited in the 2004 Integrated Energy Policy. They point out that pumped storage is only one option and all other options should be fully explored prior to making any decision on the Iowa Hill development. Finally, Mr. and Mrs. Summer comment that the fourth paragraph in section 1.2.2 of the draft EIS implies that there will be power benefits to the local community. He notes that there is not one user of SMUD power in El Dorado County.

Response: The Summers did not provide any citations to support the contention that pumped storage projects have a net efficiency of 60 percent. The hydro-mechanical equipment in this Project would likely be new equipment designed to state-of-the-art standards. Therefore, efficiency in the range of 75 to 80 percent would not be unrealistic. Note the total head on this Project is on the order of 1,200 feet and variations in net head would not significantly affect the efficiency.

We see no reason to question the displacement of gas fired generation during on-peak hours. The power from by the Iowa Hill development would generally be produced during on-peak hours and hence would displace gas fired combustion turbines. We reviewed the recently issued *2007 Integrated Energy Policy Report* (CEC, 2007a) as issued by the California Energy Commission. The California Energy Commission continues to include pumped storage as a primary load management technique and an important tool for storing renewable energy on windy nights. There are other methods of shifting off-peak power to on-peak power, such as storage batteries; however, large-scale implementation of battery technology currently is not economically feasible.

We acknowledge that SMUD's service includes Sacramento County and a small portion of Placer County. We did not specifically reference El Dorado County a beneficiary in the draft EIS; however, SMUD is an interconnected utility, and energy as well as ancillary services may be incidentally provided to the region including El Dorado County.

Comment-7: Mr. DeBord states that the cost analysis does not include the new capital costs of supplying power to pump the water from Slab Creek reservoir to the new Iowa Hill reservoir. He also comments that SMUD repeatedly states that it would use wind power to supply this power, and he wonders why SMUD does not include the cost of the windmills needed to generate this power in its cost analysis. He states that factoring the capital cost of the planned windmills or other new power generating facilities could easily make the Project cost prohibitive.

Response: In its license application, SMUD assumes the pumping generation would come from gas-fired combustion turbines, not wind turbines. We agree with this assumption and have used it in our analysis. We show the cost of the pumping energy based on combustion turbines in table 4-13 of the draft EIS and continue to use that cost in the final EIS

PROJECT DESCRIPTION

Comment-8: PG&E makes a general comment that the draft EIS refers to the 19.1 mile-long reach between the Chili Bar dam and the Folsom reservoir in at least 20 differ ways. PG&E consistently referred to this reach as “the reach downstream of Chili Bar” in its license application and technical reports and suggests that it be referred to as such in the final EIS.

Response: We revised the text in the final EIS to use consistently “the reach downstream of Chili Bar and 19.1-mile-long length.”

Comment-9: SMUD questions the discussion on page 2-9 of the draft EIS about expanding the Project boundary. First, SMUD notes that staff recommends expansion of the boundary to include the entire Jones Fork penstock. SMUD clarifies that the entire Jones Fork penstock is included in the Project boundary as depicted on exhibit G, as are the Robbs Peak, Camino, and White Rock penstocks. Second, SMUD states that the Deer Crossing camp (referred as Deer Camp in the Settlement Agreement and shown on figure 3-32 as Deer Creek Crossing Camp in the draft EIS) is a small private camp operated under a special use permit by the Forest Service but is not a Project-related campground. SMUD notes that the Forest Service originally included this camp it the preliminary section 4(e) conditions but subsequently deleted it from the revised 4(e) conditions and the camp is not included in the Settlement Agreement and should not be included in the Project boundary. Third, The Northern Union Valley road cited on page 2-9 of the draft EIS is a 7.5-mile-long system of connecting Forest Services roads that are not solely used for Project purposes but provide the primary access route to the Sierra Pacific Industry owned lands and should not be included in the Project boundary.

Response: We reviewed exhibit G and agree that the Jones Fork penstock is shown as completely within the Project boundary. We also deleted the reference to the private Deer Camp. Our analysis indicates that the proposed new campground on the south side of Loon Lake would provide publically accessible camping at that location. Because the Northern Union Valley Road is not used primarily for Project purposes, it should not be included within the Project boundary, consistent with Commission policy. We revised the text in section 2 of the final EIS accordingly.

Comment-10: U.S Department of the Interior (Interior), PG&E, and American Whitewater note that the informal boat launch described on page 2-10 of the draft EIS is managed by PG&E is for administrative use only and that the site is inaccessible to the public. PG&E provided suggested text for the final EIS.

Response: We revised the text in section 2 of the final EIS to clarify that PG&E uses the informal boat launch for inspections and maintenance and that this informal boat launch is inaccessible to the public.

Comment-11: PG&E points out that the draft EIS omits the description of the second section of Proposed Article 1-4 dealing with coordination in implementing certain license conditions. PG&E states that this provision is critical to the implementation of Proposed Articles 4 though 12 and 21 through 23, and Proposed Article 1-4 must described and adopted in the Staff Alternative in the final EIS.

Response: We added the second component of Proposed Article 1-4 to table 2-3 and to the Staff Alternative in section 5 in the final EIS to explicitly include SMUD's coordination with PG&E in the implementation of Proposed Articles 2-1, 2-2, 2-4, 2-5, 2-6, 2-14 and 2-15 for the Chili Bar Project. We note that we do discuss the importance of this coordination in the relevant resources sections of the EIS.

Comment-12: SMUD provides several clarifications to the description in section 2.0 about the construction of the Iowa Hill development. First, on page 2-14, SMUD clarifies that underground spoils would be transported to the upper reservoir site using a vertical material handling system consisting of either a conveyor belt or bucket-and-cable system located in the cable shaft as stated in exhibit C of the license application. Second, SMUD requests that the description of the proposed tie-line and switchyard locations on page 2-14 be revised to be consistent with exhibit C and exhibit G-036 of the license application.

Response: We modified the Project description to include SMUD's comments about the proposed vertical material handling system and revised the description of the proposed tie-in line and switchyard locations.

Comment-13: American Whitewater comments that the staff descriptions in section 2.0 of the water chemistry monitoring programs in Proposed Articles 1-5 and 2-4 on pages 2-20 and 2-21 of the draft EIS omit any reference to the general chemistry monitoring elements of that program. Interior comments that tables 2-3 and 2-4 in the draft EIS omit any reference or summary of the general chemistry monitoring element of the water chemistry monitoring program in Proposed Article 1-5 (item 10) of the Settlement Agreement. Interior requests that staff summarize both elements, in situ and general chemistry monitoring, in the final EIS.

Response: We added the general chemistry monitoring elements to the descriptions of the Proposed Articles in tables 2-3 and 2-4 in section 2 of the final EIS.

Comment-14: SMUD notes the descriptions of Proposed Articles 1-25 and 2-14 on pages 2-27 and 2-36 of the draft EIS are incorrect and should be revised to make clear that SMUD would provide two simple staff gages only on the two stream reaches proposed for whitewater boating consistent with the intent and language of the Settlement Agreement. SMUD states the staff repeats these incorrect descriptions on pages 5-10 and 5-15 of the draft EIS.

Response: We revised the text in the final EIS to correctly refer to Proposed Articles 1-25 and 2-14.

Comment-15: PG&E notes several discrepancies in the draft EIS with regard to storage capacity and usable storage in Chili Bar reservoir. First, PG&E notes that the storage capacity of 3,700 acre-feet given for Chili Bar reservoir in figure 2-2 is incorrect. PG&E points out that exhibit A-7 shows the storage capacity of Chili Bar reservoir as constructed as 3,319 acre-feet when full to the spillway crest elevation of 997.5 feet (NGVD), and the reservoir has a normal usable storage capacity of 1,339 acre-feet. Second, PG&E requests that the legend to figure 3-1 be clarified to show the full pool storage (3,319 acre-feet) at elevation 997.5. PG&E also requests that staff revise the usable storage volume of 1,088 acre-feet to 1,339 acre-feet on page 3-32 and add a footnote to page 3-58 to note that the 3,139 acre-feet at elevation 997.5 is based on as-constructed data.

Response: We revised figures 2-2 and 3-1, as requested. A usable storage volume of 1,088 acre-feet is based on the results of a 2004 bathymetric survey of Chili Bar reservoir as described in the *Chili Bar Reservoir Incremental Storage Modification Technical Report*, which was part of the license application. We added a footnote to table 3-2 stating that the usable storage based on as-constructed data was 1,339 acre-feet.

Comment-16: PG&E states that in addition to the discussion of PG&E's proposed Project boundary revision on page 2-37 of the draft EIS, PG&E plans to propose a future modification to the Chili Bar Project boundary to avoid a conflict with the UARP licensee's future Slab Creek reach boating take-out. PG&E indicates that although the exact location of the future UARP facility is unknown, it is anticipated that it would be in the vicinity of the White Rock powerhouse. PG&E proposes to develop and submit a revised proposed Project boundary after consultation with BLM and SMUD and requests that the schedule for the submittal of revised exhibit G drawings be consistent with the schedule for the UARP licensee's development of the UARP's Slab Creek recreation management plan.

Response: We added the additional boundary revisions contemplated by PG&E to section 2.5.4 of the final EIS. Under Proposed Article 2-13, PG&E would provide the new or improved recreational facilities within 3 years of license issuance. Under Proposed Article 1-49, SMUD would develop a recreation access plan for Slab Creek reservoir prior to the commencement of construction of the Iowa Hill development in 2009. Given these timelines, it would be reasonable for PG&E to provide revised exhibit G drawings after SMUD has prepared the recreation access plan for Slab Creek reservoir because that plan also would include the proposed Slab Creek boating take out and access facilities.

CUMULATIVELY AFFECTED RESOURCES

Comment-17: EPA recommends including a discussion about the potential effects of climate change relative to the proposed action in the cumulative effects analysis of the final EIS. EPA requests that the discussion summarize the applicable climate change studies, including the findings and recommendations for addressing potential effects on environmental resources and water supplies.

Response: Future climate change effects on water resources and water temperatures in the UARP and Chili Bar reservoirs and reaches are unknown, although some models may attempt to predict change in certain river basins. The Commission's standard reopener article would be included in any license as the vehicle for making changes to the license if unforeseen and unanticipated adverse environmental effects occur in the future.

GEOLOGY AND SOILS

Comment-18: Mr. Summers questions the statements in the draft EIS that the upper reservoir would be not likely affected by the known fault or fault systems any more than the structures that already impound Project waters and, with the earthen berm construction and impermeable liner, might actually withstand an earthquake better than the closest dam. He requests an analysis of failures at other pumped storage projects and a discussion of what would be done to prevent such a failure at the Iowa Hill development.

Response: We have no record of any pumped storage projects that have failed do to earthquake forces. An analysis of probable earthquake effects on Iowa Hill was done in the SMUD's Preliminary Safety Analysis Report, where the consultant concludes that the proposed reservoir would not be significantly affected by movements along fault lines resulting from earthquakes

Comment-19: Ms. Bailey-Hacker questions the findings of the geotechnical studies done in 1972 and 2004 that led to SMUD's conclusion that the Iowa Hill site is suitable for development of the upper reservoir. Ms. Bailey-Hacker questions why the surface geology would be suitable for use in the construction of the upper reservoir berm since it is likely to break down to soil and gravel during construction. She suggests that using larger rock in the upper reservoir berm would be more stable. She cites the Taum Sauk pumped storage project failure as an example of why she is concerned about the structural stability of the berm. She also states her concern that the foliation of the rock could allow seepage from the upper reservoir to cause geologic instability. Finally, Ms. Bailey-Hacker questions why an exploratory tunnel was not drilled to verify the type and quality of rock surrounding the proposed powerhouse and tunnel structures. She states that sample drill holes were only taken from residential parcels of land near the site, along Chute Camp Road, and from Slab Creek Reservoir.

Response: First, we note that the failure of the Taum Sauk reservoir was reported to have been caused by instrument malfunction, not instability of the embankment retaining the upper reservoir. Second, with regard to the stability of the berm, using a variety of crushed rock from the excavation of the upper reservoir site and tunnel is consistent with engineering practices that mix gradations of rock, from small to large sizes for this type of construction. By using a mixture of various sizes, or "well-graded" rock, the spaces between pieces of rock and gravel are filled with smaller particles to produce an embankment with no unstable voids. We analyzed SMUD's proposed measures to control seepage in the EIS and conclude that installing a toe drain and drain pipes in the rock fill embankment, filling voids in the rock under the reservoir with construction grout, and installing an impermeable liner at the bottom of the upper reservoir would control seepage from the upper reservoir. Finally, in addition to the geotechnical studies performed on the site, SMUD maintains records from the construction and recent examination of nearby project facilities, including the Slab Creek dam, and the Camino and Whiterock tunnel, which confirm the presence of stable geology in the area. Therefore, at this phase of investigation, we do not think an exploratory tunnel at that specific location is needed. If unstable rock is encountered during SMUD's final geologic studies, SMUD would excavate the unstable rock and replace it with concrete or similar material.

WATER RESOURCES

Comment-20: PG&E points out that USGS gage no. 11444500 (SFAR near Placerville)is not part of the UARP as listed in table 3-11 on page 3-49 of the draft EIS. PG&E states that this gage is actually on the SFAR below Chili Bar dam and is used for compliance purposes for the Chili Bar Project and requests that table 3-11 be revised.

Response: We revised the layout of the last rows of table 3-11 to clarify that that this gage is not part of the UARP. Page 3-40 of the draft EIS includes a description of the gage use for compliance downstream of the Chili Bar Project.

Comment-21: The Forest Service, SMUD, Interior, and American Whitewater question the staff's modification to Proposed Article 1-8. The modification would require SMUD to maintain Gerle Creek reservoir at a set reservoir elevation of 5,288 feet from August through October to provide for the passage of brown trout spawning runs from the reservoir upstream into Gerle Creek. SMUD comments that this measure as modified by staff would not have the intended results and would place undue constraints on SMUD operations and maintenance activities at the Loon Lake and Robbs Peak developments. First, SMUD states that new bathymetric data from studies conducted during maintenance activities in the fall of 2006 confirm the presence of an alluvial deposit at the confluence of Gerle Creek and the reservoir that has the potential to pose a migration barrier. SMUD comments that this new information suggests that the water surface elevation of Gerle Creek reservoir may not facilitate fish passage into Gerle Creek. Second, SMUD states that the staff's modification to Proposed Article 1-8 would constrain SMUD's need to use the Gerle Creek reservoir as an afterbay to Loon Lake powerhouse. Third, the modification would limit SMUD's ability to conduct maintenance activities at the Loon Lake and Robbs Peak developments. The Forest Service and Interior point out that although maintaining the reservoir elevation at 5,288 feet may currently allow for fish passage, this could change over time. Therefore, these entities all request that the Commission adhere to the intent of Proposed Article 1-8 and require that SMUD maintain Gerle Creek reservoir at an elevation that would allow for passage of brown trout spawning runs from August through October and adjust that level as needed in consultation with the agencies.

Response: We reviewed the information provided by SMUD and agree that there are uncertainties as to whether passage of brown trout into Gerle Creek can be maintained by managing the level of Gerle Creek reservoir. Although the rationale report for the Settlement Agreement identified a reservoir elevation of 5,228 feet as being needed to provide effective fish passage into Gerle Creek, the new information provided by SMUD indicates that because of backwater effects from Gerle Creek reservoir, there is a deposit of cobbles and boulders extending upstream along Gerle Creek. Portions of this deposit now extend to an elevation that is higher than the normal maximum level of the reservoir, and that the geometry of this deposit may have a greater effect than reservoir levels on fish passage conditions. We note that future changes in the size and geometry of this deposit, which may affect fish passage conditions, are difficult to predict. As a result, we agree that additional studies, site visits, and consultation with the agencies, as proposed by SMUD, would be needed to determine how to ensure that upstream fish passage from the reservoir into Gerle Creek is maintained. Therefore, we revised the final EIS to include the new information provided by SMUD in section 3 and now recommend a Gerle Creek fish passage plan in section 5 that would include measures, such as periodic channel modifications, if needed, to ensure upstream passage of brown trout, consistent with the intent of the Settlement Agreement.

Comment-22: SMUD notes the staff recommendation on page 3-83 of the draft EIS to install a new gage downstream of the Rubicon reservoir. SMUD comments that there are alternative means to satisfy compliance needs and requests that the Commission not limit SMUD's options for minimum/pulse flow compliance to constructing a new gage. Specifically, for minimum flows, SMUD would continue to measure flow using acoustic flow meters attached to the outlet pipe following installation of the larger capacity valves. For pulse flows, SMUD would likely propose the use of the existing Rubicon reservoir water surface elevation recorder along with a rating of the Rubicon dam spillway, consistent with current practice. SMUD states that measuring flow using the spillway weir would likely be more accurate than modifying and using the abandoned auxiliary gage as recommended by staff and would avoid stream channel modification in the wilderness area. SMUD would prefer to consult with the Forest Service and USGS as to the most efficient means of establishing a compliance gage plan with the least effect to the wilderness area.

Response: We modified the text of the final EIS to allow for use of a gaging method that is best suited for this location based on consultation with the USGS and the Forest Service. We also noted that the use of the existing Rubicon reservoir water level recorder might be technically challenging.

Comment-23: PG&E points out that the statement on page 3-100 of the draft EIS that Chili Bar reservoir water is released from the low-level outlet, which is at a depth of about 73 feet below Chili Bar reservoir's normal maximum level is incorrect. PG&E primarily releases water from Chili Bar reservoir through the turbine or the turbine bypass valve and that they only operate the low-level outlet once a year in accordance with maintenance and emergency test requirements.

Response: We revised the text in the final EIS to describe the invert of the penstock intake as about 46 feet below the reservoir's normal maximum level.

Comment-24: Interior, SMUD, and American Whitewater agree the description of the temperature monitoring location in item k in the water quality section of Proposed Article 1-5 of the Settlement Agreement should read Silver Creek immediately upstream of the Camino reservoir's high water line.

Response: We note your agreement with our understanding of the temperature monitoring locations in the final EIS.

Comment-25: Mr. and Mrs. Kuehn comment that since 1983 more than half a million cubic yards of sediment originating from landslides and debris torrents have entered the river and most of it should be in Slab Creek reservoir. They ask why SMUD did not perform a sediment study for the Slab Creek reservoir in light of the deep-water pump storage intake.

Response: We reviewed and generally agreed with the "Iowa Hill Pumped Storage Development Turbidity Analysis" filed by SMUD in October 2004. This document analyzed effects of the proposed operation of the Iowa Hill development on sediment within Slab Creek reservoir. Based on this analysis, we determined that only initial and small-scale changes in the turbidity of the reservoir would be likely. The document also analyzed the existing and future growth of sediment delta in the upstream portion of the reservoir, and we agree with the determination that the proposed operational regime of the Iowa Hill development would not affect the delta for at least 100 years.

Comment-26: Interior and American Whitewater note that in the draft EIS, staff states that monitoring of certain water quality parameters may not be necessary during the full term of any new license. Interior and American Whitewater point out that Proposed Article 1-5 of the Settlement Agreement offers science-based options for future modifications or reduction in the frequency or number of stations what would require long-term monitoring. These entities recommend that the Staff Alternative be consistent with the Settlement Agreement.

Response: Our rationale on page 5-27 of the draft EIS for supporting Proposed Article 1-5 (see draft EIS page 5-27, paragraph 2) is consistent with the intent of the Settlement Agreement, which we interpret to allow SMUD to reduce monitoring of some water quality parameters once data have consistently documented that the parameter supports the desired aquatic resources. ,

Comment-27: In reference to the statement on page 3-106 of the draft EIS, PG&E requests that in the final EIS, staff clarify that water temperature modeling was not conducted for the Chili Bar Project or the reach downstream of Chili Bar.

Response: We revised the text in section 3.3.2.2 of the final EIS in the *Water Temperature Modeling* analysis to clarify that water temperature modeling was not conducted for the Chili Bar Project or the reach downstream of the Chili Bar Project.

AQUATIC RESOURCES

Comment-28: Interior, PG&E, American Whitewater, Friends of Slab Creek, Ms. Schweitzer, and several recreational boaters comment that on page 3-136 of the draft EIS, staff incorrectly defines a Super Dry water year type.

Response: We corrected the definition of a Super Dry water year type in the final EIS.

Comment-29: Interior and American Whitewater comment that the term *naturalized* as used on pages 3-147 and 3-156 to describe populations of rainbow trout is a politically sensitive term and suggests that in the final EIS the term *wild* be substituted for *naturalized*.

Response: We substituted the term *wild* as requested.

TERRESTRIAL RESOURCES

Comment-30: PG&E notes that the draft EIS states on pages 3-178 and 3-194 that overlapping studies were conducted to identify riparian vegetation and for foothill yellow-legged frogs within both Project boundaries and requests that the final EIS indicate that the stream reaches, which lie primarily outside of the Project boundaries, were also included in these overlapping studies. PG&E further requests that the final EIS clarify that the 18 survey sites for the foothill yellow-legged frogs were in the reach downstream of Chili Bar.

Response: We revised the final EIS to clarify the locations of the riparian and foothill yellow-legged frog surveys.

Comment-31: Mr. and Mrs. Kuehn indicate that Scotch broom invaded Iowa Hill about 5 years ago and is present on their property that adjoins the east boundary of SMUD's Iowa Hill property.

Response: Invasive species are prevalent throughout the Project area, and California as a whole. The presence of the invasive Scotch broom located on the Kuehn's property is not Project-related. SMUD proposes an invasive weed and vegetation management plan that would minimize the effects of the Iowa Hill development construction on the spread of invasive species.

Comment-32: Interior and American Whitewater note that Interior no longer maintains a list of federal Species of Concern as stated on page 3-188 of the draft EIS and that the fisher is currently on the FWS Candidate Species List.

Response: We revised the final EIS to correct the status of special-status species.

Comment-33: Interior requests that staff include *FD* in the list of notes for table 3-57 to indicate that the species has been federally delisted. Interior also points out that delisting from the list of endangered and threatened species does not remove all federal protections and requests that staff address the current status of federal protection for the bald eagle in the subsection on bald eagles in the final EIS.

Response: We revised table 3-57 of the final EIS to include the federally delisted designation. As pointed out by Interior, although the bald eagle has been federally delisted, it continues to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The proposed UARP is consistent with the National Bald Eagle Management Guidelines, which have been developed to ensure activities do not violate the protections provided by the acts. We added this information to the final EIS.

Comment-34: EPA questions the finding in the draft EIS that no riparian vegetation or wetlands would be affected by the construction of the Iowa Hill development because of the wetlands and intermittent drainages identified in the draft EIS as being located on both the proposed transmission line route and Iowa Hill site. To clarify the potential effects on waters of the United States that would occur with the construction of the Iowa Hill development, EPA recommends that staff indicate in the final EIS how the Project would comply with the 404(b)(1) guidelines, such as identifying how the preferred alternative avoids waters of the United States and what design measures could be used for further avoidance. EPA suggests including a map or more information about jurisdictional waters, if available, in the final EIS.

Response: According to the *Iowa Hill Wetlands Technical Report* (2004g), SMUD had the Iowa Hill development area, including the proposed reservoir, intake structure, and transmission line studied using aerial photography to locate potential wetland areas, followed by field surveys to delineate any wetlands. As described in section 3.3.4.1 of the draft EIS, the surveys did not locate any palustrine wetlands within these areas. Seven small drainages were located during field surveys, although only one, located along the proposed transmission line route, is classified as a riverine wetland. Our finding that the proposed Iowa Hill development would not affect any wetlands or riparian vegetation is based on the fact that the wetland study did not locate any wetlands within the proposed reservoir or intake sites and only one small intermittent riverine wetland was located along the proposed transmission line route. Narrow, riverine wetlands located within the proposed transmission line can be avoided by siting towers such that the transmission line spans the wetland with no fill required. As such, we do not anticipate construction of the proposed Iowa Hill development would result in fill of any jurisdictional wetlands. We revised the final EIS to clarify this statement.

Comment-35: Ms. Bailey-Hacker states that the biological “reports” do not discuss the effects of the proposed Iowa Hill development construction on wildlife and that the draft EIS does not discuss the fact that the Iowa Hill upper reservoir would be located on a spotted owl Protected Activity Center.

Response: Section 3.3.4.1 of the EIS describes wildlife, including California spotted owls, occurring in the vicinity of the proposed Iowa Hill development. Although one Protected Activity Center is located within 0.25-mile of the Iowa Hill development footprint, the upper reservoir is not located within a Protected Activity Center. Section 3.3.4.2 analyzes the effects of the construction and operation of the Iowa Hill development on wildlife, including California spotted owls, mule deer, black bears, and other species.

Comment-36: PG&E notes that the first two paragraphs under *Our Analysis* under *Vegetation and Noxious Weed Management* seem to apply to the UARP and the third paragraph seems to apply to the Chili Bar Project, but this is not clear. PG&E requests that staff clarify the final EIS to be explicit about when a particular section is discussing one Project or the other Project, or both Projects.

Response: We revised the final EIS to clarify which Project is being discussed.

Comment-37: Interior comments that recommendation no. 15 on page 5-14 of the draft EIS should reference the BLM Sensitive Species List instead of the Eldorado National Forest Watch List.

Response: Although Article 2-9 of the Settlement Agreement incorrectly defines special status plant and wildlife species as "species that are Federal Endangered or Threatened, Forest Service Sensitive," we revised the final EIS to indicate that the definition should be BLM Sensitive instead of Forest Service Sensitive.

THREATENED AND ENDANGERED SPECES

Comment-38: Interior comments the water storage and supply functions of the UARP would allow El Dorado County to fully implement its General Plan, and the prospective development that would result from the full implementation of the plan has the potential to directly affect all five of the Pine Hill endemic listed plants. Interior states that the final EIS should include an analysis in the resource section of this indirect effect and a discussion of cumulative effect of relicensing the UARP on the listed plants in the cumulative effects summary in section 5.0 of the final EIS.

Response: SMUD filed an informational copy of the El Dorado County – SMUD Cooperative Agreement with the Commission in December 2005. However, none of the terms of that agreement are included in the Settlement Agreement as they are outside the scope of the relicensing proceeding. The acquisition of water rights by the El Dorado parties and the provisions dealing with delivery of water from and storage of water in certain UARP facilities would be subject to the Water Board approval and would require a separate NEPA analysis after the El Dorado parties secure the requisite water rights.

Comment-39: Interior and American Whitewater disagree with the staff modification to Proposed Articles 1-12 and 2-9 that a draft biological assessment be prepared by the applicant for the relevant federal agencies and instead states that only the final biological assessment should be filed with the Commission. Interior and American Whitewater recommend the final EIS adopt the language in Proposed Articles 1-12 and 2-9.

Response: Under section 7 of the Endangered Species Act (ESA), it is the Commission's responsibility to consult with FWS or NMFS. Although the Commission can designate SMUD to conduct informal consultation with FWS and NMFS, only the Commission can enter into formal consultation with these federal agencies. Therefore, only the Commission can file a *final* biological assessment with FWS and NMFS and request formal consultation. As such, under this recommended measure, SMUD would prepare and file a *draft* biological assessment with the Commission, and the Commission would then prepare a *final* biological assessment and submit it to the appropriate federal agency requesting formal consultation, if necessary.

RECREATIONAL RESOURCES

Comment-40: Interior, PG&E, American Whitewater, Friends of Slab Creek, Ms. Schweitzer, and several recreational boaters note that table 3-67 does not include the proposed recreational flows downstream of the Chili Bar dam specified in the Settlement Agreement and requests that staff include the table from the Settlement Agreement in the final EIS. PG&E suggests that staff interpreted the flow values in the table in the Settlement Agreement to be in military time, when in fact, the values are in clock time.

Response: You are correct. We revised the information in table 3-67 to be consistent the proposed recreational flows downstream of the Chili Bar dam specified in the Settlement Agreement.

Comment-41: The Forest Service, American Whitewater, the Friends of Slab Creek Ms. Schweitzer, and several recreational boaters comment that the draft EIS does not convey an understanding of the connection between the construction of the Iowa Hill development and the release of recreational streamflows in the SFAR downstream of Slab Creek dam. These commentors state the construction of the Iowa Hill development would facilitate the provision of whitewater flows because (1) the upper reservoir would provide another source of water for these flows, and (2) the cost of making physical modifications to provide these flows would be less because SMUD would have the equipment and personnel already at the Iowa Hill construction site. SMUD comments that by using the constructed Iowa Hill development to better manage water in the Slab Creek reservoir, SMUD could provide boating flows without building expensive release structures. SMUD also requests that staff correct the description of Proposed Article 1-24 on pages 2-276 and 2-278 in the final EIS to reflect the language in the Settlement Agreement that SMUD would enhance recreational streamflows at year 15 after license issuance, if Iowa Hill is not constructed and if certain triggers are met. In addition, the Forest Service and American Whitewater comment that the draft EIS incorrectly summarizes Proposed Article 1-24 of the Settlement Agreement by substituting the words *constructed within 15 years* for the words *commenced construction within 15 years* as the trigger for consultation on a whitewater boating recreation plan.

Response: We revised the text on pages 3-276 and 3-278 to reflect the intent of Proposed Article 1-24. We acknowledge SMUD's comment that with the construction of the Iowa Hill development, it may be able to provide the enhanced recreational boating flows without expensive structural modifications to existing facilities. Therefore we have eliminated SMUD's original estimate of $10,000,000 for anticipated physical modification from the cost of the staff alternative. However, providing the enhanced recreational streamflows, with or without the construction of the Iowa Hill development, would reduce the energy the Project now generates. At the same time, we recognize the value of allowing SMUD and the Agencies as much time as possible to determine if the recreational triggers can be met. We continue to recommend that after

10 years of monitoring, in year 15 after license issuance, that recreational streamflow releases only be provided if the environmental and recreational triggers are met. However, we agree that the volume of these releases need not be revisited. We revised our conclusions about recreational streamflows in section 5 of the final EIS to be consistent with the clarifications made in section 3.

Comment-42: Mr. Shackleton comments that the whitewater run downstream of the Slab Creek dam is a high-quality Class IV/V section of whitewater with easy access to major population centers. He states that SMUD was able to provide the proposed level of flows during the whitewater flow study and urges the Commission to adopt the proposed recreational streamflows included in the Settlement Agreement.

Response: We understand that SMUD was able to provide the proposed level of flows during the whitewater flow study. We take issue with the assumption that whitewater flows would be provided regardless of the level of demand for these flows, and we would continue to require an assessment of the level of demand prior to requiring the proposed whitewater flows as a condition of any license issued for the Project.

Comment-43: Interior and American Whitewater comment that the Staff Alternative in the draft EIS does not include Proposed Article 2-20, which reserves BLM's authority under section 4(e) of the FPA, consistent with the Recreation Payment Agreement dated February 1, 2007, to provide for the protection and utilization of BLM lands through the inclusion of conditions in the license for the Chili Bar Project.

Response: We added Proposed Article 2-20 to table 2-3 in section 2 of the final EIS. However, because the Recreation Payment Agreement (found in appendix 6 of the Settlement Agreement for the UARP and Chili Bar Projects) was filed for information purposes only, we do not include this measure in the Staff Alternative.

Comment-44: Interior, PG&E, and American Whitewater comment that the limited recreational use of the Project facilities would not seem to warrant a separate recreation plan. PG&E further notes that such a plan was not included in the Settlement Agreement and that existing and proposed processes and consultation for monitoring and reporting are sufficient to address public recreation use.

Response: A recreation plan would formalize the existing consultation and reporting requirements and provide the rationale and description for the proposed new and improved recreational facilities for boating access and can be done at relatively minor cost to the Project.

LAND USE

Comment-45: The Forest Service, SMUD, and American Whitewater disagree with the Commission staff's limitation on the scope of the transportation system management plan to Project roads used solely for Project purposes because of the extensive, but not exclusive, use that SMUD makes of these roads. For instance, the Forest Service comments that SMUD's road plowing in the winter to provide access to Project facilities also increases recreational use that otherwise might not occur. SMUD comments that this provision is one that the Commission would not normally included as a condition of license, but as a matter of settlement, SMUD agreed to a broader plan. The Forest Service continues to request that the Commission's policy on Project access roads allow for cost-sharing of facilities on or adjacent to National Forest System lands and that the staff alternative be consistent with the provisions in the Settlement Agreement. For many of the same reasons, the Forest Service and American Whitewater also disagree with the staff's limitation on the scope of the trail system management plan to trails that are needed [solely] for Project purposes. SMUD indicates that while it would include these trails, such as the 7-mile-long segment of the Rubicon hiking trail that is used by SMUD staff to operate the Project and hikers traveling north to Project and non-project destinations, in the trail system management plan, these trails should not be included in the Project boundary.

Response: Commission policy would limit SMUD's and PG&E's responsibilities for road and trail maintenance to those roads and trails that are required solely for Project purposes and would include these facilities in the Project boundary. SMUD and PG&E may enter into a variety of arrangements with other entities to provide for road and trail maintenance as they so chose.

Comment-46: Mr. Summers comments that the draft EIS is incorrect in stating that Carson Road to Cable Road would be the primary access to the proposed upper reservoir site and that Carson Road to Larsen Drive to Slab Creek reservoir would provide primary access to the lower reservoir site. He points out that Larsen Road and Slab Creek Reservoir Road do not intersect and construction traffic would have to travel 1.8 miles between them. However, he states that SMUD now indicates that all Project traffic would access the site via the North Canyon and Slab Creek Reservoir Road but no decision has been made about how traffic would access North Canyon Road. Without this information, he questions how any informed decisions can be made relative to the effects of construction traffic on the local residents, roads, and air quality.

Response: In its comments on the draft EIS, SMUD points out that, as described in exhibit C of the license application, underground spoils would be transported to the upper reservoir site using a vertical material handling system. We provided this information in the final EIS (see response to Comment 12). SMUD also indicates, in a filing dated December 7, 2007, in response to questions raised at the public meeting on the draft EIS, that consultation with the Advisory Committee has produced an alternative route for construction traffic, the Iowa Hill SW connector route, which SMUD currently is considering. We provide SMUD's description of this alternative route for construction traffic access to the site in section 2 and 3 of the final EIS and recommend that SMUD include a detailed traffic analysis for this alternative in the final transportation management plan for the Iowa Hill development. We encourage selection of a route that would minimize user conflicts.

Comment-47: Mr. Summers observes that the draft EIS does not provide the number of vehicles currently using Larsen Road, North Canyon Road, or Carson Road, and the draft EIS does not provide the number of trips a day the Project would generate. He notes that there is no discussion about how workers would get to the construction site or the traffic effect for contingencies, such as imported materials on which to bed the poly membrane liner, which he states could add as many as 13,000 heavy truck trips. With this many potential truck trips, he requests an analysis of the truck traffic effects on property values, safety for local residents walking and bicycling along the roads, pets, and air quality.

Response: You are correct that the draft EIS does not provide the number of vehicles currently using Larsen, North Canyon, or Carson Roads because SMUD did not conduct traffic counts on Larsen or North Canyon Roads during the pre-application studies. SMUD conducted traffic counts on U.S. Route 50 and on Carson Road. SMUD's analysis that found that the traffic generated by Project construction would not affect the level of service categories as defined by El Dorado County, except at the East Camino eastbound ramp in the morning. This means that the roads are capable of handling the additional traffic and the additional traffic would not cause unacceptable delays under the county guidelines. We state the number of daily trips that the Project would generate in the discussion of construction impacts on local traffic in section 3.3.10.2 in the draft EIS. The proposed access routes to the upper reservoir and powerhouse construction sites are described in both section 2 and section 3.3.7.1 of the draft EIS. We, however, added the description of the alternative access routes considered by SMUD in the Transportation Route Technical Report filed on January 31, 2008. SMUD does not propose to haul in clay or other materials to place under the poly membrane at the upper reservoir site. Instead, SMUD would balance excavation and fill quantities on site. This means that excavated material would be crushed on site and used as fill material for the earthen berm. Consequently, fill material would not be trucked in from outside the construction sites nor would excavated material be trucked off the site. We revised the final EIS to make clear that SMUD proposes to use a vertical material handling system consisting of either a conveyor or bucket and cable system located in the cable shaft to transport material excavated from the proposed tunnel and powerhouse cavern to the upper reservoir site. Therefore, these materials would not be trucked. To transport the construction materials and equipment that are needed for construction, about 25 truck-trips are expected per day during initial mobilization and during other periods when deliveries are necessary, such as the liner itself.

Comment-48: Ms. Arteaga comments that the draft EIS does not take into account that the lower access road (Slab Creek Road referred to as Slab Creek dam access road in the draft EIS) goes through private property and does not have a recreational easement. She notes SMUD obtained an easement for the construction and operation of the Slab Creek development but not for public right-of-way and that the intent of the original easement is not sufficient for the needs of the Iowa Hill development. Therefore, she concludes that the proposed improved recreational access to both the river and the reservoir would be unauthorized use of private lands and that new easements would be needed for the construction of the Iowa Hill development. She also comments that adequate access for management and public use of National Forest System lands has not been acquired.

Response: We agree that SMUD would need to obtain the appropriate easements to use the lands prior to construction.

Comment-49: Ms. Arteaga cites the discussion on page 3-292 of the draft EIS about the potential for development that might result from improvements to the roads used for construction and states that Slab Creek Road is a private road and no other entity (SMUD, the Forest Service, or the county) takes responsibility for maintenance and public safety of the road. She asks, "Who will be responsible for the maintenance and public safety of the road?"

Response: As described in the Forest Service Road Maintenance Plan included in the license application, SMUD would maintain the Slab Creek Road (Dam Access Road and Reservoir Access Road)—grading, maintaining ditches, and removing rocks. Slab Creek Road would be maintained at a level needed to access Slab Creek dam facilities.

Comment-50: Mr. Summer, Mr. DeBord, and several commentors at the public meeting raise concerns about the increased potential for wildfires in the Slab Creek Canyon with the construction of a major project and the potential increase in public access to the canyon. They and others comment that the combination of an extreme fuel build-up in the canyon and the near constant breezes up and down the valley would turn a fire into a major wildfire very quickly. They recommend removal of the fire-fuel build-up, including the high pile of debris that SMUD stacked on National Forest System lands near the Slab Creek reservoir 10 years ago, prior to the commencement of any construction. In their opinion, the draft EIS must include an analysis of how the proposed Iowa Hill development and the associated increase in public use would affect the current potential for wildfires.

Response: We discuss the high fire hazard in the Iowa Hill area in sections 3.3.7.1 and 3.3.10.2 of the draft EIS. SMUD would file a fire risk and protection plan prior to any land disturbing/construction activity at Iowa Hill. This plan would be developed to reduce fire risk associated with construction and address issues such as blasting and equipment use, emergency and evacuation procedures, procedures for removing brush and other fire hazardous materials, and rules about construction workers smoking and other related fire risks.

Comment-51: Mr. and Mrs. Kuehn make several comments related to the proposed use of local roads for construction traffic. They comment that (1) that there is no detailed map showing the access route to the proposed powerhouse in the canyon or to the upper reservoir location; (2) the draft EIS implies that all construction traffic would pass through the town of Camino which is already congested and has limited parking; (3) Larsen Road is only 20 feet wide and provides an inadequate base for heavy trucks given the yearly damage done by local logging trucks; (4) Chute Camp Road is a very narrow, old road that would require full bench construction and retaining walls; and (5) excavated material from the powerhouse would be moved to the upper reservoir by a conveyor belt and not be trucked as stated in the draft EIS.

Response: We agree that there is not a detailed map in the draft EIS showing the proposed and alternative access routes to the construction. In response to a Commission request for additional information, SMUD filed a traffic analysis of an alternative access routes that were developed in consultation with the Advisory Committee that would channel construction traffic to the west of the construction site away from the Camino town center. We added descriptions of these alternative routes to section 3.3.7 of the final EIS. With regard to the proposed access routes, we acknowledge that Larsen Road and Chute Camp Road are unimproved rural roads that would require widening and strengthening to accommodate heavy truck traffic. SMUD would widen Chute Camp Road to meet guidelines for a narrow two-lane road and would retain the adjacent slope by tie-back anchors where necessary. SMUD also proposes to perform an engineering analysis of roadways to the upper reservoir site prior to finalizing the Transportation Management Plan to address issues of roadway width and capacity. Finally, we revised the Project description in section 2 of the final EIS to clarify that SMUD proposes to use a vertical material handling system to move excavated materials from the powerhouse site to the upper reservoir and not truck this material through the streets of Camino. We also corrected the names of road segments in the final EIS and corrected information about road names and width.

Comment-52: Mr. and Mrs. Kuehn comment that contrary to the statement on page 3-327 of the draft EIS, the El Dorado Transit serves Camino and Carson Road on a scheduled daily basis and will service unscheduled areas by appointment. They further comment that bicycling and walking are common in the area.

Response: We modified the text in section 3.3.10.2 of the draft EIS to clarify that SMUD indicated that because the area does not have public transportation facilities and is generally not suitable for walking or bicycling, its study focused on automobile and truck traffic likely to be generated by the Project. We also note that SMUD is considering alternative routes for construction traffic and heavy equipment that would avoid many of the user conflicts on the local roads.

Comment-53: Ms. Bailey-Hatcher comments that the information provided on page 3-292 of the draft EIS is incorrect and states that the El Dorado County General Plan (General Plan) land use designations in place for SMUD's parcels on Iowa Hill is Rural Residential and the zoning designation is RE-10, Residential Estate, 10 acres. She notes that the land that SMUD wants to clear-cut, blast, clear, and build over is heavily used for hunting, residential use, birdwatching, and hiking and states that the industrial use envisioned by SMUD is completely out of character with the area.

Response: The draft EIS refers to the 2004 General Plan Land Use Diagram that shows the land within the proposed boundary of the Iowa Hill development to be designated as Natural Resources. SMUD's land use technical report for the Iowa Hill development clearly states that its lands in the proposed boundary of Iowa Hill development are designated Rural Residential with a platted overlay under the General Plan. The General Plan designations are intended to maintain a low residential density. The proposed Iowa Hill development would not increase the residential density on SMUD lands. SMUD also states that the provisions of the El Dorado General Plan would not be applicable to a FERC-licensed project. If licensed, the proposed Iowa Hill development would be constructed entirely within the proposed project boundary as shown on figures 2-4 and 3-36 of the draft EIS on lands currently owned by SMUD, the Eldorado National Forest, and Sierra Pacific Industries. We also note that the Iowa Hill area currently includes hydroelectric uses at the Slab Creek dam and that the Sierra Nevada Forest Plan Amendment (2004) includes hydroelectric generation as a permitted use within the Eldorado National Forest.

AESTHETIC RESOURCES

Comment-54: Mr. Summer and several commentors at the public meeting state that the view of the American River Canyon is vitally important to many more properties than suggested in the draft EIS. He comments that SMUD has said that it intends to clear-cut the entire Project site, which he assumes to mean all the land within the Project boundary, including the transmission and road right-of-ways as shown on figure 2-4 (on page 2-13) of the draft EIS. Under this assumption, he states that the clear-cut area would extend well over the summit of Iowa Ridge and run down the west side of Iowa Hill and would affect the property values of many more parcels than mentioned in the draft EIS.

Response: Prior to construction, SMUD would clear the majority of the land within the proposed Project boundary, including the footprint of the upper reservoir, earthen berm, construction lay down areas, and the locations where organic top soils would be stored. In addition, SMUD would clear a 100-foot-wide corridor about 2 miles long for the new Project transmission line as well roadways and adjacent lands sufficient for grading the new or improved roads. The cleared areas would extend downslope and would be visible from the hillside across the Slab Creek reservoir prior to and during construction. SMUD's Iowa Hill development revegetation plan shows areas to the north and south of the upper reservoir that would be cleared to accommodate the organic top soils removed during excavation for the upper reservoir and that would be revegetated following construction. As discussed in section 3.3.7.2 of the draft EIS and as documented in the Visual Resources Technical Report Addendum filed by SMUD on January 31, 2008, under the current design, the berm would be seen from several viewpoints and may not meet the Forest Service visual quality objectives (VQOs) for Eldorado National Forest. However, under Proposed Article 1-44, SMUD would develop a design for the Iowa Hill development that meets the visual quality standards.

CULTURAL RESOURCES

Comment-55: PG&E questions the use of *TCP* (i.e., traditional cultural properties) on pages 3-304 to 3-11 and suggests that the staff refer to *potential TCPs* rather than *TCP*.

Response: We reviewed section 3.3.9.1 through 3.3.9.3 of the draft EIS and determined that the term *TCP* generally is used appropriately. However, we agree that for clarity, reference should be made to potential TPCs in two instances on page 3-309 and 3-311, and we revised the text in the final EIS.

Comment-56: PG&E provides a clarification about the Chili Bar Toll House Cemetery. PG&E comments that the text should be revised to note that this cemetery also consists of a flat area that may have been prepared as a cemetery pad and to state that the wife of the toll house keeper was reportedly Native American.

Response: We revised the text in section 3.3.9.1 to provide the suggested clarifications.

Comment-57: The Forest Service, PG&E, and American Whitewater comment that Commission staff recommends that SMUD finalize and implement the Historic Properties Management Plan (HPMP) within 1 year of license issuance and states that the recommendation is unclear relative to the Forest Service review and approval and therefore is inconsistent with Proposed Article 1-28 that calls for completion of the HPMP within 6 months for the Forest Service approval. Similarly, Interior and American Whitewater comment that the recommendation that PG&E file a final HPMP with the Commission within 1 year of licenses does not explicitly provide for BLM review and approval. Both agencies and American Whitewater recommend that these measures be consistent with the Settlement Agreement.

Response: On February 11, 2008, the Commission issued a draft Programmatic Agreement and draft HPMP with a 30-day comment period. The Commission directs SMUD to file a revised HPMP within 90 days after the end of the comment period. It is the intent of the Commission to issue a final PA with a final HPMP attached prior to issuing any license for the project. Therefore, we modified Proposed Article-28 and related text in the final EIS to specify that SMUD implement the final HPMP.

Comment-58: Mr. and Mrs. Kuehn comment that there are remnants of historic logging operations throughout the area. They state that Cable Road was an access road to the South tower and today much of it follows the old narrow gage railroad grade. Ms. Bailey-Hacker comments that the unevaluated sites mentioned in SMUD's cultural reports should be evaluated before construction begins at the Iowa Hill development and requests a more thorough study of historical sites and peoples before the final EIS is completed.

Response: We are aware of the area's logging history and artifacts from that industrial use. SMUD conducted prehistoric, historic, and ethnographic studies of lands within Project's Area of Potential Effects including the Iowa Hill development site prior to submitting its license application and the results of these studies were summarized in the draft EIS. These reports have been reviewed by Commission staff and the Forest

Service and provided to the State Historic Preservation Office. We determined that the these reports covered the lands that could be affected by relicensing the project with the proposed Iowa Hill development and were sufficient for assessing the potential effects on cultural properties. Prior to any license issuance, the Commission will execute a Programmatic Agreement for the protection of historic properties. SMUD has prepared a draft HPMP that sets forth its procedures for monitoring potential effects to and completing evaluations of properties that could be affected by project operations. A revised HPMP, reflecting the comments of the Forest Service and others involved in the consultation process under section 106 of the National Historic Preservation Act, will be attached to the Programmatic Agreement.

SOCIOECONOMICS

Comment-59: SMUD comments that the updated construction costs it filed with the Commission in April 2007 are not reflected in table 3-71.

Response: The socioeconomic analyses in the draft EIS are based on the data provided in the 2004 and 2005 study reports. We included a new footnote in the final EIS to explain this. We also deleted table 3-71 both because the values in the table are not directly used in the IMPLAN analysis and to avoid confusion with the current cost estimates provided in table 4-5 in our developmental analysis.

Comment-60: Mr. Morris states that he is opposed to the Iowa Hill Project as initially proposed because it would overwhelm his small community. He states that the construction traffic on a one-lane, rural neighborhood street would devastate his quality of life and threaten his family's safety and property value. Mr. Morris notes that SMUD would not compensate him or his neighbors if they felt it necessary to sell their homes or businesses. He asks FERC to please identify how it would address that issue if the Commission decides to grant approval of the Project. He notes that he has participated in many sub-committee meetings where potential mitigation measures have been identified, and that at a minimum, all of these mitigation measures (Advisory Committee recommendations) should be adopted as a comprehensive package with no exceptions. He states that the safety of the children and local residents should be of paramount concern during the construction phase of the Project if it is built.

Response: Draft EIS section 3.3.7.2, *Environmental Effects, Land Ownership, Management, and Use,* stated that construction of Iowa Hill would begin with updating existing access roads, including Cable Road, Slab Creek dam access road, and Slab Creek reservoir access road, to accommodate construction vehicles. Given the improvement to Cable Road prior to the start of construction, and the analysis showing that the increased traffic would not reduce the level of service on these roads, we concluded in the draft EIS that residents in the area, while they would likely be inconvenienced, would not experience serious disturbances during construction. We revised final EIS section 3.3.10.2, *Environmental Effects, Construction Traffic Impact* *and Impact on Tourism at Apple Hill*, to reflect the results of SMUD's January 2008 *Transportation Route Technical Report*, which investigated several routes as alternatives to the proposed route described in the draft EIS (that is, the route using Cable Road, among others). It also evaluated the use of park and ride and/or equipment staging facilities as a means of alleviating traffic pressures. The study found that construction of the SW Connector would resolve the issues of large truck traffic on Cable Road, and that other measures such as a park-and-ride facility and use of multiple routes for different types of traffic could also help reduce adverse effects on neighborhoods. The final Transportation Management Plan may include these and other measures recommended by the Advisory Committee. However, we must emphasize that the Commission lacks any statutory authority to award or require compensation for harm or damages.

AIR RESOURCES

Comment-61: EPA comments that the Clean Air Conformity Analysis in appendix A of the draft EIS states that the construction schedule for the Iowa Hill development would be adjusted to eliminate the exceedances of oxides of nitrogen, but it notes that this measure is not included in the preferred alternative. EPA requests that in the final EIS staff include a revised General Conformity analysis that reflects the adjusted construction schedule to show that emissions are below the *de minimis* for all pollutants and that the adjustment to the construction schedule be included as a condition of any license issued for the Iowa Hill development, consistent with appendix A.

Response: In response to the California Air Resources Board (CARB), we revised our air conformity analysis using their OFFROAD model. The results of our analysis using the CARB model show that emissions would be below the *de minimis* for all pollutants. Based on these results, SMUD would not need to adjust the construction schedule. We provide the results of the revised air conformity analysis in section 3.3.11 and appendix B of the final EIS.

Comment-62: Mrs. Summers states that her property is in proximity to the Project and she is an asthmatic. Therefore, she wants assurances that SMUD will be in compliance with all California standards and guidelines in effect at the time of construction regarding particle pollution, ozone air pollution, ROG, and NOx on a daily basis.

Response: Based on our independent air conformity analysis included in the EIS, we conclude that the air emissions during construction of the proposed Iowa Hill development fall below the *de minimis* thresholds under California standards. We provided our analysis to the CARB for review.

STAFF'S CONCLUSIONS

Comment-63: Interior and American Whitewater note that recommendation no. 62 on page 5-11 of the draft EIS fails to include FWS in the reservation of authority to prescribe fishways at the UARP consistent with Proposed Article 1-35. Interior further points out that section 5.0 does not refer to Proposed Article 2-19 that reserves Section 18 authority for FWS and NMFS at the Chili Bar Project. Interior and American Whitewater state that staff should correctly paraphrase and include both Proposed Articles in the final EIS.

Response: We revised the text of the final EIS to include these corrections.

Comment-64: CDFG, SMUD, PG&E, Interior, and American Whitewater point out that the Staff Alternative in section 5 of the draft EIS modifies Proposed Articles 2-1 and 2-1 of the Settlement Agreement such that the minimum streamflow and ramping rate provisions would only apply when inflow to the Chili Bar Project is greater than the proposed minimum streamflow instead of when inflow to the Chili Bar reservoir is sufficient to maintain the proposed minimum streamflow and ramping rates. CDFG states that its HEC-ResSim model, which takes into account available storage in the reservoir, demonstrates that PG&E could comply with the minimum streamflow and ramping rates specified in the Settlement Agreement. CDFG, SMUD, PG&E, Interior, and American Whitewater request that the Commission adhere to the language in the Settlement Agreement and allow the storage in the Chili Bar reservoir to help PG&E meet the proposed minimum streamflow and ramping rates.

Response: We agree with the HEC-ResSim modeling results that show that under modeled conditions, storage in the Chili Bar reservoir could be used to maintain the minimum stream flow and ramping rates. We have modified proposed measures 1 and 2 for Chili Bar to reflect the language in the Settlement Agreement that allows for the usage of storage within Chili Bar reservoir when feasible.

Comment-65: PG&E notes that the draft EIS qualifies the development of the water temperature monitoring plan to install and maintain continuous recording devices to occur as soon as weather and flow conditions allow. PG&E states that it was not the intent of the Settlement Agreement to so restrict this measure and requests that the final EIS delete the phrase "as soon as weather and flow conditions allow."

Response: We revised the text in section 5 of the final EIS to be consistent with the intent of the Settlement Agreement.

Comment-66: Interior, SMUD, and American Whitewater comment the Staff Alternative does not include gages for real-time reporting on non-project diversion structures in the Rubicon watershed. Interior and American Whitewater recommend the Staff Alternative include these gages to be consistent with the Settlement Agreement for gaging on the Rubicon River. SMUD agrees with the staff conclusion that there is no nexus between the real-time telemetry of this gaging data and the UARP relicensing. However, SMUD points out that in summarizing the conclusions on this recommendation on page 5-22, staff appears to classify the tunnels and powerhouses as non-project diversion structures. SMUD requests that staff clarify the reference to gages located at the tunnels and powerhouses in the final EIS.

Response: We clarified that neither the Project gages at the tunnels and powerhouses, nor those on non-project diversion structures located within the upper Rubicon River watershed have real-time reporting in section 5 of the final EIS. As discussed in the draft EIS, real-time reporting gages requested by Placer County are not necessary for SMUD to ensure compliance with the recommended streamflow schedules or reservoir levels and their omission is not inconsistent with the Settlement Agreement.

Comment-67: The Forest Service, SMUD, Interior, and American Whitewater question the staff recommendation to not include the provisions of Proposed Article 1-23 to make every reasonable effort or good faith effort to meet specified reservoir elevations for several smaller reservoirs in the UARP, and these entities suggest that monitoring and adjusting the specified reservoir elevations every 5 years would address the staff's concern that these smaller reservoirs would not be able to comply with the specified elevations. SMUD comments that it agreed to keep reservoir elevations in non-storage reservoirs at historical levels for recreational and aesthetic reasons and its commitment to do so was important to the settlement negotiations. Therefore, these entities all recommend that the Staff Alternative adopt the language of Propose Article 1-23 to be consistent with the Settlement Agreement.

Response: We appreciate the effort that will be made to meet the specified reservoir elevations on the smaller reservoirs. However, as noted in the draft EIS, "good faith," "every reasonable" and related efforts to meet a measure would be impracticable to enforce as a license condition in the license articles. Therefore, we will not recommend the inclusion of these measures in any license that may be issued for the UARP.

Comment-68: SMUD notes the staff recommendation at page 5-8 of the draft EIS to expand the geographic scope of invasive weed management plan to include all lands within the Project boundary. SMUD states that staff's modification to this measure extends beyond the intent of Proposed Article 1-13 and would cost substantially more than estimated by the staff, especially in the lower 30 miles of the UARP transmission line boundary. Therefore, SMUD requests that the Commission adopt the plan described in the Settlement Agreement in the final EIS.

Response: As discussed in sections 3.3.4.2 and 3.3.5.2 of the draft EIS, managing Project-related invasive weeds infestations on all Project lands would benefit native plants and wildlife, particularly rare plants. We recognize that the increased coverage of this plan would result in some increased cost, and we recommend that monitoring be conducted during your annual inspections to cut down on expenses. Additionally, although SMUD states the effort to determine which new infestations are Project-related would be "impossible," determining which infestations are Project-related would involve the same methodology SMUD would be employing to implement Proposed Article 1-13. Although SMUD states that the cost of this plan would be substantial, it does not provide an estimated cost. Therefore, we revised the final EIS to include our estimated cost based on the information you provided about the level of effort envisioned.

Comment-69: SMUD requests that the staff-recommended wildlife lands mitigation plan, as described on page 5-39 of the draft EIS, not limit SMUD's options with respect to the issue of land ownership and inclusion of such wildlife mitigation plans in the Project boundary. Instead, SMUD requests that the staff-recommended plan allow for alternative approaches, such as an ownership transfer of SMUD-purchased land to a conservancy for wildlife preservation and management in perpetuity.

Response: Proposed Article 1-41 states that SMUD would purchase lands or obtain a conservation easement for lands to be managed as wildlife habitat for the term of the license. As stated in section 3.3.4.2 of the draft EIS, we were unable to analyze whether or not this proposed measure would adequately mitigate for the lost habitat without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals SMUD would apply to the property. To ensure that the loss of wildlife habitat at the Iowa Hill development is properly mitigated, these mitigation lands need to be within FERC's jurisdictional authority. Therefore, these lands need to be within the Project boundary.

Comment-70: SMUD takes issue with the conclusion on page 5-31 of the draft EIS that it is reasonable to include the Cleveland Corral Information Center within the Project boundary. SMUD believes that the facility is not project-related because it is a Forest Service facility that is open to all visitors to Crystal Basin, including visitors to non-project lakes, stream, lands, and trails throughout the 68,000-acre basin. Further, SMUD states that this facility is not needed for Project purposes, is not currently included in the Project boundary or adjacent to a Project reservoir, and is not included in the Settlement Agreement. Therefore SMUD requests that the Commission not include this facility in the Project boundary in the final EIS.

Response: Although SMUD assisted in the construction of this facility and continues to provide support, we agree that there is no Proposed Article that would require continued support for the facility. Therefore, we revised sections 3 and 5 of the final EIS, and we longer would recommend inclusion of the Cleveland Corral Information Center within the UARP boundary.

Comment-71: SMUD comments that the discussion on page 5-31 of the draft EIS is unclear about what facilities at the Big Hill Overlook staff recommends for inclusion in the Project boundary. SMUD requests that, consistent with the discussion on page 3-267, the final EIS include only those recreational-specific facilities of Big Hill Overlook within the Project boundary and not the non-public facilities, such as the Forest Service heliport facilities.

Response: We revised section 5 of the final EIS to clarify that only the public accessible recreational facilities of the Big Hill Overlook would be included within the Project boundary.

Comment-72: The Forest Service and American Whitewater do not agree with the staff's position that Proposed Article 1-21 is contrary to the Commission's policy on the imposition of funds and cost caps and comment that the collection agreement between SMUD and the Forest Service described in Proposed Article 1-21 is the appropriate vehicle to direct and define the maintenance activities and estimated costs that are directly related to Project operations. The Forest Service and American Whitewater point to the data Rationale Report (CDFG, 2007, as cited in the main text of the draft EIS) that demonstrates a Project nexus and states that the annual dollar amount specified in Proposed Article 1-21 is considerably less than the actual costs to the Forest Service. SMUD comments that this provision is one that the Commission would not normally include as a condition of license and that it agreed to an annual payment to the Forest Service as a matter of settlement. However, SMUD points out that the annual amount was carefully negotiated, and it agrees with the Forest Service that the proposed annual payment is less than the cost estimates by the Forest Service for the operation, maintenance, and administration of the developed sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities. Furthermore, SMUD states that it would be a mandatory condition under section 4(e) and requests that the Commission include Proposed Article 1-21 as presented in the Settlement Agreement in any license issued for the Project. SMUD also comments that the discussion of its responsibilities for maintaining Project features combined with elimination of the cost cap suggests that SMUD would have responsibility for non project-related recreation.

Response: As a matter of Commission policy, we do not recommend inclusion of conditions that impose cost caps. We do, however, recognize the complex collaborative effort between SMUD and the Forest Service to provide recreational facilities at and near the UARP. We revised our analysis of Proposed Article 1-21 for Recreation Operation, Maintenance, and Administration in section 3.3.6.2 to conclude that the continued provision of funding by SMUD to the Forest Service for the day-to-day management and operation of Project recreation facilities benefits the public and that the proposed collection agreement would clearly define activities and costs related directly to Project recreational facilities. We also conclude that though the costs the Forest Service incurs outside the Project boundary are only a small part of the total funding, based on the recent Commission settlement policy, we would not recommend these costs be part of the an article the Commission would enforce.

Comment-73: SMUD notes the statement on page 5-33 concerning SMUD's obligations under any new license implies a staff concern that SMUD may be trying to limit its responsibility for Project-related recreational facilities. SMUD points out that under Proposed Article 1-20, it would maintain full responsibility for keeping UARP recreational facilities in safe and usable condition.

Response: We did not intend to suggest that SMUD would be limiting its responsibilities for maintaining Project recreational facilities in safe and useable conditions. We clarified this in the final EIS.

Comment-74: The Forest Service, American Whitewater, the Friends of Slab Creek, and several recreational boaters do not agree with the staff's recommended provision to determine within 10 years of licensing, what the recreational streamflows downstream of Slab Creek dam would be for the remainder of the license period. These entities state that Proposed Article 1-24 provided 15 years, if Iowa Hill development were not to be constructed, to provide whitewater flows based on monitoring because that period would allow SMUD a reasonable amount of time to construct Iowa Hill development, to allow a reasonable maximum period to install new facilities before increasing whitewater flows, and to meet the interests of whitewater boaters in having a specified period in which to increase whitewater flow days if monitoring studies indicate the increases are warranted. The Forest Service and American Whitewater further note that the draft EIS presents the most costly scenario for providing future whitewater flows rather than conveying the range of options discussed during settlement negotiations. According to the Forest Service and American Whitewater, the provision of whitewater boating flows was one of the most contentious issues addressed in the Settlement Agreement and modifications to the provision should not be made without agreement of the parties to the Settlement Agreement.

Response: As noted in response to Comment 40, we take issue with the assumption that whitewater flows would be provided regardless of the level of demand for these flows, and we would continue to require an assessment of the level of demand prior to requiring the proposed whitewater flows as a condition of any license issued for the Project.

Comment-75: Interior and American Whitewater do not agree with the staff's position that an annual fund of $15,000 for BLM to provide Project-related recreation brochure/map and an interpretive, education, public information plan is contrary to the Commission's policy on the imposition of funds and cost caps.

Response: As a matter of policy, the Commission holds licensees accountable for fully implementing the environmental measures included in a license and does not limit implementation of measures to specific cost caps. We, however, included the provision of Project-related recreational brochure/map and an interpretive, education, and public information plan in the Staff Alternative as reasonable measures that would benefit recreational users at the Chili Bar Project.

Comment-76: Interior notes on page 5-32 of the draft EIS staff indicates that PG&E's proposal to exclude 152 acres from the current Project boundary would likely have minimal environmental effects, but it does not make a recommendation because PG&E had not demonstrated the lands are no longer needed for Project purposes. Interior does not support PG&E's proposal to exclude these lands, but agrees that the new trail from Rock Creek road should be included in the Project boundary. PG&E comments that it proposes to develop and submit a revised proposed Project boundary after consultation with BLM and SMUD and request that the schedule for the submittal of revised exhibit

G drawings be consistent with the schedule for the UARP licensee's development of the UARP's Slab Creek recreation management plan.

Response: PG&E would be required to provide revised exhibit G maps after completion environmental measures that would require boundary changes, such as the proposed trail. Given that PG&E has 3 years to complete the proposed recreational improvements and that SMUD would need to file its Slab Creek recreation management plan prior to the commencement of construction of the Iowa Hill development, it would not be unreasonable for PG&E to file its revised exhibit E drawings after SMUD files its recreational management plan, assuming the schedules hold up over time.

CUMULATIVE EFFECTS

Comment-77: Mr. Hanson comments that although pages 3-290 and 3-292 of the draft EIS suggest that road improvements and maintenance associated with the construction of the Iowa Hill development may enhance the potential for development, nowhere in the draft EIS are the cumulative effects of this potential for development analyzed. He recommends that staff either augment the final EIS to include this analysis or preferably prepare a separate EIS for the Iowa Hill development.

Response: We augmented the cumulative effects summary in section 5 of the final EIS to include the cumulative effects of road improvements in the Iowa Hill area.

CONSISTENCY WITH COMPREHENSIVE PLANS

Comment-78: The Forest Service and American Whitewater comment that, contrary to the statement on page 5-44 of the draft EIS, the Iowa Hill development as described in the draft EIS, particularly the proposed berm, does not meet the visual quality standards in the Eldorado National Forest Land and Resource Management Plan and requests that the final EIS reflect this information.

Response: We revised the section 5 of the final EIS to reflect the conclusion in our analysis in section 3.3.8.2 that the Iowa Hill development as proposed would not meet the Eldorado National Forest VQOs. Under Proposed Article 1-44, SMUD would develop a visual resource protection plan that would include final designs for the development that would meet the Forest Service VQOs.

Comment-79: The Forest Service and American Whitewater point out that page 5-37 of the draft EIS incorrectly states that an HPMP is currently under review by the Forest Service and provides a copy of the Forest Service comment letter on the HPMP.

Response: We revised the text in section 5 of the final EIS to note that the Forest Service has provided comments to SMUD on the draft HPMP.

Comment-80: SMUD estimated the high-end cost to build the Iowa Hill development to be $855,362,000 in 2007 dollars.

Response: Staff corrected the high-end cost to be $855,362,000.

APPENDIX B

UPPER AMERICAN RIVER HYDROELECTRIC PROJECT (FERC No. 2101)
AND
CHILI BAR HYDROELECTRIC PROJECT (FERC No. 2155)
CALIFORNIA

CLEAN AIR ACT CONFORMITY ANALYSIS

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LIST OF TABLES

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LIST OF ABBREVIATIONS

CAA	Clean Air Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	Carbon monoxide
Commission	Federal Energy Regulatory Commission
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ºF	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GCR	General Conformity Rule
HC	hydrocarbons
kg	kilogram
kV	kilovolt
mmBtu	million British thermal units
mph	miles per hour
MW	megawatt
MWh	megawatt-hours
MWR	Morale, Welfare and Recreation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOx	oxides of nitrogen
NSR	non-Attainment New Source Review
O_3	ozone
Pb	airborne lead
PG&E	Pacific Gas and Electric Company
Projects	UARP and Chili Bar Project
PM	particulate matter
$PM_{2.5}$	particulate matter with an equivalent aerodynamic diameter less than 2.5 um
PM_{10}	particulate matter with an equivalent aerodynamic diameter less than 10 um
PSD	prevention of significant deterioration
SIP	State Implementation Plan
SO_2	sulfur dioxide
SMUD	Sacramento Municipal Utility District
TPY	tons per year
UARP	Upper American River Project
VOC	volatile organic compounds

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1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC), Office of Energy Projects has retained the services of The Louis Berger Group, Inc. (Berger), to perform a conformity determination with respect to proposed relicensing to the Upper American River Project (UARP or Project No. 2101) and the Chili Bar Hydroelectric Project (Project No. 2155). In support of the environmental impact statement (EIS) being prepared, Berger is performing a conformity determination for the Projects, pursuant to the provisions of 40 CFR 93.150 for General Conformity, to assess emissions that would result from construction and operation of the Projects

1.1 DESCRIPTION OF PROJECT

The Upper American River Project (UARP or Project No. 2101) is a hydroelectric project located in El Dorado and Sacramento County, California within the Rubicon River, Silver Creek, and the South Fork of the American River (SFAR) drainages and operated by the Sacramento Municipal Utility District (SMUD). The Chili Bar Hydroelectric Project (Project No. 2155), operated by the Pacific Gas and Electric Company (PG&E), is located on the SFAR in El Dorado County, California. The Projects have common stakeholders and issues, as well as operational and hydraulic interrelationships. The UARP can generate up to 688 megawatt (MW) of power, while the Chili Bar Project provides an additional capacity of 7 MW.

PG&E and SMUD entered into two relicensing cooperation agreements that defined the common relicensing issues between the Projects' overlapping issues. These overlapping issues are related to flows into and out of Chili Bar reservoir and operational coordination. Both SMUD's and PG&E's license applications outlined their proposals to continue operating the UARP and the Chili Bar Project in accordance with certain existing and interim operational and environmental measures.

As part of the relicensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill pumped storage development (Iowa Hill development). The Proposed Action includes the construction of a new upper reservoir atop Iowa Hill and operation of the completed pump-storage facility with capability to generate 400 MW of electricity. The existing Project produces an average of approximately 1,835,000 megawatt-hours (MWh) of power annually. The Iowa Hill development is not expected to significantly change the Project's average annual energy production, but by using off-peak energy to pump water to the storage basin and then releasing water through the powerhouse during peak periods, SMUD would significantly increase the generated energy's value and water use efficiency.

The final EIS concludes that issuing a new license for the Chili Bar Project as proposed by PG&E with staff modifications would best achieve proper use, conservation, and comprehensive development of the Chili Bar Project and the Upper American River. Furthermore, continuing operations of the Chili Bar Project would not substantially increase air emissions. As such, an air conformity analysis was performed only for alternatives related to the UARP.

1.2 CLEAN AIR CONFORMITY

The 1990 amendments to the Clean Air Act (CAA) and the Conformity Rules require federal agencies to conform to State Implementation Plans (SIPs). Requirements and procedures have been established by the US Environmental Protection Agency (EPA) and federal agencies to ensure that federal sponsored or approved actions will comply with the National Ambient Air Quality Standards (NAAQS), and conform to the appropriate SIPs. The conformity rules apply to designated non-attainment or maintenance areas for criteria pollutants regulated under NAAQS. The SIPs are the approved state air quality regulations that provide policies, requirements, and goals for the implementation, maintenance, and enforcement of the NAAQS. SIPs include emission limitations and control measures to attain and maintain the NAAQS.

The EPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51 and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Since the proposed project is a non-transportation project, the general conformity rule applies.

The general conformity determination and applicability analysis have been prepared as supplements to the EIS for the Project. Air emissions of the proposed actions during construction and operation of the Project Alternatives, including UARP-Only (without the Iowa Hill development), UARP with the Iowa Hill development, and No-Action Alternative, were evaluated for air conformity purposes.

2.0 GENERAL CONFORMITY

2.1 ATTAINMENT AND NON-ATTAINMENT AREAS

The General Conformity Rule applies to federal actions occurring in air quality regions designated as being in non-attainment for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. A criteria pollutant is a pollutant for which an air quality standard has been established under the CAA. Under the requirements of the 1970 CAA, as amended in 1977 and 1990, the EPA established NAAQS, for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Non-attainment designation is based on the exceedances or violations of the air quality standard. A maintenance plan establishes measures to control emissions to ensure that the air quality standard is maintained in areas that have been re-designated as attainment from a previous non-attainment status.

The proposed Projects would take place in Sacramento County and El Dorado County, California. These impact areas are currently designated as serious non-attainment for 8-hour ozone, and as CO maintenance (previously nonattainment) areas. Sacramento County is also designated as moderate non-attainment for PM_{10}. The project areas are designated as attainment for other criteria pollutants. Thus, ozone (O_3), CO, and PM_{10} are the primary pollutants of concern. O_3 is principally formed through chemical reactions of oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the atmosphere; therefore, emissions of NO_x and VOC need to be included in the conformity analysis.

2.2 *DE MINIMIS* EMISSION LEVELS

Threshold (*de minimis*) rates of emissions for federal actions with the potential to have significant air quality impacts are established in 40 CFR 93.153. Under the general conformity rule, net emissions resulting from proposed federal action must be compared to the applicable *de minimis* levels on an annual basis. A formal conformity determination is required when the annual direct and indirect emissions from a federal action, occurring in a non-attainment or maintenance area, equals or exceeds the *de minimis* level. Table 2-1 lists the established *de minimis* levels for each criteria pollutant.

Table 2-1. *De minimis* emission levels for applicable air pollutants

Pollutant	Non-attainment / Maintenance Designation	TPY
Ozone (Precursors VOCs or NO_x)	Serious[a]	50
	Severe	25
	Extreme	10
	Other non-attainment areas outside ozone transport region	100
	Marginal and moderate non-attainment areas inside ozone transport region	50/100
Carbon monoxide	All[a]	100
Sulfur dioxide	All	100
Lead	All	25
Nitrogen dioxide	All	100

Pollutant	Non-attainment / Maintenance Designation	TPY
Particulate matter	Moderate[a]	100
	Serious	70

[a] *De minimis* levels for emissions included in the UARP Conformity Analysis.

2.3 ANALYSIS METHODOLOGY

Per the provisions of 40 CFR 93.150, federal agencies are required to perform a conformity determination when the emissions in non-attainment or maintenance areas would total or exceed thresholds emission levels. "Federal action," as defined in the Conformity Rules, means any activity engaged in by a federal agency, or any activity that a federal agency supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects developed, funded, or approved under Title 23 USC or the Federal Transit Act (49 USC §5301 et seq.). Where the federal action is a permit, license, or other approval for some aspect of a nonfederal undertaking, the relevant activity is the part, portion, or phase of the nonfederal undertaking that required the federal permit, license, or approval. Therefore, the proposed action is defined as activities related to the re-licensing of the UARP.

Per the provisions of 40 CFR 93.150, a full conformity determination is required if calculated net emissions are above *de minimis* in non-attainment or maintenance areas. Net emissions are estimated as the difference in annual peak-year emissions between the action being analyzed and baseline condition, which is the no action alternative in this case.

The proposed action would be subject to conformity requirements if net project VOC or NOx emissions above baseline conditions exceed 50 tons per year, or if CO or PM net emissions exceed 100 tons per year. Other pollutants do not need to be included in the conformity analysis since the area is designated as attainment or unclassifiable for all other criteria pollutants. The conformity determination consists of an emission netting analysis and comparison with applicability thresholds. The detailed methodologies and procedures for air emission calculations and general conformity demonstration are described below.

3.0 ANALYSIS

The conformity analysis for a federal action examines the effects of the direct and indirect net air emissions from all sources compared to baseline conditions. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions, occurring later in time and/or further removed in distance from the action itself, must be included in the determination if both of the followings apply; the federal agency can practicably control the emissions and has continuing program responsibility to maintain control and the emissions caused by the federal action are reasonably foreseeable.

3.1 ACTIVITIES INCLUDED IN ANALYSIS

The three alternatives proposed in the final Environmental Impact Statement for Hydropower License (FERC Project Nos. 2101 and 2155) include both construction and operations-related activities that may effect air emissions in the Project Area.

3.1.1 No-Action Alternative

Under the No-action Alternative, the UARP and Chili Bar Project would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. This alternative establishes baseline environmental conditions for comparison of net emissions produced under the other alternatives. Under the No-action Alternative, a Simple-Cycle Turbine (SCT) system will be added for additional on-peak use. These stationary combustion turbines use natural gas to generate shaft power that is converted into electricity.

3.1.2 SMUD's Proposal: Iowa Hill Development

As part of the re-licensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill development, which would operate as a pumped storage facility. The Iowa Hill development, as proposed, would be an off-stream pumped storage project that makes use of the existing UARP Slab Creek reservoir as a lower reservoir and creates a new upper reservoir atop Iowa Hill. A proposed underground powerhouse would house two or three, equally sized, reversible, variable-speed pump/turbine units with a rated capacity of 400 MW. Under this alternative, SMUD would also seek for additional future off-peak generation with either a preferred Combined-Cycle Turbines (CCT) combustion system or conventional coal-fired units for supplements of energy supply. A Simple-Cycle Turbine (SCT) system will also be added for additional on-peak use.

3.1.3 UARP-Only Alternative

Under this alternative, all components of SMUD's Proposal would be established with the exception of the Iowa Hill development. SMUD would operate the existing UARP facilities. Slab Creek reservoir water level fluctuations under this alternative would be the same as existing conditions, while the release schedule for the project dams would be the same as with the Iowa Hill development. Without the additional 400 MW of capacity from the Iowa Hill development, SMUD would have to meet future peak generation needs with replacement facilities, additional on-peak simple cycle peaking plants, such as a SCT system, or seek an alternative supplemental energy supply. SMUD would also add the additional future off-peak generation with either a preferred CCT combustion system or conventional coal-fired units during for supplements of energy supply.

3.2 EMISSIONS SOURCE DETERMINATION

The General Conformity Rule (GCR) requires that potential emissions generated by any project-related demolition or construction activity and/or increased operational activities be determined on an annual basis and compared to the annual *de minimis* levels for those pollutants (or their precursors) for which the area is classified as non-attainment or maintenance. CO, PM, NO_x, and VOC emissions attributable to operational activities and construction were analyzed.

In estimating construction-related air pollutants emissions, the California Air Resources Board (CARB) OFFROAD2007 model was used. The usage of equipment, the likely duration of each activity, and manpower estimates for each activity for the construction were determined by the engineer. In estimating operational-related emissions, the EPA-developed AP-42 emission factors were used if other emissions information was not provided.

3.3 CONSTRUCTION EMISSIONS

Construction-related air emissions include potential direct and indirect VOC, NO_x, CO, and PM emissions generated by construction equipment and vehicles. Emissions may result from the use of construction equipment, equipment mobilization, site preparation, foundations, exterior masonry work, interior and exterior utilities, structures demolition and construction, and exterior pavement around structures. Construction activities would involve operations of on-site construction equipment and motor vehicles, including construction material delivery trucks and workers' commuting vehicles, and dusts from earth surface handling activities. Since the maximum annual emissions would result from all lots being constructed at the same time, the number and type of equipment necessary for construction activities were determined in aggregate for the project.

In estimating air emissions from construction activities, the usage of equipment and the duration of activities for construction were first determined based on the sizes of structures and lots to be constructed. To be conservative, all equipment was assumed to be diesel-powered unless otherwise noted. Types of equipment to be used include, but are not limited to; bull dozers, rigs, crushers, rock saws, drill, scrapers, concrete batch plants, dumpers, excavators, compressors, water tanks, cranes, graders, pavers, backhoes, dump trucks, front-end loaders, jackhammers, and vibrators. The resulting air emissions were then calculated using the engine emissions model and procedures established by CARB, and other relevant data from EPA provided guidance and dust emission factors.

Because there are no construction activities in either the No-Action Alternative or the UARP-Only Alternative, construction-related emissions analysis has been performed only for the Iowa Hill development. Operational-related air emissions have been analyzed for all proposed alternatives.

Construction of the Iowa Hill development may affect short-term air quality due to construction equipment and vehicle emissions, and fugitive dust from earthmoving activities. Both potential effects would be temporary (limited to the construction period) and local (only occurring in the immediate vicinity of the construction activity).

Estimates of construction equipment emissions were based on the estimated hours of usage and emission factors for each motorized source for the project. Emission factors for NOx, VOC, CO, and PM related to heavy-duty diesel equipment were obtained from CARB OFFROAD2007 Model. The on road trucks and workers' vehicles emissions were estimated by latest CARB EMFAC model, and relevant Vehicle Emission Study Reports (EPA). Emission factors are available for hydrocarbons (HC), which include all VOC as well as other non-VOC constituents; therefore, HC emissions represent a conservative estimate of VOC emissions.

Emission factors in grams of pollutant per hour per horsepower were multiplied by the estimated running time and equipment associated average horsepower provided by the EPA to calculate total grams of pollutant from each piece of equipment. Total grams of pollutant were converted to tons of pollutant.

The OFFROAD2007 model recommends the following formula to calculate hourly emissions from nonroad engine sources:

$M_i = N \times HP \times LF \times EF_i$

Where:

M_i = mass of emissions of pollutants.

N = source population (units).

HP = average rated horsepower.

LF = typical load factor.

EF_i = average emissions of pollutant per unit of use (e.g., grams per horsepower-hour).

Estimated emissions from construction activities are presented in attachment 1. Construction of the Iowa Hill Development will occur in two phases. During the first phase, which will last approximately 24 months, material will be excavated from the upper storage reservoir and tunnel sites. The second phase, which will extend from month 25 to month 49, will include the construction of the upper storage reservoir berm, drain structure, and impermeable surface bottom, and the installation of generating equipment in the underground facilities. Emissions will be greatest during Phase I due to the large volume of material excavated; therefore this phase was evaluated for worst-case (peak-year 2009) air emissions. Other years will have lesser emissions from the construction sites.

Heavy construction equipment and truck emissions for the Iowa Hill development would be generated from the engine exhaust pipes of diesel construction equipment and trucks used for 1) the excavation and transport of materials; 2) the boring and lining of underground tunnels; 3) surface dust control in upper reservoir and stockpiling areas; and 4) delivery of equipment and materials to the construction site.

Fugitive dust emissions from the excavation of the upper reservoir site and the tunnels would be associated with excavation and transport of topsoil; ripping and transport of weathered rock; blasting, loading, and transport of basin rock; and transport of tunnel spoils. In addition, wind erosion of areas disturbed during construction activities may contribute emissions. Commuting and delivery motor vehicles operations would result in indirect emissions. The activities that are subject to the general conformity determination include vehicles' operations within project areas. Per engineering and construction team estimates, motor vehicles operations are assumed to be as follows:

- On-Road (off-site) delivery vehicles would travel at an average speed of 25 miles per hour, for a total estimated 15 deliveries per working day with 45 minutes delivery time per visit.
- Each commuter vehicles would make an average round trip of 60 miles within project areas at an average speed of 25 mph.
- Average number of commuting worker vehicles would be 130 per working days.
- There would be 264 working days per construction year.
- Obey California Idling Provisions to limit heavy duty diesel vehicles idling to 5 minutes (October 2005, CARB).

Emission factors for motor vehicles were calculated for 2009 for both delivery vehicles (heavy duty diesel vehicles) and commuter vehicles (light duty gasoline vehicles) using the most recent CARB EMFAC mobile source emission factor model associated with regional parameters.

Under the proposal, SMUD would develop and implement an Iowa Hill Development Construction Dust and Exhaust Emissions Abatement Plan in consultation with interested parties. Under the plan proposed measures would potentially minimize exhaust and fugitive dust emissions during construction of the Iowa Hill development, including:

- Operational measures, such as limiting engine idling time and shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;

- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle diesel fuel;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;
- Use of low-emitting diesel engines meeting federal emissions standards for construction equipment, if available;
- Use of either water application or chemical dust suppressant application to control dust emissions from unpaved surface travel and unpaved parking areas;
- Use of vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Require all onsite haul trucks to maintain at least two feet of freeboard;
- Limit on-site traffic speeds on unpaved surfaces to 20 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Re-plant vegetation in disturbed areas as quickly as possible; and
- As needed, use gravel pads along with wheel washers or wash tires of all trucks exiting Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant and/or use of windbreaks.

To determine the potential worst-case (peak-year) construction emissions, the engine exhausts and dust emission rates were evaluated for each source of emissions according to construction schedule. Tables 3-1 and 3-2 present the estimated worst-case maximum daily and annual heavy equipment exhaust and fugitive dust emissions with proposed measures discussed above for onsite construction activities during peak-year of construction. Detailed emissions analyses and procedures for various heavy construction equipment, trucks, and fugitive dust emissions are presented in attachment B1.

The emissions resulting from heavy equipment and trucks during construction under the Iowa Hill Alternative, as shown on table 3-2, also represent the net emission increases versus the No-action Alternative, which has no construction-related emissions. These net increases for NOx, CO, VOC, and PM are all below *de minimis* levels and meet the conformity thresholds. The SOx emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement.

Table 3-1. Maximum daily construction emissions during peak year (pounds per day)

Emission Source	NO_x	CO	VOC	SO_x	PM_{10}	$PM_{2.5}$
On-site heavy equipment and trucks	323.8	114.0	33.6	0.3	13.0	12.1
Fugitive dust					234.5	46.1
Vehicles for deliveries (on-road)	13.4	12.1	1.7	0.02	0.5	0.4
Worker travel vehicles (on-road)	7.8	75.5	7.7	0.08	0.7	0.4
Total construction emissions	345.0	201.6	43.0	0.4	248.7	59.0

Table 3-2. Annual construction emissions during peak year (tons per year)

Emission Source	NO_x	CO	VOC	SO_x	PM_{10}	$PM_{2.5}$
On-site heavy construction equipment and trucks	33.3	11.3	3.5	0.04	1.4	1.3
Fugitive dust					31.0	6.1
Vehicles for deliveries (on-road)	1.8	1.6	0.2	0.003	0.07	0.05
Worker travel vehicles (on-road)	1.0	9.9	1.0	0.01	0.09	0.05
Total construction emissions	36.1	22.8	4.70	0.18	32.56	16.9
De minimis emission levels	50	100	50	100[a]	100	100

[a] Sulfur dioxide *de minimis* level does not apply to the projects

3.4 OPERATIONAL EMISSIONS

The existing UARP produces renewable energy by using available stream flow within the two river basins in which the project is located. Conventional hydroelectric generation is a reliable, efficient, economical, and less polluting source of energy than burning fossil fuels. As water flows downstream, conventional hydro projects store and then release the water to convert the potential energy into electricity through hydraulic turbines that are connected to generators. The water exits the turbines and is returned to a stream. To evaluate air emissions resulting from UARP future operations, the energy generations for all Projects Alternatives were evaluated.

3.4.1 Operational Emissions from No-action (Baseline) Alternative

Hydropower, defined by EPA as clean energy, has nearly zero air quality impacts during operations (electricity generation). Under the No-action (baseline) Alternative, the UARP generates an average of 1,835,000 MWh of emissions-free energy annually. Hydropower's air emissions are negligible for criteria pollutants because no fuels are burned. In the UARP relicensing proceeding, SMUD proposes to add 400 MW of pumped storage capacity to the existing conventional hydropower generation at the project. Unlike conventional hydropower generation, pumped storage generation uses an upper and lower reservoir and pumps water to the upper reservoir for use in generating power to meet peak loads. So that all the alternatives we evaluate have the same total generation, we assumed that under the No-action Alternative, SMUD would meet its peak load needs by adding a simple cycle turbine (SCT) system built to generate the same additional on-peak energy of 931,000 MWh as the proposed Iowa Hill Pumped Storage development and this would contribute air emissions. Additionally, we add 43,000 MWh of off-peak energy to the baseline such that the alternative would be directly comparable to an alternative with Iowa Hill. The first column of table 3-3 shows the generation from the No-action Alternative and table 3-4a and table3-4b summarize emissions from the existing hydroelectric operations and added on-peak SCT generation. The detailed emission analysis is included in attachment B2.

3.4.2 Operational Emissions from UARP-Only Alternative

Under the UARP-only Alternative, the existing UARP facilities would operate in a manner identical to the Proposed Action, without construction of Iowa Hill development. As column 2 of table 3-3 shows, the UARP-only Alternative would result in the annual generation of 1,699,000 MWh of conventional hydroelectric energy, resulting in a reduction of about 136,000 MWh from the No-action Alternative. This reduction in generation compared to the No-Action Alternative is caused by the proposed environmental measures in the relicensing settlement agreement. We added generation in our analysis to replace this energy.

Table 3-3. Energy generation and requirement for all Project alternatives (post 2014)

UARP Operation	No Action Plus SCT for Peaking	Proposed Action Without Iowa Hill	Proposed Action With Iowa Hill	Staff Alternative
Capacity (MW)	688	688	1,088	1,088
Energy generation:				
Super-peak generation (MWh)	0	0	931,000	931,000
On-peak generation (MWh)	1,287,000	1,217,000	1,217,000	1,217,000
Off-peak generation	548,000	482,000	525,000	525,000

UARP Operation	No Action Plus SCT for Peaking	Proposed Action Without Iowa Hill	Proposed Action With Iowa Hill	Staff Alternative
(MWh)				
Total UARP Hydroelectric Generation (MWh)	1,835,000	1,699,000	2,673,000	2,673,000
Pump back energy requirements (MWh)	--	--	1,230,000	1,230,000
Net UARP Energy generation (MWh)	1,835,000	1,699,000	1,443,000	1,443,000
Replacement of delta energy between no action and alternatives				
On-peak replacement (MWh)	--	70,000	(861,000)	(861,000)
Off-peak replacement (MWh)		66,000	23,000	23,000
Replacement subtotal (MWh)	--	136,000	392,000	392,000
Other supply units:				
Additional on-peak from SCT	931,000	1,001,000	70,000	70,000
Additional off-peak from CCT or Coal	43,000	109,000	1,296,000	1,296,000
Other Supply Subtotal	974,000	1,110,000	1,366,000	1,366,000
Total net energy (MWh) under Project Alternative	2,809,000	2,809,000	2,809,000	2,809,000

Table 3-4a. Peak-year annual operational emissions for the No-action Alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
No-Action Sub-total		0.0	0.0	0.0	0.0	0.0

Table 3-4b. Peak-year annual operational emissions for the No-action Alternative (post 2014).

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
On-peak generation from SCT	931,000	77.7	38.2	22.3	9.3	11.2
Off-peak generation						
Option 1 Combined Cycle	43,000	2.2	0.9	0.8	0.4	0.5
Option 2 Coal-fired unit	43,000	2.4	2.3	0.4	0.8	2.2
Combined cycle sub-total		79.9	39.1	23.2	9.7	11.7
Coal-fired unit sub-total		80.1	40.5	22.8	10.1	13.4

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Similar to the No-action Alternative, operation of the existing UARP facilities would not result in any atmospheric emission of criteria pollutants, or other hazardous material that can affect air quality. However, without the Iowa Hill Development, SMUD would have to meet future peak generation needs by using other resources, or purchasing power from the energy market. To account for both the reduction in generation from environmental measures and the added peak generation Iowa Hill provides we've added on-peak SCT generation (1,001,000 MWh[51]), and by off-peak CCT or coal-fired units (109,000 MWh[52]) (See table 3-3) to the baseline. The replacement energy generation from all involved gas turbines or fossil fuel facilities would result in regional air emissions associated with operations. Table 3-5a and Table 3-5b estimate the

[51]Computed by adding the 931,000 MWh of on-peak added to the baseline plus 70,000 MWh in replacement on-peak energy due to environmental measures.

[52]Computed by adding the 43,000 MWh of off-peak added to the baseline plus 66,000 MWh in replacement off-peak energy due to environmental measures.

near-term (prior to 2015) and future (post 2015) emissions related to the UARP-Only Alternative's use of various systems. These emissions are compared to the No-Action emissions, to obtain the net emission increases or decreases for the conformity test of *de minimis* levels.

Table 3-5a Peak annual operational emissions for the UARP-only Alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	136,000					
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 Combined Cycle	66,000	3.3	1.4	1.3	0.7	0.8
Option 2 Coal-fired unit	66,000	3.7	3.6	0.7	1.3	3.4
Combined cycle sub-total		9.1	4.2	2.9	1.4	1.6
Coal-fired unit sub-total		9.5	6.5	2.3	2.0	4.2

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Table 3-5b. Peak annual operational emissions for the UARP-only Alternative (post 2014).

UARP-Only (without Iowa Hill)	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	1,110,000					
On-peak SCT	1,001,000	83.6	41.0	24.0	10.0	12.0
Off-peak generation						
Option 1 Combined Cycle	109,000	5.5	2.2	2.1	1.1	1.3
Option 2 Coal–fired unit	109,000	6.0	5.9	1.1	2.1	5.6
Combined cycle sub-total		89.0	43.3	26.1	11.1	13.3
Coal-fired unit sub-total		89.6	47.0	25.1	12.1	17.6

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.3 Operational Emissions from Proposed Iowa Hill Development

Pumped storage projects store water during off-peak periods that can be rapidly released to provide energy generation during on-peak periods. Regional power benefits from the new development would include those often referred to as ancillary system benefits, including spinning reserves, non-spinning reserves, peaking capacity, and grid stability. The generation capacity of the Iowa Hill development would reduce the need to produce peak energy using fossil fuel-fired plants. Our analysis shows the Iowa Hill development would generate about 931,000 MWh during the super-peak period and 43,000 MWh off-peak. During Iowa Hill pumping operation, turbines would be reversed and 1,230,000 MWh of energy from a tie-in transmission line connected to the Camino-White Rock Line will pump water into the upper reservoir, thus reducing the net energy generation under this alternative to 1,443,000 MWh. Considering this revision to net energy production and future super-peak energy demand, replacement energy by other forms of electrical generation would be needed as discussed below.

3.4.4 Air Emissions Resulting From SCT for Additional On-Peak Generation

Additional on-peak generation of 70,000 MWh would be included in the Iowa Hill alternative. The additional on-peak generation would be produced from a natural gas SCT and would provide for the replacement on-peak generation due to environmental measures. A SCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. These emissions are listed in table 3-6, which summarizes the post 2014 annual peak-year emissions for all units associated with the Iowa Hill development. The annual emissions prior to 2015 would be the same as UARP-only alternative

Table 3-6. Annual peak-year operational emissions from the SMUD-proposed action with Iowa Hill Development (post 2014).

	Annual Energy Generation (MWh)	**Peak-Year Annual Emissions (tons per year)**				
		NO_X	**CO**	**VOC**	**PM_{10}**	**SO_2**
Hydroelectric	2,673,000	0.0	0.0	0.0	0.0	0.0
Electric Water Pumps	–1,230,000	--	--	--	--	--
Replacement facilities include:						
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 combined cycle	1,296,000	64.8	26.6	24.6	13.0	15.6
Option 2 coal–fired unit	1,296,000	71.9	70.6	13.0	25.3	66.1
Combined Cycle subtotal		70.6	29.4	26.3	13.7	16.4
Coal-fired subtotal		77.8	73.5	14.6	26.0	66.9

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper “Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine,” 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.5 Air Emissions Resulting From CCT or Coal-Fired Unit for Additional Off-Peak Generation

Additional off-peak generation of 1,296,000 MWh would be included in the Iowa Hill alternative. The additional off-peak generation would be produced from a natural gas CCT or renewable sources and would provide both pumping energy and replacement of off-peak generation due to environmental measures.

Even, with the best available control technology installed, a CCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. In addition to emission from SCT, table 3-6 summarizes the post 2014 annual peak-year emissions associated with the Iowa Hill development. The analysis includes replacement energy, additional off-peak energy generation, and use of coal-fired units the worst-case scenario for comparison.

Total future emissions resulting from the Iowa Hill development are compared to the No-Action Alternative emissions to obtain the net emission increases or decreases for conformity test of *de minimis* levels.

3.5 CONFORMITY APPLICABILITY TEST FOR *DE MINIMIS* LEVELS—TOTAL PROJECT-INDUCED ANNUAL EMISSIONS FROM CONSTRUCTION AND OPERATION

For conformity test purposes, peak-year net increases or decreases in annual operational and construction emissions are compared among Project Alternatives (tables 3-7 and 3-8).

These net emissions represent the difference in emissions between each analyzed alternative and the no-action and are used to compare with the *de minimis* levels for conformity requirement. Both off-peak replacement generation option 1, combined cycle turbine, and option 2, coal fired unit, are presented in the table for comparing to the options used in no-action conditions. As shown in these tables, the Projects-induced emissions would not exceed the *de minimis* criteria of 50 TPY of VOC or NOx, and would not exceed the criteria of 100 TPY of CO or PM, for any of the peak-case years. During the construction period, the California Idling Provisions of 5-minute limit for heavy-duty trucks and diesel equipment apply to the construction site, and therefore engine emissions would be less than those from the engines without idling limit by approximately 5 percent. Therefore, no mitigation is warranted and the Projects are determined to be compliance with the general conformity rules.

The SO_x emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement for sulfur dioxide.

Table 3-7. Peak-year project-induced annual emissions[a] during Iowa Hill construction period (prior to 2015).

		Additional Supply	Net Peak Annual Emissions (tons/year)					
			NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only								
Construction			0	0	0	0	0	0
Operational		CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
		Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill								
Construction			36.1	22.8	4.7	0.2	32.6	16.9
Operational		CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	45.2	27.0	7.6	1.8	34.0	18.2
		Coal	45.6	29.3	7.0	4.4	34.6	18.7
	De minimis		50	100	50	100	100	100

[a] Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

[b] CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

[c] Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

Table 3-8. Peak-year project-induced annual emissions[a] following Iowa Hill construction period (post 2014)

	Additional Supply	Net Peak Annual Emissions (tons/year)					
		NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only							
Operational	CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
	Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill							
Operational	CCT	–9.2	–9.6	3.1	4.7	3.9	3.5
	Coal	–2.4	33.0	–8.1	53.6	15.8	14.2
De minimis		50	100	50	100	100	100

[a] Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

[b] CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

[c] Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

4.0 CONCLUSION

The cumulative emissions and effects on air quality resulting from all operational and construction activities of UARP Alternatives were evaluated. Construction-related emissions result from development of the UARP Iowa Hill pump-storage facility, while operational emissions are associated with generation of additional power under UARP alternatives.

As shown in this analysis, the Projects-induced emissions for all Projects Alternatives during both worst-case construction and operational periods would not exceed the applicability test *de minimis* criteria. Therefore, the Projects will meet the General Conformity rules for all evaluated Alternatives.

While air quality emission modeling indicates construction of the Iowa Hill development would contribute to increases in temporary emissions, these increases are below *de minimis* criteria and would be limited to worst-case conditions during a short-term period. Overall, total peak-year annual construction emissions related to Iowa Hill facility development meet the General Conformity requirements because they would not exceed *de minimis* thresholds.

Without the Iowa Hill development, viable substitute resources to cover the energy supply shortage in the future would be required. Air emissions resulting from these substitute plants are also estimated to be below the conformity thresholds based on plants' control measures, including selective catalytic reduction (SCR) and thermal efficiency control, to achieve emission reduction to meet the regulations and requirements.

ATTACHMENT B1

GENERAL CONFORMITY ANALYSIS

UARP/CHILI BAR PROJECT AIR EMISSIONS SUMMARY PRIOR TO 2015

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Table B1-1. UARP/Chili Bar Project air emissions summary, prior to 2015.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh)[a]					Peak-Year Annual Emissions (tons/year)				
				NO_x	CO	VOC	PM	SO2	NO_x	CO	VOC	PM	SO2
No-action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		Generation sub-total	1,835,000						0.0	0.0	0.0	0.0	0.0
UARP-only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	70,000	0.167	0.082	0.048	0.020	0.024	5.8	2.9	1.7	0.7	0.8
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	66,000	0.100	0.041	0.038	0.020	0.024	3.3	1.4	1.3	0.7	0.8
		- Option 2 Coal-fired unit	66,000	0.111	0.109	0.020	0.039	0.102	3.7	3.6	0.7	1.3	3.4
		Generation sub-total	1,835,000				Sub-total – Option 1		9.1	4.2	2.9	1.4	1.6
							Sub-total – Option 2		9.5	6.5	2.3	2.0	4.2
									Peak-Year Iowa Hill Construction Emissions (tons/year)				
									NO_x	**CO**	**VOC**	**PM**	**SO2**
UARP with Iowa Hill	Construction Emissions (Prior to 2015)	a) Heavy equipment and trucks.							44.3	18.3	4.0	3.4	0.10
		b) Dust from earth & surface handling.										31.0	
		c) Deliveries and workers' commuting vehicles.							0.3	10.4	1.4	0.1	0.03
								Sub-total	44.6	28.7	5.4	34.5	0.1
				General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action									
									NO_x	**CO**	**VOC**	**PM**	**SO2**
				UARP only (without Iowa Hill)									
				- Option 1 (CCCT for off-peak)					9.1	4.2	2.9	1.4	1.6
				- Option 2 (Coal unit for off-peak)					9.5	6.5	2.3	2.0	4.2
				UARP with Iowa Hill									
				- During Construction					44.6	28.7	5.4	34.5	0.1

Staff alternative will have the same air emissions as those for Proposed UARP action with Iowa Hill

References:
- [a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu
- [b] California Energy Commission, November 2001
- [c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International
- [d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)
- [e] SMUD, July 2006

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ATTACHMENT B2

GENERAL CONFORMITY ANALYSIS

UARP/CHILI BAR PROJECT AIR EMISSIONS SUMMARY POST 2015

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Table B2-1. UARP/Chili Bar Project air emissions summary, post 2015.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh)[a]					Peak-Year Annual Emissions (tons/year)				
				NO_x	CO	VOC	PM	SO2	NO_x	CO	VOC	PM	SO2
No-action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	861,000	0.167	0.082	0.048	0.020	0.024	71.9	35.3	20.7	8.6	10.3
		Generation sub-total	2,696,000						71.9	35.3	20.7	8.6	10.3
UARP-only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	931,000	0.167	0.082	0.048	0.020	0.024	77.7	38.2	22.3	9.3	11.2
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	66,000	0.100	0.041	0.038	0.020	0.024	3.3	1.4	1.3	0.7	0.8
		- Option 2 Coal-fired unit	66,000	0.111	0.109	0.020	0.039	0.102	3.7	3.6	0.7	1.3	3.4
		Generation sub-total	2,696,000					Sub-total – Option 1	81.0	39.5	23.6	10.0	12.0
								Sub-total – Option 2	81.4	41.8	23.0	10.6	14.5
									Peak-Year Iowa Hill Construction Emissions (tons/year)				
									NO_x	**CO**	**VOC**	**PM**	**SO2**
UARP with Iowa Hill	Operational Emissions (post 2015)	a) Hydroelectric	2,673,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Electric energy requirements for pump-back operation	-1,230,000						0.0	0.0	0.0	0.0	0.0
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	1,253,000	0.100	0.041	0.038	0.020	0.024	62.7	25.7	23.8	12.5	15.0
		- Option 2 Coal-fired unit	1,253,000	0.111	0.109	0.020	0.039	0.102	69.5	68.3	12.5	24.4	63.9
		Generation sub-total	2,696,000					Sub-total					
								Option 1	62.7	25.7	23.8	12.5	15.0
								Option 2	69.5	68.3	12.5	24.4	63.9

General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action	NO_x	CO	VOC	PM	SO2
UARP only (without Iowa Hill)					
- Option 1 (CCCT for off-peak)	9.1	4.2	2.9	1.4	1.6
- Option 2 (Coal unit for off-peak)	9.5	6.5	2.3	2.0	4.2
UARP with Iowa Hill					
- Option 1 (CCCT for off-peak)	-9.2	-9.6	3.1	3.9	4.7
- Option 2 (Coal unit for off-peak)	-2.4	33.0	-8.1	15.8	53.6

Staff alternative will have the same air emissions as those for Proposed UARP action with Iowa Hill

References:
[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu
[b] California Energy Commission, November 2001
[c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs Conventional Coal vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International
[d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)
[e] SMUD, July 2006

APPENDIX C

CAPITAL AND ANNUAL COSTS OF MEASURES FOR THE UARP AND CHILI BAR PROJECT

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C.1 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE UARP ALTERNATIVES

In this section, we present the costs of environmental measures associated with the UARP alternatives. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted, in this case, to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-1. No reduction in dependable capacity was identified by SMUD for any environmental measures. Because table 1 of SMUD's April 11, 2007, submittal shows the total generation benefits drop by $8,848,800 and table 4 shows the total generation benefit drops by $8,914,400, we used the slightly lower value in our analysis to be consistent with SMUD's projected effect on energy generation. We also note that in some cases the footnotes, resulting costs, and Settlement Agreement did not always agree. In those instances, we made an appropriate entry in the column labeled comments. We show corrections to footnotes in italics. We also note when staff does not endorse a particular measure. Please note that minor round off errors of $100 may occur because all values are rounded to the nearest $100.

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Table C-1. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications. (Source: SMUD, 2007; Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
1	**Article 1-1. Minimum streamflows.**							
2	Implement daily minimum reservoir release schedule, and provide compliance documentation to FERC annually.	$0	$5,500	$5,500	$0	Water quantity	Yes	
3	Periodic manual adjustments to minimum release valves at all 10 Project dams.[c]	$0	$23,600	$23,600	$0	Water quantity	Yes	
4	Minimum release at Rubicon dam; installation of larger valve required.	$273,300	$0	$18,100	$710,000	Water quantity	Yes	
5	Minimum release at Buck Island.	$0	$0	$0	$134,000	Water quantity	Yes	
6	Minimum release at Loon Lake.	$0	$0	$0	$964,000	Water quantity	Yes	
7	Combined minimum release at Gerle Creek dam and Robbs Peak dam.	$0	$0	$0	$1,265,000	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
8	Minimum release at Ice House dam.		$0		$617,000	Water quantity	Yes	
9	Installation of larger valve at Ice House.	$273,300	$0	$18,100	$0	Water quantity	No	
10	Minimum release at Junction dam.	$0	$0	$0	$457,000	Water quantity	Yes	
11	Minimum release at Camino dam.	$0	$0	$0	$484,000	Water quantity	Yes	
12	Minimum release at Brush Creek dam.	$0	$0	$0	$2,000	Water quantity	Yes	
13	Minimum release at Slab Creek dam; installation of larger valve required.	$2,076,700	$0	$137,900	$2,648,000	Water quantity	Yes	
14	**Articles 1-2 and 1-3. Pulse flows**							
15	Implement pulse flows below Rubicon dam, with ramping; capital costs are for physical modifications at tunnel gate to facilitate pulse flows.[d]	$82,000	$1,500	$6,900	$152,000	Soils and geology	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
16	Implement geomorphic pulse flows below Loon Lake dam, with ramping; capital costs are for site sensitivity investigation and test releases prior to implementation.	$273,300	$500	$18,600	$126,000	Soils and geology	Yes	
17	Implement geomorphic pulse flows below Ice House dam, with ramping.	$0	$500	$500	$200,000	Soils and geology	Yes	
18	**Article 1-4. Develop and file a plan to coordinate with Chili Bar Licensee on operations and in implementing certain license conditions.**	$32,800	$10,900	$13,100	$0	Water quantity	Yes	
19	**Article 1-5. Monitoring program.**							
20	Prepare and implement long-term monitoring plan for trout populations.[e]	$10,900	$39,300	$40,000	$0	Aquatic	Yes	
21	Prepare and implement long-term monitoring plan for hardhead populations.[f]	$10,900	$6,600	$7,300	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
22	Prepare and implement long-term monitoring plan for aquatic macroinvertebrates.[g]	$10,900	$13,100	$13,800	$0	Aquatic	Yes	
23	Prepare and implement long-term monitoring plan for foothill yellow-legged frogs.[h]	$10,900	$37,700	$38,400	$0	Terrestrial	Yes	
24	Prepare and implement long-term monitoring plan for mountain yellow-legged frogs.[i]	$10,900	$6,600	$7,300	$0	Terrestrial	Yes	
25	Prepare and implement long-term monitoring plan for riparian vegetation.[j]	$10,900	$19,700	$20,400	$0	Terrestrial	Yes	Staff corrected footnote—every 10 years after year 15.
26	Investigate fluvial geomorphic properties at two sites in Loon Lake dam reach.	$273,300	$0	$18,100	$0	Soils and geology	Yes	
27	Prepare and implement long-term monitoring plan for geomorphology.[k]	$10,900	$10,500	$11,200	$0	Soils and geology	Yes	Staff corrected footnote—every 10 years after year 15.
28	Prepare and implement long-term monitoring plan for water temperature.[l]	$131,200	$27,300	$36,000	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
29	Prepare and implement long-term monitoring plan for physical water quality.[m]	$10,900	$109,300	$110,000	$0	Water quality	Yes	
30	Prepare and implement long-term monitoring plan chemistry water quality.[n]	$10,900	$54,700	$55,400	$0	Water quality	Yes	
31	Prepare and implement long-term monitoring plan for bacterial water quality.[o]	$10,900	$16,400	$17,100	$0	Water quality	Yes	Staff revision based on applicant's information on monitoring frequency in Settlement Agreement.
32	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish.[p]	$10,900	$5,500	$6,200	$0	Water quality	Yes	
33	Prepare and implement 2-year monitoring plan for fish entrainment at Robbs Peak powerhouse.	$327,900	$0	$21,800	$0	Aquatic	Yes	
34	Prepare and implement long-term monitoring plan for bears.[q]	$10,900	$10,900	$11,600	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
35	Prepare and implement long-term monitoring plan for bald eagles.	$10,900	$32,800	$33,500	$0	Terrestrial	Yes	
36	**Article 1-6. Adaptive Management Program.**[r]	$0	$0	$0	$0	Multidisciplinary	Yes	
37	**Article 1-7. Develop and implement Stream Channel Stabilization Plan in Loon Lake dam reach.**[s]	$109,300	$0	$7,300	$0	Soils and geology	Yes	
38	**Article 1-8. Maintain elevation of Gerle Creek reservoir to ensure fish passage into Gerle Creek.**[t]	$27,000	$5,000	$6,800	$0	Aquatic	Yes	
39	**Article 1-9. Implement plan to pass large woody debris downstream at Robbs Peak, Junction, Camino and Slab Creek dams.**	$21,900	$12,500	$14,000	$0	Aquatic	Yes	
40	**Article 1-10. Develop and implement a Streamflow and Reservoir Elevation Gaging Plan.**[u]	$655,800	$54,700	$98,200	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
41	**Article 1-11. Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points.**	$32,800	$0	$2,200	$0	Water quality	Yes	
42	**Article 1-12. Wildlife and plant protection measures.**							
43	Annually monitor for deer or wildlife in Gerle Canal.	$0	$1,100	$1,100	$0	Terrestrial	Yes	
44	If any new construction or maintenance may affect Forest Service sensitive plants or wildlife, or ESA species, conduct a biological evaluation; the Forest Service may require measures to protect sensitive species, and a biological assessment and consultations with FWS may be required per the ESA.	$0	$16,400	$16,400	$0	Terrestrial	Yes	
45	Conduct annual review of special-status species lists and prepare study plan and perform study, if necessary.[v]	$0	$11,400	$11,400	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
46	Consult with agencies before conducting any O&M under transmission lines within the Pine Hill Pare Plant Preserve.	$0	$1,000	$1,000	$0	Terrestrial	Yes	
47	Develop Avian Protection Plan that addresses retrofitting transmission lines to meet design and sighting standards to minimize bird electrocutions and collisions.[w]	$306,000	$0	$20,300	$0	Terrestrial	Yes	
48	**Article 1-13. Develop and implement a Vegetation and Invasive Weed Management Plan for ENF lands, and monitor annually.**	$43,700	$54,700	$57,600	$0	Terrestrial	Yes	Staff revision of proposed measure to include all Project lands and employee awareness training.
49	**Expand Vegetation and Invasive Weed Management Plan to include all Project lands and monitor annually**	$0	$30,300	$30,300	$0	Terrestrial	Yes	Not an applicant measure.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
50	**Article 1-14. Meet annually with resource agencies to review results of implementing all ecological measures, and prepare and share a Project O&M plan for that year.**	$0	$32,800	$32,800	$0	Terrestrial	Yes	
51	**Article 1-15. Develop Recreation Implementation Plan, and update every 6 years (cost of updates incorporated into facility review measure).**	$16,400	$0	$1,100	$0	Recreation	Yes	
52	**Article 1-16. Conduct recreation survey and prepare Recreation Report every 6 years.[x]**	$0	$55,100	$55,100	$0	Recreation	Yes	
53	**Article 1-17. Designate a Forest Service liaison.**	$0	$32,800	$32,800	$0	Recreation	Yes	
54	**Article 1-18. Review recreation facilities every 6 years.**	$0	$21,900	$21,900	$0	Recreation	Yes	
55	**Article 1-19. Specific recreation measures.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
56	Prepare and implement a plan to install bear-proof food storage and trash receptacle facilities.[y]	$568,400	$0	$37,700	$0	Recreation	Yes	
57	Construct vault toilet at Buck Island reservoir.	$54,700	$0	$3,600	$0	Recreation	Yes	
58	Improve hiking trails at Buck Island reservoir.	$10,900	$0	$700	$0	Recreation	Yes	
59	Reconstruct or relocate portions of Rubicon Hiking Trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
60	Reconstruct hiking trail at Pleasant Campground.	$10,900	$0	$700	$0	Recreation	Yes	
61	Construct vault toilet at Ellis Creek staging area.	$32,800	$0	$2,200	$0	Recreation	Yes	
62	Prepare and implement a Development Plan for Loon Lake.	$371,600	$0	$24,700	$0	Recreation	Yes	
63	Reconstruct Pleasant Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
64	Expand and upgrade Northshore RV Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	
65	Reconstruct Loon Lake Campground (including Equestrian Loop).	$1,038,400	$0	$68,900	$0	Recreation	Yes	
66	Upgrade Loon Lake Group Campgrounds.	$98,400	$0	$6,500	$0	Recreation	Yes	
67	Reconstruct Loon Lake Group Equestrian Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
68	Upgrade Loon Lake Boat Launch and Day Use Area.	$21,900	$0	$1,500	$0	Recreation	Yes	
69	Upgrade Red Fir Group Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
70	Upgrade Loon Lake Chalet.	$437,200	$0	$29,000	$0	Recreation	Yes	
71	Upgrade Loon Lake Sanitation Station.	$16,400	$0	$1,100	$0	Recreation	Yes	
72	Upgrade Loon Lake Trailhead facility.	$16,400	$0	$1,100	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
73	Construct a new campground on the south shore of Loon Lake reservoir.	$2,951,100	$0	$195,900	$0	Recreation	Yes	
74	Prepare and implement a Development Plan for the Gerle Creek and Airport Flat areas.	$98,400	$0	$6,500	$0	Recreation	Yes	
75	Reconstruct Gerle Creek Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
76	Upgrade Gerle Creek Day Use Area.	$27,300	$0	$1,800	$0	Recreation	Yes	
77	Upgrade Angel Creek Day Use Area.	$306,000	$0	$20,300	$0	Recreation	Yes	
78	Upgrade Airport Flat Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
79	Extend Angel Creek Trail (to tie into Summer Harvest Trail).	$273,300	$0	$18,100	$0	Recreation	Yes	
80	Upgrade Summer Harvest Trail.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
81	Prepare and implement a Development Plan for the Union Valley area.	$131,200	$0	$8,700	$0	Recreation	Yes	
82	Prepare and implement a Union Valley Reservoir Boating Management Plan.	$76,500	$0	$5,100	$0	Recreation	Yes	
83	Upgrade Azalea Cove Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
84	Upgrade Big Silver Group Campground.	$109,300	$0	$7,300	$0	Recreation	Yes	
85	Upgrade Camino Cove Campground.	$437,200	$0	$29,000	$0	Recreation	Yes	
86	Upgrade Fashoda Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
87	Upgrade Fashoda Day Use Area.	$16,400	$0	$1,100	$0	Recreation	Yes	
88	Upgrade Jones Fork Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
89	Upgrade Lone Rock Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
90	Reconstruct Sunset Campground.	$983,700	$0	$65,300	$0	Recreation	Yes	
91	Upgrade Sunset Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
92	Reconstruct Wench Creek Campground.	$874,400	$0	$58,000	$0	Recreation	Yes	
93	Reconstruct Wench Creek Group Campground.	$218,600	$0	$14,500	$0	Recreation	Yes	
94	Upgrade West Point Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
95	Upgrade West Point Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
96	Upgrade Wolf Creek Campground.	$382,600	$0	$25,400	$0	Recreation	Yes	
97	Upgrade Wolf Creek Group Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
98	Reconstruct Yellowjacket Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
99	Upgrade Yellowjacket Boat Launch and extend boat ramp.	$109,300	$0	$7,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
100	Extend the Union Valley Reservoir bike trail (to loop the reservoir).	$3,289,900	$0	$218,400	$0	Recreation	Yes	
101	Construct access trails and restore areas on north side of Union Valley reservoir.	$453,600	$0	$30,100	$0	Recreation	Yes	
102	Prepare and implement a Development Plan for the Ice House area.	$371,600	$0	$24,700	$0	Recreation	Yes	
103	Site and construct a new small boat-in camping area.	$98,400	$0	$6,500	$0	Recreation	Yes	
104	Reconstruct Ice House Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
105	Reconstruct Ice House Day Use Area.	$191,300	$0	$12,700	$0	Recreation	Yes	
106	Upgrade Northwind Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
107	Upgrade Strawberry Point Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
108	Upgrade Ice House Boat Launch.	$21,900	$0	$1,500	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
109	Reconstruct Ice House Sanitation Station.	$54,700	$0	$3,600	$0	Recreation	Yes	
110	Construct access trails and restoration along Lakeshore Road.	$191,300	$0	$12,700	$0	Recreation	Yes	
111	Construct a new day use facility (Highland Point).	$453,600	$0	$30,100	$0	Recreation	Yes	
112	Construct a new day use facility (Upper Silver Creek/Ice reservoir).	$453,600	$0	$30,100	$0	Recreation	Yes	
113	Extend the Ice House Mountain Bike Trail (to loop the connector trail to Union Valley reservoir bike trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
114	Upgrade Big Hill Overlook facility.	$10,900	$0	$700	$0	Recreation	Yes	
115	Improve the informal boat launch at Junction reservoir.	$109,300	$0	$7,300	$0	Recreation	Yes	
116	Improve the access area at Bryant Springs Road and SF Silver Creek.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
117	Develop and implement plan to improve access at Brush Creek reservoir.	$131,200	$0	$8,700	$0	Recreation	Yes	
118	Develop and implement plan for boating access at Slab (upstream end).[z]	$2,448,300	$0	$162,500	$0	Recreation	Yes	
119	Develop and implement plan to improve boating access at Slab Creek reservoir (near dam).[aa]	$338,800	$0	$22,500	$0	Recreation	Yes	
120	**Article 1-20. Complete necessary heavy maintenance as determined via 6-year recreation facility review.**[bb]	$0	$109,300	$109,300	$0	Recreation	Yes	
121	**Article 1-21. Annually pay the Forest Service $1,000,000 for O&M and administration of recreation facilities and to manage use.**	$0	$1,000,000	$1,000,000	$0	Recreation	Yes	Staff recommends that SMUD provide for operations and maintain and does not endorse cost cap.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
122	**Article 1-22. Provide data to the Forest Service for carrying capacity.**	$71,000	$0	$4,700	$0	Recreation	Yes	
123	**Article 1-23. Reservoir levels.**							
124	Meet specific, summer monthly reservoir levels at Loon Lake, Union Valley, and Ice House reservoirs.[cc]	$0	$0	$0	$725,400	Recreation	Yes	
125	Maintain Gerle Creek reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 through September 10.[dd]	$0	$0	$0	$0	Recreation	Yes	
126	Maintain Slab Creek reservoir elevation above 1,830 feet during daylight hours, and restrict daily fluctuations to less than seven feet during daylight hours between July 1 and September 30.[dd]	$0	$0	$0	$0	Recreation	Yes	
127	Maintain the seasonal reservoir levels at Junction and Brush Creek reservoirs within historical levels.	$0	$0	$0	$0	Recreation	No	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
128	Maintain Rubicon and Buck Island reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 to September 10.[dd]	$0	$0	$0	$0	Recreation	No	
129	Monitor reservoir levels and prepare report every 5 years.	$0	$10,900	$10,900	$0	Recreation	Yes	
130	**Article 1-24. Recreation streamflows.**							
131	Provide up to 19 days annually during March 1 through May 31 and in October of various flows from Slab Creek dam for whitewater boating, with ramping, and use monitoring.	$0	$35,200	$35,200	$322,000	Recreation	Yes	Cost associated with physical modifications and reduced energy benefits associated with October flow releases in year 15 are contingent on studies in year 10.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
132	Slab Creek whitwater boating capital costs for physical modifications to facilitate long-term boating flows.[ee]	$10,930,000	$0	$725,500	$0	Recreation	No	Staff has not included this cost for either the Proposed Action or Proposed Action with Staff Modifications because SMUD now indicates the cost could be considerably less than $10.9 million if the Iowa Hill development is constructed.
133	Develop and implement a whitewater boating management plan for Slab Creek dam reach, including access facilities and a plan for easement for access and parking.[ff]	$732,300	$0	$48,600	$0	Recreation	Yes	
134	Provide up to 16 days annually of various flows from Ice House dam for whitewater boating, with ramping, and use monitoring.	$0	$19,000	$19,000	$108,000	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
135	**Article 1-25. Public information services.**							
136	Develop and implement plan to make Project information (streamflow and reservoir levels) available to the public.	$32,800	$10,900	$13,100	$0	Recreation	Yes	
137	Develop and implement an interpretive, education and public information plan, and provide a Project recreation brochure.	$109,300	$27,300	$34,600	$0	Recreation	Yes	
138	**Article 1-26. Annually match fish stocking by CDFG, up to 50,000 pounds of fish each year.**	$0	$106,100	$106,100	$0	Recreation	Yes	
139	**Article 1-27. Visual resource protection.**						Yes	
140	Meet with the Forest Service every 5 years and review opportunities to better blend Project features with landscape.[gg]	$0	$3,300	$3,300	$0	Land use and aesthetics	Yes	
141	Prior to any new construction or maintenance, prepare plan to protect visual resources.	$0	$5,500	$5,500	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
142	Improve visual quality of Robbs powerhouse and Jones Fork penstock.[hh]	$0	$0	$0	$0	Land use and aesthetics	Yes	
143	Improve visual quality of fencing at Union Valley dam switchyard.	$360,700	$0	$23,900	$0	Land use and aesthetics	Yes	
144	Improve visual quality of weather stations.	$480,900	$0	$31,900	$0	Land use and aesthetics	Yes	
145	Improve visual quality of several other Project features.	$273,300	$0	$18,100	$0	Land use and aesthetics	Yes	
146	**Articles 1-28 and 1-29. Develop and implement the Heritage Properties Management Plan, and suspend work or operations in the event heritage resources are discovered.**	$16,400	$5,500	$6,600	$0	Cultural resources	Yes	
147	**Article 1-30. Transportation system management.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
148	Develop and implement Transportation System Management Plan, including a Snow Plowing Plan; update every 5 years.[ii]	$98,400	$273,300	$279,800	$0	Land use and aesthetics	Yes	Staff restricts this measure to only Project-related roads primarily used for Project purposes
149	Improve three Forest Service roads (5.3 miles of north shore road at Union Valley Reservoir, 1.3 miles of lake shore road at Ice House reservoir, and Wright's Lake tie-in intersection) and add gate at Junction dam road.[jj]	$4,382,900	$0	$290,900	$0	Land use and aesthetics	Yes	
150	**Article 1-31. Develop and implement a Trails System Management Plan; update every 5 years.**[kk]	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
151	**Article 1-32. Develop and implement a Facility Management Plan; update every 5 years.**	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
152	**Article 1-33. Develop and implement a Vegetation Management Plan to rehabilitate inadequately vegetated areas.**[ll]	$32,800	$21,900	$24,100	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
153	**Article 1-34. Develop and implement a Fire Prevention and Response Plan.**[ll]	$82,000	$21,900	$27,300	$0	Land use and aesthetics	Yes	
154	**Article 1-37. Develop a Project Implementation Plan that sets forth a schedule for implementing all articles in the license.**	$16,400	$0	$1,100	$0	Multidisciplinary	Yes	
155	**Article 1-40. Aquatic resources–Iowa Hill development.**							
156	Monitor hardhead populations in Slab Creek reservoir 2 years before and 2 years after construction of Iowa Hill development.	$382,600	$0	$25,400	$0	Aquatic	Yes	
157	Monitor temperatures in shallow water areas of Slab Creek reservoir to determine if Iowa Hill development is affecting hardhead distribution.[mm]	$0	$2,600	$2,600	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
158	Maintain 12°C or higher temperatures during June, July, and August in SFAR reach below Mosquito Bridge (Iowa Hill development measure).[nn]	$0	$16,400	$16,400	$0	Aquatic	Yes	
159	**Article 1-41. Purchase equivalent land or conservation easement for inkind replacement of wildlife habitat due to Iowa Hill development.[oo]**	$546,500	$0	$36,300	$0	Terrestrial	Yes	
160	Develop a wildlife lands mitigation plan for Iowa Hill construction.	$20,000		$1,300	$0	Terrestrial	Yes	Not an applicant measure.
161	**Article 1-42. Develop and implement a Storm Water Pollution Prevention Plan for construction of Iowa Hill development.[pp]**	$54,700	$0	$3,600	$0	Water quality	Yes	
162	**Article 1-43. Prepare and implement a Groundwater Management Plan for managing groundwater inflows during construction of the Iowa Hill development and post construction monitoring.[pp]**	$54,700	$0	$3,600	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
163	**Article 1-44. Develop a design for the Iowa Hill development that meets the visual quality standards of the ENF Management Plan.[pp]**	$27,300	$0	$1,800	$0	Land use and aesthetics	Yes	
164	**Article 1-45. Heritage resources protection.[qq]**	$0	$0	$0	$0	cultural resources	Yes	
165	**Article 1-48. Develop and implement a noise attenuation plan for construction of the Iowa Hill development.**	$54,700	$0	$3,600	$0	Land use and aesthetics	Yes	
166	**Article 1-49. Develop a Recreation Access Plan for Slab Creek reservoir to address access during Iowa Hill development construction and post construction.[rr]**	$27,300	$0	$1,800	$0	Recreation	Yes	
167	File and implement a transporation plan for Iowa Hill	$30,000	$3,900	$5,900	$0	Land Use and Aesthetics	Yes	Included in license application, but not in Settlement Agreement

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
168	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[ss]	$0	$461,800	$461,800	$0	Multidisciplinary	Yes	
169	**Total of all Article 1 measures under the UARP-only Alternative.**	$48,753,100	$2,850,800	$6,086,300	$8,914,400			
170	**Total of all Article 1 measures under the Proposed Action.**	$39,000,900	$2,873,700	$5,461,800	$8,914,400			
171	**Total of all Article 1 measures under the Proposed Action with Staff Modifications.**	$38,747,600	$2,904,000	$5,475,300	$8,914,400			

[a] Annualized costs for one-time and capital costs determined as actual costs over a 50-year license term with 6.25 percent SMUD discount rate.

[b] Flow-related costs were derived from output of the CHEOPS water balance model, and represent incremental generation value costs from the model Base Case due to modifications to system operations at individual facilities.

[c] Annual cost based on substantial increase in frequency of dam visits to adjust valves to implement monthly release schedule.

[d] Estimated capital cost assumes minor modifications to Rockbound tunnel intake gate at Rubicon reservoir.

[e] Annual cost based on $163,950 per year of trout sampling at 13 sites, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly trout sampling cost based on relicensing study costs 2002-2004. Four of the sites will require helicopter transport.

[f] Annual cost based on $27,325 per year of hardhead sampling, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term.

[g] Annual cost based on $54,650 per year of benthic macroinvertebrates at 10 sites, performed every 2 of 5 years during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly BMI sampling based on relicensing study costs 2002–2004. One of the sites will require helicopter transport.

[h] Annual cost based on $81,975 per year of foothill yellow-legged frog sampling at 6 sites in three Project reaches, performed at variable frequencies depending on Project reach. Yearly sampling based on relicensing studies and PG&E survey protocols, which call for repeat visits to sampling sites. Monitoring results may lead to expansion of monitoring program and higher costs.

[i] Annual cost based on $54,650 per year of mountain yellow-legged frog sampling at Rubicon Reservoir, Rockbound Lake, and Buck Island reservoir (spring/summer surveys). Yearly sampling based on relicensing studies and PG&E survey protocols, which call for periodic visits to sampling sites. Studies performed by CDFG may result in reduced monitoring costs.

[j] Annual cost based on $163,950 per year for aerial photograph mapping and intensive greenline sampling at 15 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly riparian sampling cost based on relicensing study costs of 2003. Three of the sites will require helicopter transport.

[k] Annual cost based on $87,440 per year of sampling at 8 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly geomorphology sampling cost determined from relicensing studies.

[l] One time cost associated with installing permanent temperature monitoring instruments at 12 Project facilities with linkage to SMUD data management systems. Annual costs associated with yearly installation of 5 non-permanent instruments.

[m] Annual cost based on $109,300 per year of sampling, performed every year of license term. Yearly physical monitoring at 7 Project reservoirs (two seasons/year) and multiple stream sites (four seasons/year) above and below Project reservoirs based on costs to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[n] Annual cost based on $273,250 per year of sampling, performed every 5 years of license term. Yearly water chemistry monitoring at all Project reservoirs (four seasons/year) and multiple stream sites above and below Project reservoirs based on costs (e.g., laboratory costs for total and dissolved metals at very low detection levels) to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[o] Annual cost based on $32,790 per year of sampling at 15 sites, performed every year the first 5 years then every other year through the term of the license. Yearly sampling based on relicensing study costs. Monitoring results may lead to sampling every year, which will increase annual costs.

[p] Annual cost based on $27,325 per year of sampling at 6 reservoirs, performed every 5 years throughout the license term. Yearly sampling based on relicensing study costs. Additional studies may be required based on results of sampling.

[q] One time and/or annual costs could increase under the adaptive management plan depending on results of monitoring plan.

[r] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[s] Includes one-time cost of developing study plan to investigate stream stabilization throughout 8.5-mile Loon Lake dam reach and performing the field investigation (stream stability was not studied throughout Loon Lake dam reach during relicensing). Implementing any remedial actions is an unknown future cost and not included in the table.

[t] One-time cost associated with study of current passage conditions. Annual cost associated with regular re-evaluations of passage conditions through license term. This measure is estimated to result in no reduction in annual energy benefits.

[u] One-time and capital cost is for adding new gaging sites below Gerle Creek dam and Robbs forebay dam ($546,500), and staff gages for the two boating reaches and possible telemetry equipment installation below Rubicon and Buck Island dams ($109,300); annual cost is for two streamflow monitoring sites and nine reservoir monitoring sites to be added to compliance program, and maintenance of new gages and telemetry equipment in remote sites.

[v] Annual costs associated with performing periodic reviews of new species added to special-status species lists ($5,000). A total cost of $320,000 (8 surveys at $40,000 per survey) is assumed for special-status species field surveys, distributed equally over the 50-year license term.

[w] One time cost estimate includes Avian Protection Plan development and $54,650 per year for 5 years of study. Results of study may require retrofitting.

[x] Annual cost based on $234,995 for recreation survey and $109,300 for recreation report, performed every 6 years through license term.

[y] Capital cost of $21,860 for plan development and $546,500 for implementation.

[z] Capital and one-time costs are for plan development and a new access route from the south side of the reservoir.

[aa] Actual costs may be significantly greater due to steep topography.

[bb] Actual costs may vary significantly from year to year.

[cc] Power generation losses associated with this measure reflect CHEOPS model simulated spill at UARP storage reservoirs. See section 2.0 for a discussion of the likelihood of spill occurring at the storage reservoirs under real time operation.

[dd] This reservoir level restriction measure is estimated to result in no reduction in annual energy benefits.

[ee] Capital cost is based on reconfiguring White Rock tunnel adit to serve as release point for boating flows; this reconfiguration work would be done in year 15 and only if the Iowa Hill development is not built and use triggers have been met.

[ff] Actual costs may vary.

[gg] Annual costs are for meetings with the Forest Service only. As a result of the meetings, additional annual costs are likely for measures to blend Project facilities into surrounding landscape.

[hh] The cost to paint the powerhouse and penstock are not included because SMUD will incur these costs as part of regular maintenance activities during the license term.

[ii] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan. Annual costs include road maintenance and snow plowing.

[jj] Breakdown of one-time costs: (1) North Union Valley Road cost share portion: $3,278,000, (2) Lakeshore Road: $821,500, (3) Wright's Lake tie-in cost share portion: $272,500, and (4) Junction Dam Road: $10,930.

[kk] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ll] Actual costs may vary significantly from year to year.

[mm] Annual costs based on assumption of need to place 6 to 8 temperature sensors throughout Slab Creek Reservoir annually for period of 10 years to demonstrate that temperatures in shallow water areas of Slab Creek Reservoir are not affecting hardhead distribution by pump discharge.

[nn] Annual costs associated with placing temporary temperature probe in SFAR at Mosquito Road Bridge each year from June through August.

[oo] Actual cost may vary significantly depending on future land prices in rural Sierra Nevada foothill area.

[pp] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[qq] Estimated costs for this measure are incorporated into the cost estimates for Articles 1-28 and 1-29.

[rr] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ss] Annual cost is based on 2,730 hours of Project Management (2,730 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 887 hours of General Administration (887 hours x $60.43 direct rate + 64 percent surcharge for overhead).

C.2 CAPITAL COST AND ANNUALIZED COSTS FOR SHARED MEASURES FOR THE UARP AND CHILI BAR PROJECTS

Costs identified in this section will result from SMUD's 90 percent contribution to the implementation of overlapping-issue measures contained in the Chili Bar Project, as described in appendix 2 of the Settlement Agreement. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted in this case to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-2.

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Table C-2. Summary of SMUD's capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for shared measures included in the Proposed Action and Proposed Action with Staff Modifications. (Source: SMUD, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$0	Water quantity	Yes	
2	**Article 2-2. Ramping rates.**	$0	$0	$0	$0	Water quantity	Yes	
3	**Article 2-3. Develop a plan to coordination with UARP Licensee.**	--	--	--	--	Water quantity	Yes	
4	**Article 2-4. Monitoring Program to prepare and implement long-term monitoring plan for fish at two sites downstream of Chili Bar dam.**	$9,800	$7,000	$7,700	$0	Aquatic	Yes	
5	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites downstream of Chili Bar dam.	$9,800	$5,900	$6,600	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
6	Prepare and implement long-term monitoring plan for amphibians and reptiles (FYLF, CRLF, and western pond turtle) in one reach downstream of Chili Bar dam.	$9,800	$15,100	$15,800	$0	Terrestrial	Yes	
7	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam	$9,800	$9,500	$10,200	$0	Terrestrial	Yes	
8	Prepare and implement long-term monitoring plan for water temperature at four stations downstream of Chili Bar dam.	$9,800	$13,500	$14,200	$0	Water quality	Yes	
9	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and downstream of the Chili Bar dam.	$9,800	$22,500	$23,200	$0	Water quality	Yes	
10	Prepare and implement long-term monitoring plan chemistry water quality in Chili Bar reservoir and downstream of Chili Bar dam.	$9,800	$9,000	$9,700	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
11	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$9,800	$12,200	$12,900	$0	Water quality	Yes	
12	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$9,800	$1,800	$2,500	$0	Water quality	Yes	
13	**Article 2-5. Adaptive Management Program.**[a]	$0	$0	$0	$0	Multidisciplinary	Yes	
14	**Article 2-6. Sediment Management Program.**	$9,800	$5,800	$6,500	$0	Soils and geology	Yes	
15	**Article 2-7. Large woody debris.**	--	--	--	--	Aquatic	Yes	
16	**Article 2-8. Streamflow and reservoir elevation gaging.**	--	--	--	--	water quantity	Yes	
17	**Article 2-9. Wildlife and plant protection measures.**	--	--	--	--	Terrestrial		
18	**Article 2-10. Invasive Weed and Vegetation Management plans**	--	--	--	--	Terrestrial	Yes	Staff revision to include all Project lands.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
19	**Article 2-11. Annual review of ecological conditions.**	--	--	--	--	Terrestrial	Yes	
20	**Article 2-12. BLM liaison.**	--	--	--	--	Recreation	Yes	
21	**Article 2-13. BLM recreation improvements.**	--	--	--	--	Recreation	Yes	
22	**Article 2-14. Public information services. Plan for providing streamflow and reservoir level information.**	$9,800	$13,500	$14,200	$0	Recreation	Yes	
23	Pay BLM $15,000 annually to provide Project related brochure and public education plan.		$15,000	$15,000			Yes	Staff would recommend that PG&E prepare a brochure and education plan and does not endorse cost cap.
24	**Article 2-15. Recreational streamflows.**	$0	$0	$0	$0	Recreation	Yes	
25	**Article 2-16. Visual resource protection.**	--	--	--	--	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
26	**Article 2-17. Heritage resources.**	--	--	--	--	Cultural resources	Yes	
27	**Article 2-18. Heritage resource discovery.**	--	--	--	--	Cultural resources	No	This measure is part of the PA that is implemented before the new license.
28	**Article 2-21. Implementation schedule.**	--	--	--	--	Multidisciplinary	Yes	
29	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[b]	$0	$24,400	$24,400	$0	Multidisciplinary	Yes	
30	**Proposed Action**	$107,800	$155,200	$162,900	$0			

Notes: Measures with a dash in the cost columns are not overlapping measures.

[a] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[b] Annual cost is based on 144 hours of Project Management (144 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 47 hours of General Administration (47 hours x $60.43 direct rate + 64 percent surcharge for overhead).

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C.3 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE CHILI BAR PROJECT

In this section, we present the costs of environmental measures associated with the Chili Bar Project. The latest cost information for the Chili Bar Project was submitted on May 16, 2007, by PG&E. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-3. No reduction in dependable capacity was identified by PG&E for any environmental measures. We note that PG&E made an estimate of the reduction of energy benefits in its May 16, 2007, submittal and estimated the total benefit reduction as approximately 1,000 MWh.

To enable staff to make a preliminary estimate in the final EIS, we assumed that the combined effect of minimum instream flow, ramping and recreational streamflow is a loss of 1,000 MWh as per the May 16, 2007, PG&E submittal. We applied the same ratio of peak to off-peak generation loss as PG&E previously estimated for its proposal in its additional information response dated May 18, 2006. This would result in a loss of 27.8 MWh of on peak energy and 972.2 MWh of off-peak energy.

Additionally, the effect of the Iowa Hill development on annual energy change, including both on-peak and off-peak energy, should be provided if new modeling shows a different result than the 2006 modeling. PG&E made an earlier estimate of this effect in its additional information response dated May 18, 2006, and we used this estimate in our analysis of the effect of the Iowa Hill development on energy generation and the resulting change in benefit. We applied the SMUD peak and off-peak energy rates to PG&E's 709-MWh loss due to environmental measures and the additional 291-MWh energy decrease due to the Iowa Hill development. That estimate showed that on-peak generation would increase by 638 MWh if the Iowa Hill development were to be built, and off-peak generation would decrease by 929 MWh, resulting in a decrease of 291 MWh. Therefore, if the Iowa Hill development were to be constructed, there would be an overall energy decrease of 1,000 MWh. If PG&E chooses to use peak, partial peak, off-peak, and super off-peak energy values on a monthly basis, it would need to provide complete backup information so that the Commission staff can independently check the computations.

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Table C-3. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: PG&E, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$56,300	Water quantity	Computed as 27.8 MWh times $73.89/MWh plus 972.2 MWh times $55.80/MWh
2	**Article 2-2. Ramping rates.**	$30,000	$15,000	$19,400		Water quantity	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
3	**Article 2-3. Coordination with UARP Licensee.**	$0	$10,000	$10,000	$0	Water quantity	
4	**Article 2-4. Monitoring Program.**[b]						
5	Prepare and implement long-term monitoring plan for fish at two sites in the reach downstream of Chili Bar dam.	$1,100	$800	$1,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
6	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites in the reach downstream of Chili Bar dam.	$1,100	$700	$900	$0	Aquatic	
7	Prepare and implement long-term monitoring plan for amphibians and reptiles in the reach downstream of Chili Bar dam.	$1,100	$1,700	$1,900	$0	Terrestrial	
8	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam.	$1,100	$1,100	$1,300	$0	Terrestrial	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
9	Prepare and implement long-term monitoring plan for water temperature at four stations in the reach downstream of Chili Bar dam.	$1,100	$1,500	$1,700	$0	Water quality	
10	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and in the reach downstream of the Chili Bar dam.	$1,100	$2,500	$2,700	$0	Water quality	
11	Prepare and implement long-term monitoring plan for water chemistry in Chili Bar reservoir and in the reach downstream of Chili Bar dam.	$1,100	$1,000	$1,200	$0	Water quality	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
12	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$1,100	$1,400	$1,600	$0	Water quality	
13	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$1,100	$200	$400	$0	Water quality	
14	**Article 2-5. Adaptive Management Program.**[c]	$0	$0	$0	$0	Multidisciplinary	
15	**Article 2-6. Sediment Management Program.**[b]	$1,100	$600	$800	$0	Soils and geology	
16	**Article 2-7. Large woody debris.**	$0	$10,000	$10,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
17	**Article 2-8. Streamflow and reservoir elevation gaging.**	$10,000	$5,000	$6,500	$0	Water quantity	
18	**Article 2-9. Wildlife and plant protection measures.**	$0	$5,000	$5,000	$0	Terrestrial	
19	**Article 2-10. Invasive Weed and Vegetation Management Plans.**	$10,000	$5,000	$6,500	$0	Terrestrial	
20	**Article 2-11. Annual review of ecological conditions.**	$0	$10,000	$10,000	$0	Terrestrial	
21	**Article 2-12. BLM liaison.**	$0	$2,000	$2,000	$0	Recreation	
22	**Article 2-13. BLM recreation improvements.**	$70,000	$5,000	$15,200	$0	Recreation	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
23	**Article 2-14. Public information services.**	$1,100	$1,500	$1,700	$0	Recreation	
24	**Article 2-15. Recreational stream flows.**	$0	$0	$0	$0	Recreation	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
25	**Article 2-16. Visual resource protection.**	$0	$0	$0	$0	Land use and aesthetics	
26	**Article 2-17. Heritage resources.**	$10,000	$2,000	$3,500	$0	Cultural resources	
27	**Article 2-18. Heritage resource discovery.**	$0	$0	$0	$0	Cultural resources	
28	**Article 2-21. Implementation schedule.**	$25,000	$5,000	$8,600	$0	Multidisciplinary	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
29	PG&E labor to manage development and implementation of plans, monitoring programs, data management, etc.	$0	$25,000	$25,000	$0	Multidisciplinary	
30	**Proposed Action**	$167,100	$112,000	$136,900			
31	Additional staff measure(s)						
32	Prepare a recreation plan for Chili Bar Project every 6 years.		$2,700	$2,700		Recreation	PG7E estimates that additional costs could result as the plan evolves.
33	**Proposed Action with Staff Modifications**	$167,100	$114,700	$139,300			
34	**Iowa Hill development effect on Chili Bar generation**				–$4,800		Computed as –638 MWh times $73.89/MWh plus 929 MWh times $55.80/Mwh

[a] As per PG&E, costs are current estimates based on initial analysis of the Settlement Agreement and are subject to revision.

[b] Overlapping measure with UARP.

[c] Adaptive management measure costs are not included due to the uncertainty associated with the nature, extent and implementation.

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Cover Letter (and other information before the Table of Contents)

FEIS

Federal Energy Regulatory Commission

Office of Energy Projects

March 2008

FERC/FEIS—0216F

Final Environmental Impact Statement for Hydropower License

Upper American River Hydroelectric Project
FERC Project No. 2101-084, California
Chili Bar Hydroelectric Project
FERC Project No. 2155-024, California

Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Forest Service
U.S. Department of Agriculture
Eldorado National Forest
100 Forni Road
Placerville, CA 95667

FERC/FEIS-0216F

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE

Upper American River Hydroelectric Project—FERC Project No. 2101-084—California
Chili Bar Hydroelectric Project—FERC Project No. 2155-024—California

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, N.E.
Washington, DC 20426

Forest Service
U.S. Department of Agriculture
Eldorado National Forest
100 Forni Road
Placerville, CA 95667

March 2008

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FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Final Environmental Impact Statement

Attached is the final environmental impact statement (EIS) for the Upper American River Project (UARP or Project No. 2101-084) located in the California counties of El Dorado and Sacramento, within the Rubicon River, Silver Creek, and the South Fork of the American River (SFAR) drainages; and the Chili Bar Hydroelectric Project (Project No. 2155-024), located on the SFAR in El Dorado County, near the town of Placerville, California.

The final EIS documents the view of governmental agencies; non-governmental organizations; affected Indian tribes; the public; the license applicants; the U.S. Department of Agriculture, Forest Service (Forest Service); and the Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations of the applicants' proposals and the alternatives for relicensing the UARP and Chili Bar Project.

The Commission and the Forest Service have agreed to participate as cooperating agencies in the preparation of the EIS for the UARP and Chili Bar Project. The Commission will use the EIS to determine whether, and under what conditions, to issue new licenses for the Projects. The Forest Service will use the EIS to base its finding under section 4(e) of the Federal Power Act and to decide whether to issue any necessary special use authorizations.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The EIS will be part of the record from which the Commission will make its decision. The final EIS is being issued in March 2008.

Copies of the final EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, NE, Washington DC 20426. The final EIS also may be viewed on the Commission's web site at www.ferc.gov by using the "eLibrary" link. Please call (202) 502-8222 or TTY (202) 208-1659 for assistance.

Attachment: Final Environmental Impact Statement

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COVER SHEET

a. Title: Relicensing the Upper American River Project (UARP), Federal Energy Regulatory Commission (FERC or Commission) Project No. 2101 and the Chili Bar Project, FERC Project No. 2155.

b. Subject: Final environmental impact statement

c. Lead Agency: FERC with U.S. Department of Agriculture, Forest Service (Forest Service) as a cooperating agency.

d. Abstract: The UARP is on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California. The Project affects 6,375 acres of federal land administered by the Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Bureau of Land Management (BLM).

The Chili Bar Project is on the SFAR in El Dorado County, near Placerville, California. The Project affects 48 acres of federal land administered by the BLM.

e. Contact:

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f. Transmittal: This final environmental impact statement prepared by the Commission and Forest Service staffs on the hydroelectric license application filed by Sacramento Municipal Utility District and Pacific Gas and Electric Company for the existing UARP and Chili Bar Projects (FERC Project Nos. 2101 and 2155) is being made available to the public on or about March 14, 2008, as required by the National Environmental Policy Act of 1969[1]

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[1]National Environmental Policy Act of 1969, amended (Pub. L. 91-190. 42 U.S.C. 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, §4(b), September 13, 1982).

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FOREWORD

The Federal Energy Regulatory Commission (Commission), pursuant to the Federal Power Act (FPA)[2] and the U.S. Department of Energy Organization Act[3] is authorized to issue licenses for up to 50 years for the construction and operation of non-federal hydroelectric development subject to its jurisdiction, on the necessary conditions:

> That the project…shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)…[4]

The Commission may require such other conditions not inconsistent with the FPA as may be found necessary to provide for the various public interests to be served by the project.[5] Compliance with such conditions during the licensing period is required. The Commission's Rules of Practice and Procedure allow any person objecting to a licensee's compliance or noncompliance with such conditions to file a complaint noting the basis for such objection for the Commission's consideration.[6]

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[2] 16 U.S.C. §791(a)-825r, as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-486 (1992).

[3] Public Law 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. §803(a).

[5] 16 U.S.C. §803(g).

[6] 18 C.F.R. §385.206 (1987).

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FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
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ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
Agencies	CDFG, the Forest Service, FWS, and the Water Board
AN	above normal water year
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
BBS	breeding bird survey
applicants	Pacific Gas and Electric Company and or Sacramento Municipal Utility District
BLM	U.S. Department of Interior, Bureau of Land Management
BN	below normal water year
ºC	degrees Celsius
CAA	Clean Air Act
CARB	California Air Resources Board
CCC	criterion continuous concentrations
CD	critically dry water year
CDFG	California Department of Fish and Game
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMC	criterion maximum concentrations
Commission	Federal Energy Regulatory Commission
DO	dissolved oxygen
DWR	California Department of Water Resources
EID	El Dorado Irrigation District
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
g	gram
GDP-IDP	U.S. Gross Domestic Product—Implicit Price Deflator
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kg	kilogram
kV	kilovolt
L	liter
MCL	maximum contaminant level
mg	milligram

MIS	management indicator species
mL	milliliter
mm	millimeter
MPN	most probable number
MW	megawatt
MWh	megawatt-hours
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NGO	non-governmental organization
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
PA	programmatic agreement
PAOT	people-at-one-time
PDEA	preliminary draft environmental assessment
PG&E	Pacific Gas and Electric Company
Projects	UARP and Chili Bar Projects
SD	super dry water year
SHPO	State Historic Preservation Officer
SFAR	South Fork of the American River
SFRR	South Fork of the Rubicon River
SFSC	South Fork of Silver Creek
SIP	State Implementation Plan
SMUD	Sacramento Municipal Utility District
TCP	traditional cultural property
UARP	Upper American River Project
USGS	U.S. Geological Survey
μg/L	microgram per liter
VES	visual encounter survey
VQO	visual quality objective
Water Board	State Water Resources Control Board
YOY	young-of-the-year

COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
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Docket Nos. P-2101-084 and P-2155-024

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EXECUTIVE SUMMARY

This final environmental impact statement (final EIS) evaluates the potential effects on the environment associated with the relicensing of the seven hydroelectric developments that make up the existing 688-megawatt (MW) Upper American River Project (UARP) (Project No. 2101); the proposed construction of an eighth, 400-MW development at Iowa Hill (Iowa Hill development) as part of the UARP; and the relicensing of the 7-MW Chili Bar Project (Project No. 2155). The UARP is located on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California. The Chili Bar Project is located on the SFAR in El Dorado County, near Placerville, California, immediately downstream of the UARP. The licenses for both Projects expired on July 31, 2007. On August 8, 2007, the Federal Energy Regulatory Commission (Commission) authorized continued operations of both Projects through July 31, 2008.

The Sacramento Municipal Utility District (SMUD) filed a license application with the Commission for the UARP on July 7, 2005. The Project occupies 6,375[7] acres of federal land administered by the U.S. Department of Agriculture, Forest Service (Forest Service), in Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Department of the Interior, Bureau of Land Management (BLM).

The Forest Service is reviewing an application for a special use permit for constructing SMUD's proposed Iowa Hill development on National Forest System lands. The Forest Service is also a cooperating agency in preparing this EIS for the UARP.

Pacific Gas and Electric Company (PG&E) filed a license application with the Commission for the Chili Bar Project on June 21, 2005. The Project, which consists of a single development, occupies 47.81 acres of federal land administered by the BLM.

The UARP and Chili Bar Project (Projects) have common stakeholders and issues, as well as operational and hydraulic interrelationships. PG&E and SMUD entered into two relicensing cooperation agreements that resolved many of the overlapping issues between the two Projects. These overlapping issues include coordinating operations and the flow releases into and out of Chili Bar reservoir. Operational coordination and flow-related resource measures are necessary because PG&E depends on the UARP and does not have control over the amount of water flowing into Chili Bar reservoir.

The key environmental issues tied to the existing operations of the UARP are providing suitable habitat in the downstream reaches to support native species and

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[7]This acreage includes 185 acres of Eldorado National Forest lands associated with the proposed Iowa Hill development.

coordinating operations between SMUD and PG&E. Changing existing operations to increase instream flow would increase the quantity and velocity of flows into the downstream reaches. Increased flows would lower water temperatures and reduce sedimentation in these reaches. Lowering water temperatures, increasing flow velocities, and reducing sedimentation should have a positive effect on the abundance of native fish and benthic macroinvertebrates and the ability of amphibians to breed in these reaches. Increased coordination between SMUD and PG&E would reduce the number of unanticipated spills at the Chili Bar Project.

SMUD's and PG&E's license applications outlined their proposals to continue operating the Projects in accordance with certain existing and proposed operational and environmental measures. SMUD and PG&E filed a comprehensive Offer of Settlement (Settlement Agreement) with the Commission on February 1, 2007, that replaces the Proposed Actions. The terms of the Settlement Agreement[8] include a wide range of measures described in Proposed Articles 1-1 through 1-37 for the UARP without the Iowa Hill development, Proposed Articles 1-38 through 1-50 for the UARP with the Iowa Hill development, and Proposed Articles 2-1 through 2-21 for the Chili Bar Project.

In written and oral comments on the draft EIS, local residents expressed concern about the proposed construction and operation of the Iowa Hill development and agencies that were signatories to the Settlement Agreement expressed concern about our suggested modifications to certain proposed measures. Local residents commented on traffic congestion and potential heavy equipment damage to county roads, the potential threat and damage from fire, loss of habitat, the visual effects of project facilities on nearby residences, and the effects of construction and construction traffic on tourism during apple picking season. They also commented that many attended meetings of the Iowa Hill Joint Advisory Committee (Advisory Committee) and questioned why some of the mitigation measures that SMUD is considering were not included in the draft EIS. In response to comments about the Iowa Hill development and to Commission staff requests, SMUD filed additional technical reports about traffic and aesthetics on January 31, 2008. We discuss the findings of those reports in this final EIS.

Agency representatives and stakeholders who signed the Settlement Agreement expressed concern about the recommended staff modifications to several of the proposed measures in the Settlement Agreement. Notably, they state that staff misunderstands the connection between the construction of the Iowa Hill development and the whitewater boating flows and request that the staff adopt the language of the Settlement Agreement in the final EIS. Although we no longer recommend that SMUD

[8] The Settlement Agreement is available on the Commission's web site from the eLibrary feature at http://www.ferc.gov/docs-filing/elibrary.asp. Accession number 20070208-4003.

file a new whitewater release schedule after 10 years of monitoring, with or without the construction of the Iowa Hill development, we continue to recommend that whitewater releases be made only if the recreational use and environmental triggers are met after 15 years following the issuance of any license.

Under the Proposed Action, SMUD would implement the following measures at the UARP: (1) a set of measures focused on the ecological health and suitability of reaches downstream of the Project dams to support native fish, amphibian, and reptile populations implemented in coordination with PG&E's Chili Bar Project; (2) a set of measures to provide for specific water level elevations for the protection of fish populations, assuring the availability of boat launch facilities, or to enhance the visual experience at the Project reservoirs; (3) a plan to monitor streamflows and reservoir elevations; (4) a set of measures that provide for the protection of wildlife and plants, including the implementation of wildlife safety measures at Project facilities; (5) a comprehensive program of monitoring to determine the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoirs and stream reaches; (6) vegetation and invasive weed management plans, which would provide for the protection of sensitive species habitat and the control of noxious weeds; (7) a suite of measures that focus on upgrading, expanding, operating, and maintaining recreational facilities and services in response to user demands, monitoring future use, providing additional whitewater boating opportunities, providing public information, and fish stocking within the framework of a recreation implementation plan; (8) a plan for extending and formalizing trails that are needed for Project operations that are located on or affect National Forest System lands; (9) a plan to establish SMUD's level of responsibility for improving and maintaining Project access roads and to perform several specific improvements, including reconstructing and surfacing several Forest Service roads that provide access to the Project's recreational facilities; (10) a visual management plan; and (11) a Historic Properties Management Plan (HPMP) to protect cultural resources. These environmental measures are described in detail in this final EIS in section 2.4.3, *SMUD's Proposal.*

SMUD's Proposal includes construction and operation of the Iowa Hill development, a pumped-storage facility partially located on National Forest System lands. Under the Proposed Action, SMUD would implement a series of measures for resource protection during construction and operation of the proposed Iowa Hill development. These measures would address potential effects of the proposed development on water quality; groundwater; native fish and amphibians in Slab Creek reservoir; replacement of permanently disturbed wildlife habitat; control of traffic, air pollution, and noise during construction; recreational access to Slab Creek reservoir;

protection of cultural resources; and modification of facility designs so that they are compatible with the Eldorado National Forest visual quality objectives. These environmental measures also are described in detail in this final EIS in section 2.4.3, *SMUD's Proposal.*

Staff modified some of SMUD's proposed environmental measures to include the following measures:(1) file a report with the Commission by July 31 of each year about the provision of pulse flows; (2) prepare a Gerle Creek fish passage plan for brown trout; (3) expand the geographic scope of the invasive weed and vegetation management plans to include all land within the Project boundary affected by Project activities; (4) provide for an annual employee environmental awareness program in the vegetation management plan to educate employees and key personnel about the known locations of special status species and habitats; (5) prepare a transportation system management plan for roads on or affecting National Forest System lands and non-National Forest System roads that are primarily used for Project purposes and within the Project boundary; (6) prepare a plan for extending and formalizing trails primarily used for Project operations that are located on or affect National Forest System lands and are located or would be located within the Project boundary; (7) prepare a wildlife lands mitigation plan for the Iowa Hill development; and (8) provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 of any new license if environmental and use triggers are met. None of these measures conflict with measures included in the Settlement Agreement. Staff's modified and additional recommended measures are described in this final EIS in section 2.7.5, *Staff Modification of SMUD's Proposal.*

Under the Proposed Action, PG&E would implement the following measures at the Chili Bar Project: (1) a set of measures focused on the ecological health and suitability of the reaches downstream of the Project dam to support native fish, amphibian, and reptile populations implemented in coordination with SMUD's UARP; (2) a plan to monitor streamflows and reservoir elevations; (3) a set of measures that provide for the protection of wildlife and plants; (4) a comprehensive program of monitoring to determine the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoir and downstream reach; (5) vegetation and invasive weed management plans that provide for the protection of sensitive species habitat and the control of noxious weeds; (6) a suite of measures that focus on providing formal access to recreational boating, providing additional recreational boating flows, and providing public information services; (7) a visual management plan; and (8) an HPMP to protect cultural resources. These environmental measures are described in detail in final EIS section 2.5.3, *PG&E's Proposal.*

Staff modified PG&E's proposed vegetation and invasive weed management plans to: (1) expand the geographic scope of the invasive weed and vegetation management plans to include all land within the Project boundary affected by Project activities, and (2) include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats. Staff also recommends the development of a recreation plan for the Chili Bar Project. None of these modifications or the additional staff measures conflict with the measures included in the Settlement Agreement. Staff's modified and additional recommended measures are described in final EIS section 2.7.5, *Staff Modification of PG&E's Proposal.*

In this final EIS, we analyze and evaluate the environmental effects associated with issuance of new licenses for the existing hydropower projects and the proposed Iowa Hill development, and recommend conditions for inclusion in any licenses issued. For any licenses issued, the Commission must determine that the projects will be best adapted to a comprehensive plan for improving or developing the waterway. In addition to the power and development purposes for which licenses are issued, the Commission must give equal consideration to energy conservation and the protection and enhancement of fish and wildlife, aesthetics, cultural resources, and recreational opportunities. This final EIS for the UARP and Chili Bar Project reflects the Commission staff's consideration of these factors.

Overall, the measures proposed by SMUD and PG&E under the terms of the Settlement Agreement, along with additional staff-recommended and modified measures, would protect and enhance existing water use, water quality, fish and wildlife, land use, aesthetics, recreational resources, and cultural resources. In addition, the Projects would continue to provide a reliable source of renewable energy for SMUD's and PG&E's customers. The Proposed Action with Staff Modifications (Staff Alternative) for both Projects includes all of the mandatory conditions filed by the Forest Service and BLM that are enforceable by the Commission. For the two conditions that would require payments to the Forest Service and BLM, we recommend alternative measures that would achieve the same objectives.

The Proposed Action includes construction and operation of the Iowa Hill development. Building Iowa Hill would disturb the majority of 283 acres of land within the proposed Project boundary for the Iowa Hill development and introduce new visual elements to the landscape. SMUD proposes in-kind replacement of habitat and construction of an underground powerhouse to minimize the effects on wildlife and neighboring land owners. Although constructing and operating the proposed development would have environmental effects, the pumped-storage operations would provide SMUD flexibility to help meet peak power needs.

Under the Staff Alternative, the UARP (which includes the Iowa Hill development) would generate 2,673,000 MWh and have a net annual benefit of $110,791,000 ($41.45/MWh). For Chili Bar, the Staff Alternative would generate 31,291 MWh and have a net annual benefit of $481,200 ($15.38/MWh).

Based on our independent analysis of the UARP, including our consideration of all relevant economic and environmental concerns, we conclude that issuing a new license for the Project as proposed by SMUD with the Iowa Hill development, along with staff's modifications and additions to those proposals, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the UARP and the Upper American River.

Based on our independent analysis of the Chili Bar Project, including our consideration of all relevant economic and environmental concerns, we conclude that issuing a new license for the Project as proposed by PG&E, along with staff's modifications and additions to those proposals, would be best adapted to a comprehensive plan for the proper use, conservation, and development of the Chili Bar Project and the Upper American River.

COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 1
Purpose and Need for Action
Pages 1-1 through 1-12

FEIS

1.0 PURPOSE AND NEED FOR ACTION

On July 7, 2005, the Sacramento Municipal Utility District (SMUD) filed an application for new license for the Upper American River Project (UARP) with the Federal Energy Regulatory Commission (FERC or Commission). This application was prepared under the Alternative Licensing Process approved by the Commission on August 29, 2001, and included a preliminary draft environmental assessment (PDEA). The Project is on the Rubicon River, Silver Creek, and South Fork of the American River (SFAR) near Placerville, California (figure 1-1). The UARP's 11 reservoirs are capable of impounding more than 425,000 acre-feet of water. The eight powerhouses can generate up to 688 megawatts (MW) of power. The Project occupies 6,375[9] acres of federal land administered by the U.S. Department of Agriculture, Forest Service (Forest Service) Eldorado National Forest and 42.3 acres of federal land administered by the U.S. Bureau of Land Management (BLM).

On June 21, 2005, Pacific Gas and Electric Company (PG&E) filed an application for a new license for the Chili Bar Project using a Traditional Licensing Process. The Chili Bar Project is on the SFAR in El Dorado County, near Placerville, California, and it is a 7-MW hydroelectric project that encompasses about 3 river miles. The Chili Bar Project occupies 47.81 acres of federal land administered by the BLM, and its facilities are located downstream of SMUD's UARP (figure 1-1).

The Forest Service will be reviewing a special use permit application for construction of the Iowa Hill development on National Forest System lands. The Commission and the Forest Service have agreed to participate as cooperating agencies in the preparation of this final environmental impact statement (EIS) for the UARP.

The existing licenses for both the UARP and the Chili Bar Project (Projects) expired on July 31, 2007. The Commission issued annual licenses for the Projects on August 8, 2007.

1.1 PURPOSE OF ACTION

The Commission must decide whether to relicense the Projects and what conditions should be placed on any licenses issued. In deciding whether to authorize the continued operation of hydroelectric projects and related facilities in compliance with the Federal Power Act (FPA)[10] and other applicable laws, the Commission must

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[9]This acreage includes 185 acres of El Dorado National Forest lands associated with the proposed Iowa Hill development.

[10]16 U.S.C. §§791(a)-825(r), as amended by the Electric Consumers Protection Act of 1986, Public Law 99-495 (1986) and the Energy Policy Act of 1992, Public Law 102-486.

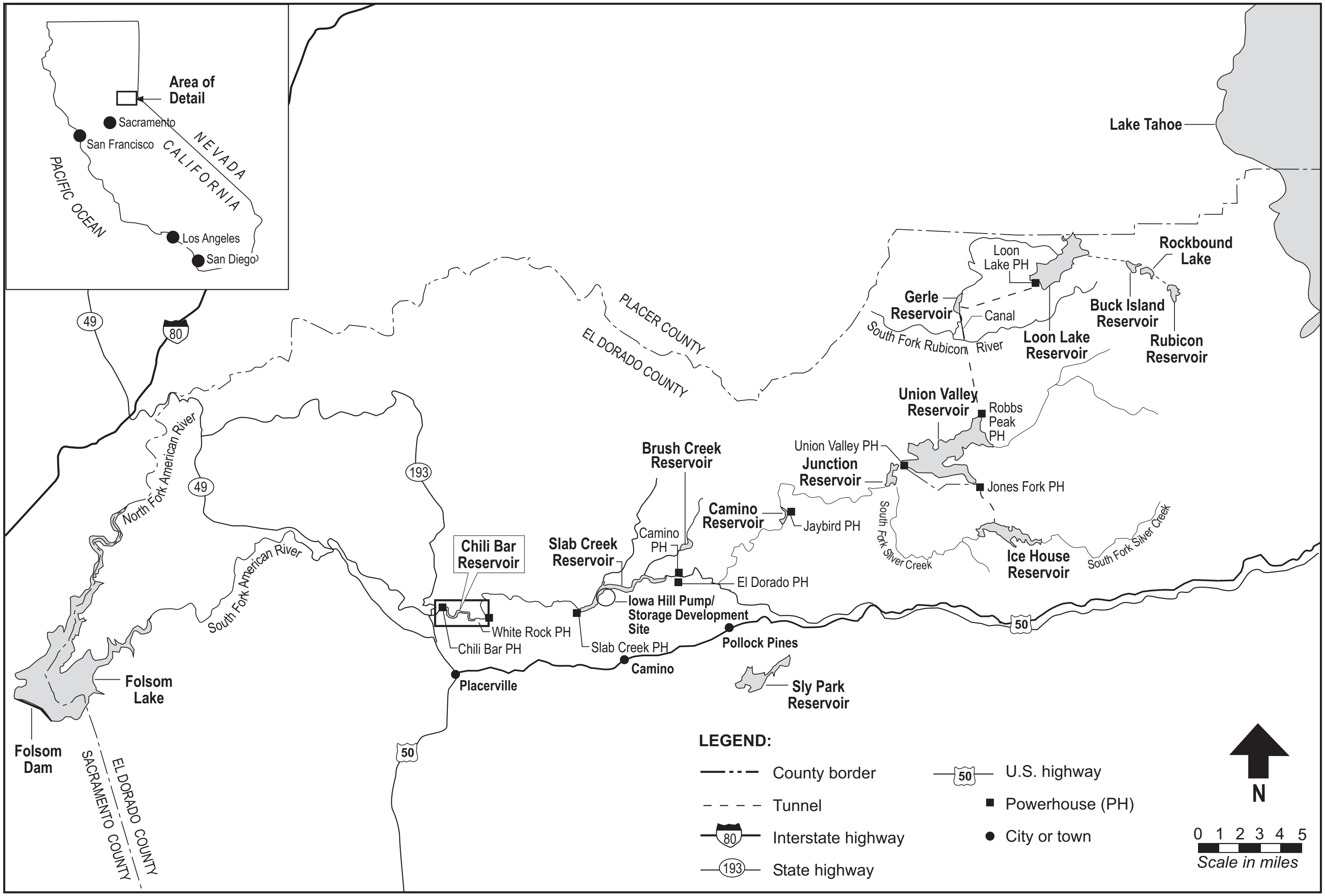

Figure 1-1. General vicinity of the UARP and Chili Bar Project. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

determine that the Projects will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., flood control, irrigation, and water supply), the Commission must give equal consideration to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat); the protection of recreational opportunities; and the preservation of other aspects of environmental quality. The Forest Service must decide whether to issue a special use permit for construction of the Iowa Hill development.

The Forest Service, under the Federal Land Policy and Management Act, must decide whether to grant a special use permit and/or easement for construction and operation of the proposed Iowa Hill development, including access and associated facilities. In this final EIS, we assess the environmental and economic effects of (1) continuing to operate the UARP and Chili Bar Project as they are currently operated (No-action Alternative); (2) operating the UARP with the Iowa Hill development as proposed by SMUD and the Chili Bar Project as proposed by PG&E (SMUD's Proposal and PG&E's Proposal as described in the Settlement Agreement, or the Proposed Action); (3) operating the UARP without the Iowa Hill development (UARP-only Alternative) and the Chili Bar Project as proposed by PG&E; and (4) operating the UARP with the Iowa Hill development as proposed by SMUD and the Chili Bar Project as proposed by PG&E with additional or modified environmental measures (Staff Alternative).

Important issues that are addressed in this final EIS include the potential effects of the Proposed Actions and alternatives on streamflows and water quality in the 12 river reaches (11 reaches of the UARP and one reach of the Chili Bar Project); the existing fish and amphibian resources in the river reaches, terrestrial resources, and plans to manage and enhance these resources; federally listed threatened or endangered plant and wildlife species; existing recreational uses and facilities and plans to improve and expand these facilities; cultural resources; and measures to protect these resources.

1.2 NEED FOR POWER

1.2.1 Regional Power Considerations

The UARP, with an installed capacity of 688 MW and an average annual generation of 1,835,000 megawatt-hours (MWh)[11] per year of energy, plays an important part in meeting the capacity requirements of SMUD. It is a significant power resource to the state of California and within the Western Electricity Coordinating

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[11]This value is the average generation for SMUD’s No-action Alternative as provided in SMUD’s April 11, 2007, Settlement Cost Analysis filed by Van Ness Feldman.

Council, which includes the states west of the Rockies; portions of Texas, Nebraska, and Kansas; Alberta and British Columbia, Canada; and a portion of North Baja California. Similarly, PG&E's Chili Bar Project, with an installed capacity of 7 MW and an average annual generation of 32,291 MWh[12] per year of energy, is another power resource available to the region.

Because the Projects are located in the California-Mexico Power area of the Western Electricity Coordinating Council region, we looked at the regional need for power as reported by the Western Electricity Coordinating Council[13] (WECC, 2005) to anticipate how the demand for electricity is expected to change in the region.

The California-Mexico Power area, which encompasses most of California and a part of Baja California in Mexico, has a significant summer peak demand. For the period from 2005 through 2014, the Western Electricity Coordinating Council forecasts peak demand and annual energy requirements in the area to grow at annual compound rates of 2.4 and 2.6 percent, respectively. The Western Electricity Coordinating Council anticipates that 6,783 MW of new capacity would come on line within the next 10 years in the California-Mexico Power area. The Projects could continue to meet part of the existing load requirements within a system in need of generating resources.

1.2.2 Iowa Hill Implications

SMUD's proposed Iowa Hill development would add an additional 400 MW of capacity during peak demand periods. The development would provide 931,000 MWh of super on-peak energy and 43,000 MWh of off-peak energy; however, 1,230,000 MWh of off-peak energy would be required to pump the water from Slab Creek reservoir to Iowa Hill reservoir during off-peak hours. This would result in net energy of –256,000 MWh.

SMUD and possibly other utilities in California would likely use the electricity from the Project to displace the use of gas-fired energy during on-peak hours. If the Project is not licensed, utilities would still need to provide a comparable amount of capacity and energy from other resources, most likely through the operation of gas-fired generation facilities.

The California Energy Commission was created in 1974 and is responsible for forecasting future energy needs and keeping historical energy data, among other duties. The California Energy Commission noted in its 2004 Integrated Energy Policy Report Update that "while supplies are tight during peak periods, the state has more than adequate amounts of power in the low load periods, especially at night" (CEC, 2004).

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[12]This value is the average generation for PG&E's No-action Alternative as provided in its May 18, 2006, Additional Information Response.

[13]WECC has yet to issue its 2006 forecast.

California utilities and generators have some options for shifting power supplies from off-peak to on-peak periods through the use of pumped-storage facilities.

If the UARP's license is issued to include the Iowa Hill development, the pumped-storage facility would contribute to a diversified generation mix and help meet power needs within and beyond the region. Regional power benefits from the new development would include those often referred to as ancillary system benefits, including spinning reserves, non-spinning reserves, peaking capacity, and grid stability. Pumped storage generates and stores power during off-peak periods that can be provided rapidly during on-peak periods. Additionally, it could allow SMUD to meet 6 to 7 years of anticipated peak demand growth. It could produce significant local generation to alleviate anticipated voltage and transmission constraints during peak-demand periods in the region and aid management of greatly increased minute-by-minute load balancing and control area[14] challenges presented by wind and other intermittent generation technologies required by renewable portfolio standards. Licensing the Iowa Hill development would allow SMUD to compete in the power market for sale of the Project's power and ancillary benefits.

1.3 SCOPING PROCESS

1.3.1 Upper American River Project

SMUD and PG&E conducted the National Environmental Policy Act (NEPA) scoping process for the overlapping issues for the UARP as part of SMUD's Alternative Licensing Process.[15] SMUD issued Scoping Document 1 on August 14, 2003. Three public scoping meetings were held in Sacramento and Placerville, California, on September 9–11, 2003, and a site tour was conducted on September 12, 2003. The scoping meetings allowed individuals an opportunity to submit oral or written comments to the relicensing record.

1.3.2 Chili Bar Project

The Commission issued Scoping Document 1 for the Chili Bar Project on December 20, 2005, to address non-overlapping issues exclusive to that Project.[16] After reviewing the two written comments filed during the scoping comment period, we

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[14]SMUD is one of four entities that currently operate control areas entirely within the state of California. As its own control area, SMUD is responsible for balancing the demand of its customers with power supplies.

[15]Under the Alternative Licensing Process, the applicant conducts scoping prior to filing the draft and final license application.

[16]Under the Traditional Licensing Process, the Commission issues a scoping document after a final license application is filed.

prepared Scoping Document 2 that addressed the comments from the State Water Resources Control Board (Water Board) and PG&E and presented the issues and alternatives for the Chili Bar Project in this final EIS.

1.4 AGENCY CONSULTATIONS

1.4.1 Alternative Licensing Process for UARP

After consulting with agencies, non-governmental organizations (NGOs), and members of the public, SMUD filed a formal request with the Commission to follow the Alternative Licensing Process. The Commission approved the request on August 29, 2001. From fall 2001 until 2005, the resource agencies and several NGOs participated in SMUD's Alternative Licensing Process with the intent (1) to produce a comprehensive set of protection, mitigation, and enhancement measures, acceptable to the settlement negotiations group, for submittal in the July 2005 final license applications for the UARP and Chili Bar Project; (2) to produce a quality settlement agreement to be submitted to the Commission for consideration in its environmental analysis; and (3) to preserve coordination between the UARP and Chili Bar Project on overlapping issues.

In April 2004, with the timeline for development of proposed measures and a settlement agreement behind schedule, the resource agencies proposed that SMUD be excused from completing a draft license application and instead have adequate time to complete studies, review study reports, develop and agree upon recommended measures, and write a comprehensive settlement agreement that would be acceptable to the settlement parties. The Commission excused SMUD from filing a draft license application. These goals were not achieved, however, and SMUD's final license application, including its PDEA, was filed without agreement on proposed measures among the parties in the Alternative License Process and without the parties knowing which environmental measures were proposed in the final license application.

PG&E filed a final license application for the Chili Bar Project in June 2005 under the Traditional Licensing Process.

1.4.2 Interventions and Comments

On July 28, 2006, the Commission issued a notice for the UARP soliciting interventions and requesting final terms, conditions, prescriptions, and recommendations and setting a comment deadline of 90 days from the date of the notice. On August 22, 2006, the Commission issued a notice for the Chili Bar Project that the Project was ready for environmental review and preliminary terms, conditions, and recommendations could be filed for the Chili Bar Project within 60 days of the date of the notice.

The following entities filed motions to intervene:

Intervenors in the UARP	Date of Filing
Eldorado Hills Community Service District	November 4, 2005
California Water Resources Control Board	September 6, 2006
Eldorado Parties[17]	September 13, 2006
U.S. Department of the Interior	September 22, 2006
Pacific Gas &Electric Company	September 25, 2006
Placer County Water Agency	October 4, 2006, and January 23, 2007
California Department of Fish and Game	October 17, 2006
Friends of the River	October 17, 2006
National Marine Fisheries Service	October 18, 2006

The following entities filed motions to intervene in the Chili Bar Project:

Intervenors in the Chili Bar Project	Date of Filing
U.S. Department of the Interior	September 22, 2006
California Water Resources Control Board	October 13, 2006
California Department of Fish and Game	October 17, 2006
National Marine Fisheries Service	October 18, 2006
Friends of the River	October 23, 2006
Sacramento Municipal Utility District	October 23, 2006

[17] Joint motion to intervene of the County of El Dorado, El Dorado County Water Agency, El Dorado Irrigation District, Georgetown Divide Public Utility District, and the El Dorado Water & Power Authority.

On November 16, 2006, the Commission extended the filing deadline for the final terms and conditions for the UARP and the preliminary terms, conditions, prescriptions, and recommendations for the Chili Bar Project to February 1, 2007, to give parties to the Settlement Agreement time to revise and file their terms, conditions, prescriptions, and recommendations.

The following entities filed comments, terms, conditions, prescriptions, or recommendations in response to the Commission's notice for the UARP and Chili Bar Project that are consistent with the Settlement Agreement:

Commenting Entities—UARP Project No. 2101	**Date of Filing**
California Water Resources Control Board	October 17, 2006
California Department of Fish and Game	October 18 2006 and January 31, 2007
U.S. Department of the Interior	October 17, 2006 and January 31, 2007
California Sportsfishing Alliance	October 18, 2006
National Marine Fisheries Service	October 18, 2006
U.S. Department of Agriculture, Forest Service	October 18, 2006 and January 30, 2007
California Department of Parks and Recreation	October 19, 2006
Environmental Council of Sacramento	October 19, 2006
Sacramento County Farm Bureau	October 23, 2006
Commenting Entities—Chili Bar Project No. 2155	**Date of Filing**
California Water Resources Control Board	October 16, 2006
California Department of Fish and Game	October 17 2006 and January 31, 2007
U.S. Department of the Interior	October 18, 2006 and January 31, 2007
California Department of Parks and Recreation	October 18, 2006

1.4.3 Settlement Agreement

After the final license applications were filed, seven resource agencies and several NGOs continued to work and developed a comprehensive alternative that addressed the interests of these parties and the interests of the licensees, as they were understood by these participants, as well as a rationale report that explained the rationale for the comprehensive alternative. On November 1, 2005, the seven agencies, two NGOs, and several individuals filed a Comprehensive Resource Agency/NGO Alternative and requested that the alternative be fully analyzed in the EIS. On August 18, 2006, SMUD filed a supplemental preliminary environmental assessment in response to the agency alternative.

From November 2005 until May 2006, the agencies and NGOs continued to negotiate with SMUD in an attempt to reach a comprehensive settlement agreement. That goal was not achieved, and in October 2006, the resource agencies filed preliminary terms, conditions, and recommendations in response to the Commission's July 28, 2006, notice. In November 2006, the agencies, NGOs, SMUD, and PG&E participated in negotiations that led to an Agreement in Principle, which was filed with the Commission on November 16, 2006. Because of the substantial progress that had been demonstrated in the Agreement in Principle, the Commission extended the deadline for filing preliminary terms, conditions, and recommendations to February 1, 2007.

SMUD and PG&E filed the Settlement Agreement on February 1, 2007. The Settlement Agreement was signed by representatives of federal and state agencies, NGOs, and individuals listed below. We consider the Settlement Agreement to represent the Proposed Actions for these Projects.

Signatories to the Settlement Agreement
U.S. Department of Agriculture, Forest Service
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, Bureau of Land Management
U.S. Department of the Interior, National Park Service
California Department of Fish and Game
California Department of Parks and Recreation
American Whitewater
Friends of the River
California Sportsfishing Protection Alliance
American River Recreation Association and Camp Lotus
Foothill Conservancy

Signatories to the Settlement Agreement
California Outdoors
Hilde Schweitzer
Rich Platt
Theresa Simsiman

The Commission issued a notice of the Settlement Agreement and set a comment deadline of March 10, 2007, and a reply comment deadline of March 25, 2007. The following entities filed comments on the Settlement Agreement.

Commenting Entities on Settlement Agreement	Date of Filing
Placer County Water Agency	March 9, 2007
California Sportfishing Protection Alliance	March 9, 2007

SMUD filed reply comments on March 16, 2007.

During the relicensing proceeding, SMUD and El Dorado County entered into the El Dorado-SMUD Cooperative Agreement on November 22, 2005. This agreement resolved all relicensing issues among SMUD, El Dorado County Water Agency, El Dorado Irrigation District (EID), Georgetown Divide Public Utility District, and the El Dorado Water & Power Authority. SMUD filed this agreement with the Commission on December 2, 2005, for information purposes only. Section 3.4.2 of the El Dorado-SMUD Cooperative Agreement requires SMUD and El Dorado County to create an Advisory Committee to the SMUD Board. The role of the Advisory Committee would be to receive public input and to develop reasonable and feasible measures to substantially mitigate the effects of activities related to construction of the Iowa Hill development on the surrounding communities and existing infrastructure. The agreement calls for the Advisory Committee to be convened no later than 30 days after SMUD issues its Notice of Intention to Proceed with construction of the Iowa Hill development following issuance of a license. However, SMUD and El Dorado County agreed that it would be beneficial to initiate the Advisory Committee early in order to engage the local community and address concerns.

The seven-member Advisory Committee, created in the spring of 2006, met 13 times between June 2006 and August 2007 and focused on five major areas of concern: visual, noise, transportation, fire protection, and socioeconomics. The results of the Advisory Committee’s efforts were summarized in a series of matrices that are available on the SMUD relicensing web site. These matrices call for SMUD to adopt numerous measures beyond those included in the license application and with greater specificity than the Proposed Articles included in the Settlement Agreement. SMUD indicates in its filing dated December 7, 2007, that it is conducting preliminary analyses of these mitigation measures but has not adopted any of the recommendations contained in the Advisory Committee's matrices. SMUD also indicates that it will address the mitigation measures proposed by the Advisory Committee in a supplemental document to be prepared under the California Environmental Quality Act. Commission staff requested that SMUD file any new or revised studies performed as a result of the recommendations of the Advisory Committee.

On January 31, 2008, SMUD filed a Technical Report of the Iowa Hill Pumped-Storage Development Turbidity Analysis (Stillwater, 2008), a Visual Resources Technical Report, Addendum No. 1 (CH2M HILL, 2008a), and a Transportation Route Technical Report (CH2M HILL, 2000b). We reviewed these technical reports and discuss the findings in this final EIS.

1.4.4 Comments on the Draft Environmental Impact Statement

The Commission issued its draft EIS for relicensing the UARP and the Chili Bar Project on September 21, 2007. The Commission also held a public meeting on November 5, 2007, in Placerville, California, to receive public comment on the draft EIS. In appendix A, we summarize the written and oral comments received, provide responses to those comments; and indicate, where appropriate, how we have modified the text of the final EIS.

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 2
Proposed Action and Alternatives
Pages 2-1 through 2-44

FEIS

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the No-action Alternative, the UARP and Chili Bar Project would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives.

2.2 UPPER AMERICAN RIVER PROJECT

The UARP was constructed from 1959 to 1985 and placed in service between 1961 and 1985. SMUD owns and operates the Project, consisting of 7 developments located in the California counties of El Dorado and Sacramento, within the Rubicon River, Silver Creek, and the SFAR drainages. The Project's 11 reservoirs are capable of impounding more than 425,000 acre-feet of water. The eight powerhouses can generate up to 688 MW of power. The Project also includes 11 transmission lines that have a combined length of about 180 miles, about 28 miles of power tunnels/penstocks, one canal that is 1.9 miles long, and about 700 developed public-use campsites.

2.2.1 Existing Facilities

The UARP includes seven developments and the components necessary to use the available water resources for hydroelectric generation: Loon Lake, Robbs Peak, Jones Fork, Union Valley, Jaybird, Camino, and Slab Creek/White Rock. Reservoir and powerhouse characteristics are shown in tables 2-1 and 2-2 (presented at the end of this subsection).

Loon Lake

The Loon Lake development is the most upstream project facility and consists of: (1) Rubicon dam—a concrete gravity diversion dam, 36 feet high and 644 feet long, with an auxiliary dam that is 29 feet high and 553 feet long, which together impound the Rubicon reservoir; (2) Rubicon-Rockbound tunnel—a horseshoe tunnel that is 13 feet in diameter and 0.2 mile long that diverts water from the Rubicon reservoir to the Buck Island reservoir via Rockland Lake (a non-project facility) on Highland Creek; (3) Buck Island dam—a concrete gravity diversion dam that is 23 feet high and 293 feet long and a concrete auxiliary dam that is 15 feet high and 244 feet long located on the Little Rubicon River that impounds the Buck Island reservoir; (4) Buck Island-Loon Lake tunnel—an unlined modified horseshoe tunnel that is 1.6 miles long and 13 feet in diameter that diverts water from Buck Island reservoir to Loon Lake reservoir; (5) Loon Lake dam—a rockfill dam that is 108 feet high and 0.4 mile long with a 250-foot-long side channel spillway on the right bank, a rockfill auxiliary dam that is 95 feet high and 910 feet long, and an earth dike that together form Loon Lake reservoir; (6) Loon Lake powerhouse penstock that includes a concrete-lined horseshoe tunnel that is 0.3 mile long and 14 feet in diameter, a concrete lined vertical shaft that is 10 feet in diameter, and a steel lined tunnel that is 8.5 feet in diameter and extends from Loon Lake reservoir to Loon Lake powerhouse; (7) Loon Lake powerhouse—an underground powerhouse located more than 1,100 feet below the surface of Loon Lake reservoir; (8) Loon Lake powerhouse tailrace tunnel—a unlined horseshoe tunnel that is 18 feet in diameter and extends 3.8 miles from the Loon Lake powerhouse to the Gerle Creek reservoir; and (9) transmission lines—two 69 kilovolt (kV) overhead transmission lines, the Loon Lake-Robbs Peak transmission line extending 7.9 miles to the Robbs Peak and the Loon Lake-Union Valley transmission line extending 12.4 miles to the Union Valley switchyard. Rubicon dam is located inside a designated wilderness area (Desolation Wilderness), within the boundary of the Eldorado National Forest. All other facilities in this development are located outside the wilderness boundary but within the Eldorado National Forest.

Robbs Peak

The Robbs Peak development consists of: (1) Gerle Creek dam—a concrete gravity overflow structure that is 58 feet high and 444 feet long on Gerle Creek, upstream of its confluence with the South Fork of the Rubicon River (SFRR); and that has two low level outlet gates, incorporating the intake of Gerle Creek canal in its left abutment, creating Gerle Creek reservoir; (2) Gerle Creek canal—an above-ground canal, partially lined with gunite, that is 22 feet wide and 19 feet deep, extending 1.9 miles from Gerle Creek reservoir to Robbs Peak reservoir; (3) Robbs Peak dam—a concrete gravity overflow structure that is 44 feet high and 320 feet long, with 12 steel bulkhead gates, all 6.2 feet high, on the spillway crest, located on the SFRR upstream of its confluence with Gerle Creek, that forms Robbs Peak reservoir; (4) Robbs Peak tunnel—an unlined horseshoe that is 3.2 miles long and 13 feet in diameter and a diversion tunnel that is 10 feet in diameter from Robbs Peak reservoir to Robbs Peak penstock; (5) Robbs Peak penstock—a steel penstock that is from 9.75 to 8.5 feet in diameter extending 0.4 mile from Robbs Peak tunnel to Robbs Peak powerhouse; (6) Robbs Peak powerhouse—located on the northeast shore of Union Valley reservoir; and (7) Robbs Peak-Union Valley transmission line—an overhead 69-kV line that extends 6.8 miles to connect the Robbs Peak switchyard to the Union Valley switchyard. This development is located on both private and public land within the boundary of the Eldorado National Forest.

Jones Fork

The Jones Fork development consists of: (1) Ice House dam—a rockfill dam located on the South Fork of Silver Creek (SFSC) that is 150 feet high and 0.3 mile long incorporating a concrete ogee spillway with radial gates, and two auxiliary earthfill dikes impounding the Ice House reservoir; (2) Jones Fork tunnel—a horseshoe concrete and steel-lined tunnel that is 8 feet in diameter and extends 0.3 mile from Ice House reservoir to the Jones Fork penstock; (3) Jones Fork penstock—a steel and concrete penstock that is 6 feet in diameter and extends 1.6 miles from Jones Fork tunnel to the Jones Fork powerhouse; (4) Jones Fork powerhouse on the southeast shore of Union Valley reservoir; and (5) Jones Fork-Union Valley transmission line—a 69-kV overhead transmission line that extends 4.0 miles from the Jones Fork switchyard to the Union Valley switchyard. The Jones Fork powerhouse is located on public land within the boundary of the Eldorado National Forest. The Jones Fork tunnel and the Jones Fork penstock are on both private and public land within the Eldorado National Forest.

Union Valley

The Union Valley development consists of: (1) Union Valley dam—an earthfill dam located on Silver Creek that is 453 high and 0.3 mile long, incorporating a concrete ogee spillway with radial gates, creating Union Valley reservoir; (2) Union Valley tunnel—a concrete-lined tunnel that is 11 feet in diameter with a steel penstock approximately 10 feet in diameter in part of the tunnel and extending 268 feet to connect the Union Valley reservoir with Union Valley powerhouse; (3) Union Valley penstock—a steel penstock that is 10 feet in diameter and extends 0.3 mile to convey water from the outlet of the Union Valley tunnel to the Union Valley powerhouse; (4) Union Valley powerhouse, located at the base of Union Valley dam; and (5) transmission lines—two 230-kV overhead transmission lines, one extending 11.8 miles to the Camino switchyard via the Union Valley-Camino transmission line and the other extending 5.9 miles to the Jaybird switchyard via the Union Valley-Jaybird transmission line. This development is located on both public and private land within the boundary of the Eldorado National Forest.

Jaybird

The Jaybird development consists of: (1) Junction dam—a double curvature, concrete overflow arch dam located on Silver Creek that is 525 feet long and 168 feet high, creating Junction reservoir; (2) Jaybird tunnel—a modified horseshoe tunnel that is 11 to 14 feet in diameter and extends 4.4 miles connecting Junction reservoir and the Jaybird penstock; (3) Jaybird penstock—a steel penstock 6 to 10 feet in diameter that is 0.5 mile long with a surge tank, connecting Jaybird tunnel and Jaybird powerhouse; (4) Jaybird powerhouse; and (5) Jaybird-White Rock transmission line—a 230-kV overhead transmission line that extends 15.9 miles to connect the Jaybird and White Rock switchyards. This development is located on both private and public land within the boundary of the Eldorado National Forest.

Camino

The Camino development consists of: (1) Camino dam—a concrete double curvature arch dam on Silver Creek that is 133 feet high and 470 feet long that has three integral bulkhead gates, creating the Camino reservoir; (2) Camino tunnel—a power tunnel with a diameter ranging from 13 feet to 14 feet, including a surge tank, that extends 5 miles to connect the Camino reservoir with the Camino penstock; (3) Brush

Creek dam—a double curvature arch dam located on Brush Creek that is 213 feet high and 780 feet long, creating Brush Creek reservoir; (4) Brush Creek tunnel—a modified horseshoe tunnel, about 14 feet in diameter extending 0.8 mile from Brush Creek reservoir to the lower end of Camino tunnel; (5) Camino penstock—an above-ground steel penstock that is 5 to 12 feet in diameter extending 0.3 mile to connect the Camino tunnel and Camino powerhouse; (7) Camino powerhouse, located on the SFAR; and (8) transmission lines—two 230-kV overhead transmission lines originating at the Camino switchyard, the Camino-Lake transmission line extends 31.7 miles and connects to SMUD's Lake substation and the Camino-White Rock transmission line extends 10.0 miles and connects to the White Rock switchyard. All the facilities in this development are located on public land within the Eldorado National Forest.

Slab Creek/White Rock

The Slab Creek/White Rock development consists of: (1) Slab Creek dam—a double curvature variable radius concrete arch dam that stretches across the SFAR that is 250 feet high and 817 feet long, with a central uncontrolled overflow spillway, creating the Slab Creek reservoir; (2) Slab Creek penstock—a steel penstock that is 24 inches in diameter that extend 40 feet and passes through the dam to connect Slab Creek reservoir with Slab Creek powerhouse; (3) Slab Creek powerhouse—located at the base of Slab Creek dam that uses minimum stream flow releases; (4) White Rock tunnel—a modified horseshoe tunnel that is 20 to 24 feet in diameter, with a surge shaft, that extends 4.9 miles to connect Slab Creek reservoir with White Rock penstock; (5) White Rock penstock—an above-ground steel penstock that is 9 to 15 feet in diameter and extends 0.3 mile to connect White Rock tunnel to White Rock powerhouse; (6) White Rock powerhouse; and (7) transmission lines—two 230-kV overhead transmission lines and one 12-kV distribution line both 21.8 miles long. The two transmission lines connect the White Rock switchyard to SMUD's Folsom Junction. The 600-foot-long 12-kV Slab Creek tap line is 600 feet long and connects the Slab Creek powerhouse to the junction with PG&E's 12-kV distribution line. The Slab Creek/White Rock development is the most downstream Project facility (excluding transmission lines) and discharges into the Chili Bar reservoir, which is part of PG&E's Chili Bar Project. Slab Creek reservoir is located on public and private (including SMUD) land within the Eldorado National Forest. The remainder of the development is located on private land adjacent to and beyond the western boundary of the Eldorado National Forest.

Table 2-1 summarizes key characteristics of each reservoir associated with the Project, and table 2-2 shows the characteristics of each powerhouse. For ease of reference and consistency, we use the terminology presented in these two tables throughout the EIS to discuss various locations relative to the Projects.

Table 2-1. Characteristics of Project reservoirs. (Source: SMUD, 2005)

Reservoir Name (Development Name if Different)	Maximum Pool Elevation (feet msl)	Normal Maximum Reservoir Capacity (acre-feet)	Surface Area at Maximum Pool (acres)
Rubicon (Loon Lake)	6,545	1,450	108
Buck Island (Loon Lake)	6,436	1,070	78
Loon Lake	6,410	76,200	1,450
Gerle Creek (Robbs Peak)	5,231	1,260	60
Robbs Peak	5,231	30	2
Ice House (Jones Fork)	5,450	45,960	678
Union Valley	4,870	277,290	2,860
Junction (Jaybird)	4,450	3,250	64
Camino	2,915	825	20
Brush Creek (Camino)	2,915	1,530	20
Slab Creek	1,850	16,600	280

Note: msl – mean sea level

Table 2-2. Characteristics of Project powerhouses. (Source: SMUD, 2005)

Reservoir Name	Powerhouse Capacity (MW)	Number of Units	Type of Units
Loon Lake	82	1	Vertical Pelton
Robbs Peak	29	1	Vertical Francis
Jones Fork	11.5	1	Vertical Francis
Union Valley	46.7	1	Vertical Francis
Jaybird	144	2	Vertical Pelton
Camino	150	2	Vertical Francis
Slab Creek	0.4	1	Vertical Francis
White Rock	224	2	Vertical Francis
Total	687.6	11	

2.2.2 Current Operations

One of the primary aspects of operational flexibility of the UARP lies in the ability of the Project to store water seasonally. The combined 400,000 acre-feet gross capacity of the three storage reservoirs (Loon Lake, Ice House, and Union Valley) allows SMUD to manage the water, within physical, safety, and regulatory constraints, to generate electricity when power is most valued throughout the year. The Project is operated generally to provide electricity during peak load situations. It is also operated to ensure reliability of the electric transmission system within SMUD's control area.

From a water management perspective, operation of the Project follows an annual cycle of reservoir filling and release that coincides with the natural patterns of rain and snowmelt runoff characteristic of the Sierra Nevada. While the Project includes 11 reservoirs, each is used in a different way to manage the water for power production. Loon Lake, Ice House, and Union Valley reservoirs, accounting for 94 percent of total UARP gross storage capacity, operate primarily as long-term storage reservoirs, capturing as much of the winter/spring rain and snowmelt runoff as practicable, consistent with various regulatory constraints.

The two uppermost reservoirs (Rubicon and Buck Island) provide limited storage and are operated primarily run-of-river to capture and divert water from the Rubicon River and the Highland Creek drainages. No power is generated at the uppermost reservoir.

Typically, from about mid-summer to winter, the elevations of the three primary storage reservoirs are gradually lowered to generate electricity and provide adequate storage space to capture winter/spring runoff and minimize the frequency and amount of spillage. During this period, the Project is operated in a peaking mode, essentially following the daily demand cycle. Water is released from one or more of the storage reservoirs and is passed through the reservoirs as it makes its way through the series of downstream powerhouses (see figures 2-1 and 2-2). In winter, as rainstorms and snowmelt begin to increase streamflow in the basin, the process is reversed, with more water stored than released through the powerhouses. Thus, from winter to early summer, the water elevations of the storage reservoirs gradually increase.

Five Project reservoirs (Gerle Creek, Robbs Peak, Junction, Camino, and Slab Creek) operate primarily as re-regulating forebays and/or afterbays to the various powerhouses. The remaining reservoir (Brush Creek) is operated typically to provide either spinning reserves or maximum peaking power for system reliability purposes. SMUD's water rights do not allow the storage of water in these six reservoirs. Thus, retention time in these reservoirs is short, and water levels are likely to fluctuate daily as they provide the re-regulating functions for which they were designed.

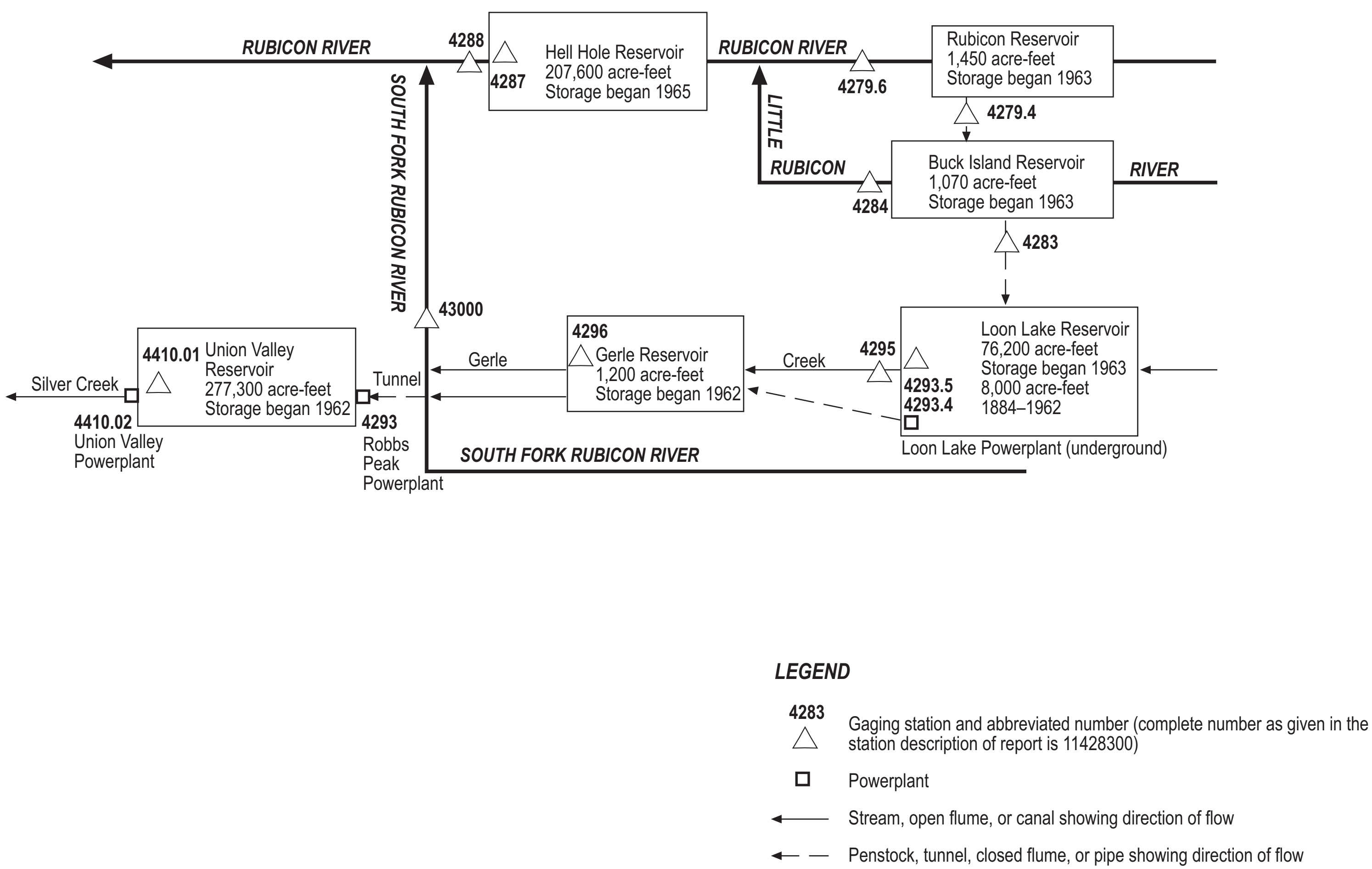

Figure 2-1. Diversions and storage in Rubicon River Basin. (Source: USGS, 2005; as modified by staff)

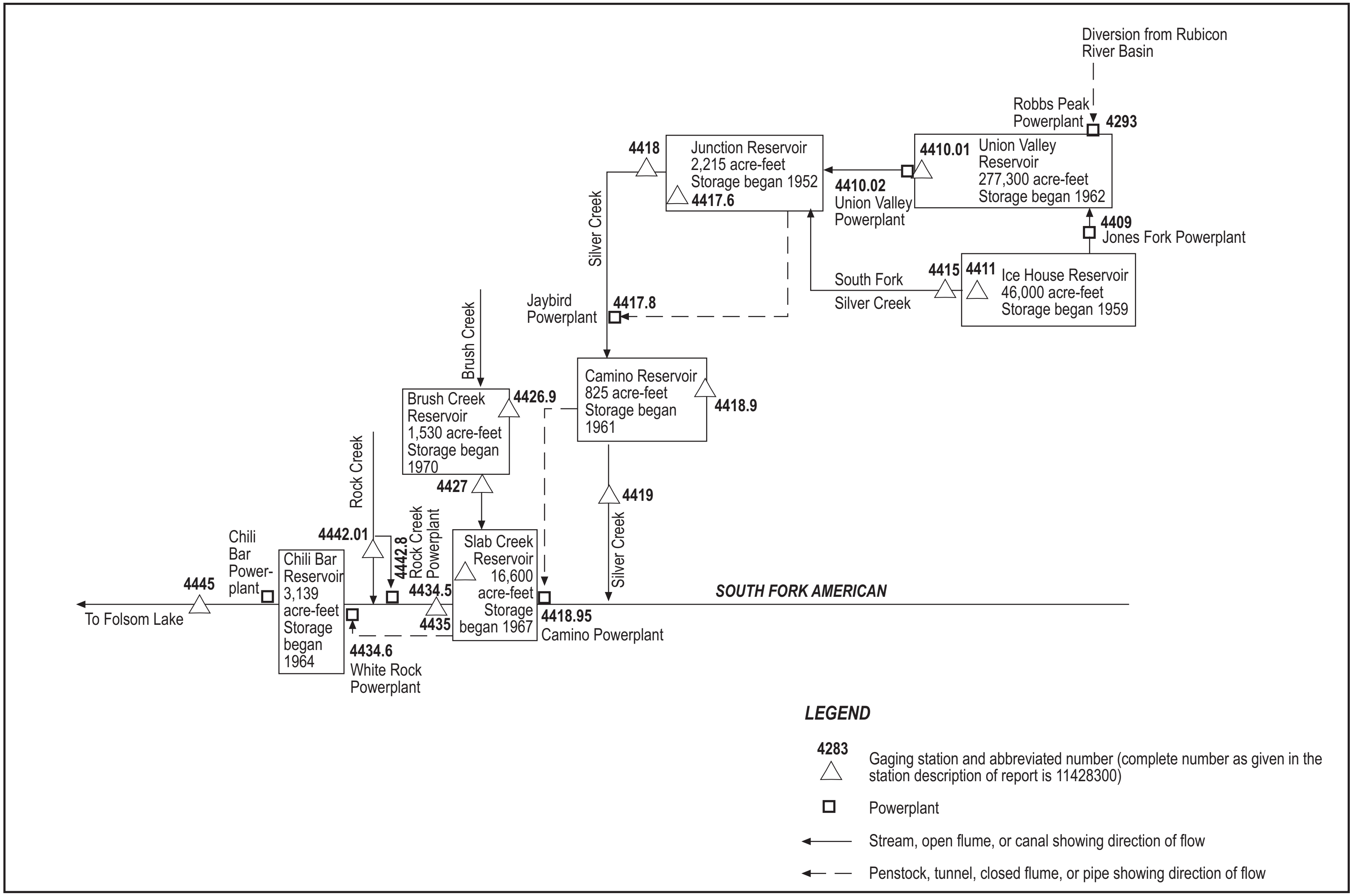

Figure 2-2. Diversions and storage in the South Fork of the American River Basin. (Source: USGS, 2005; as modified by staff)

Six powerhouses (Loon Lake, Jones Fork, Union Valley, Jaybird, Camino, and White Rock) account for 95 percent of the total UARP 688-MW maximum capability. These powerhouses can generally be operated flexibly, with limited constraints on flows and sufficient storage to meet daily peaking cycles. Of the two remaining powerhouses, Robbs Peak powerhouse is operated run-of-river due to the lack of storage capacity in the Robbs Peak development. Robbs Peak powerhouse does, however, contribute to peaking power capability because Robbs Peak's primary inflow during most of the year is the Loon Lake powerhouse discharge. The Slab Creek powerhouse is typically operated to meet baseloads and uses the continuous minimum flow from the Camino tunnel and the SFAR for power generation and releases into the SFAR.

2.2.3 Existing Project Boundary

The current Project boundary encompasses all Project facilities including linear corridors ranging from 50 to 100 feet for transmission lines and tunnels at each development and generally does not include the stream reaches downstream of the dams. The current Project boundary follows a contour line generally 3 feet above the maximum normal water surface elevation at each developed reservoir except at the location of Project facilities and at most, but not all, Project recreational facilities on National Forest System lands. The recreational facilities located within the Project boundary at the Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs are shown on figures 3-33, 3-34, and 3-35 in section 3.3.6, *Recreational Resources*.

Five campgrounds, including Gerle Creek, Pleasant, Loon Lake Equestrian, Jones Fork, and Big Silver, are only partially within the existing Project boundary. Several Project access roads also are not entirely within the existing boundary, including access roads at Wolf Creek, Northern Ice House, and Jones Fork.

2.2.4 Project Safety

The UARP has been operating for 28 years under the existing license, during which time Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the Project has been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been filed for Commission review. As part of the relicensing process, the Commission staff evaluate the adequacy of the proposed Project facilities under a new license. Since SMUD proposes to build the Iowa Hill development, Commission staff would inspect the development, if licensed, both during and after construction. Special articles relating to safety issues would be included in any license issued, as appropriate. Commission staff would continue to inspect the Project during the new license term to ensure continued adherence to Commission-approved plans and specifications; special license articles relating to construction, operation, and maintenance; and accepted engineering practices and procedures.

2.3 CHILI BAR PROJECT

2.3.1 Existing Project Facilities

The Chili Bar Project is located immediately downstream of SMUD's UARP. The Chili Bar Project facilities consist of a concrete gravity dam that is 126 feet high and 380 feet long with a dam spillway that is 170 feet long with a crest elevation of 997.5 feet (National Geodetic Vertical Datum [NGVD]) located 31 feet below the crest of the dam; (2) a reservoir with a surface area of 110 acres and a useable storage capacity of 1,339 acre-feet at elevation 997.5 feet NGVD; and (3) a powerhouse that is 80 feet square containing a single turbine unit with a normal maximum gross head of 60 feet, a maximum hydraulic capacity of 1,979 cubic feet per second (cfs), and an installed capacity of 7 MW. There is no project transmission line because the 21-kV switchyard connects directly to the local distribution grid.

2.3.2 Current Operations

Because the Chili Bar Project has limited reservoir storage, PG&E can only manage the flow releases from SMUD's upstream White Rock powerhouse on a daily basis. Typically, Chili Bar stores the releases from White Rock during off-peak hours and generates electricity during peak load hours. Therefore, flows downstream of the Chili Bar Project often fluctuate daily. Given that White Rock powerhouse has a flow capacity almost twice as high as Chili Bar, the Chili Bar Project often spills flow in excess of its generating capacity at Chili Bar dam. The Chili Bar powerhouse has semi-automatic operation and is operated from PG&E's Wise Switching Center about 35 miles away in Auburn, California.

2.3.3 Existing Project Boundary

The existing Project boundary includes all the land PG&E owns ranging from about 50 to 250 feet from either side of the river and starting about 320 feet downstream of the Project dam to about 3.2 miles upstream of the Project dam. There are no formal recreational facilities within the Chili Bar Project boundary; however, at Chili Bar dam, PG&E manages an informal boat launch that PG&E uses infrequently and exclusively for inspection and maintenance purposes. The boat launch is inaccessible to the public. The Project boundary does not include the reach downstream of Chili Bar dam.

2.3.4 Project Safety

The Chili Bar Project was placed in operation in 1965 and has been operating for 42 years under the existing license. Inspection activity is the same as described for the UARP in section 2.2.4.

2.4 SMUD'S PROPOSAL

2.4.1 Proposed Project Facilities—Iowa Hill Development

As part of the relicensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill development, which would operate as a pumped-storage facility (figures 2-3 and 2-4).

The Iowa Hill development, as proposed, would be an off-stream pumped-storage project that makes use of the existing UARP Slab Creek reservoir as a lower reservoir and a new upper reservoir atop Iowa Hill (figure 1-1). The difference in elevation between the two reservoirs would be about 1,200 feet, providing the capability of the development to generate a nominal 400 MW of electricity. Under the proposed layout, the reservoirs would connect through an underground powerhouse and tunnel system.

While SMUD considered alternative reservoir sizes and locations, the upper reservoir as proposed would cover a surface area of about 100 acres atop Iowa Hill and would hold about 6,400 acre-feet. The upper reservoir would be created by the construction of a berm atop Iowa Hill. SMUD proposes to construct the berm for the upper reservoir from crushed rock from the tunneling operation, earth from the upper reservoir basin, a high-density polyethylene liner to prevent leakage, and appropriate revetment/rock where needed to minimize bank erosion. During construction of the upper reservoir, SMUD proposes to balance the excavation and fill requirements of the total development, eliminating any need for permanent spoil disposal areas at the upper reservoir. Before construction is completed, all temporary spoil would be eliminated by incorporation into the upper reservoir dikes, and the area would be landscaped.

The proposed underground powerhouse would house three equally sized, variable-speed pump/turbine units with a rated capacity of 400 MW. Variable speed units possess a number of advantages over conventional synchronous speed units, including: (1) lower system disturbance from pumping starts, (2) the ability to operate at part load during pumping mode, (3) use for regulation while in pumping mode, and (4) flexibility to lower overall system costs.

SMUD proposes to construct a multi-port (i.e., octagonal) intake at approximately 1,770 feet, 80 feet below the Slab Creek reservoir maximum water level elevation of 1,850 feet. The intake would be 15 feet high. To construct the octagonal intake, a steel cofferdam would be floated in and sunk in place.

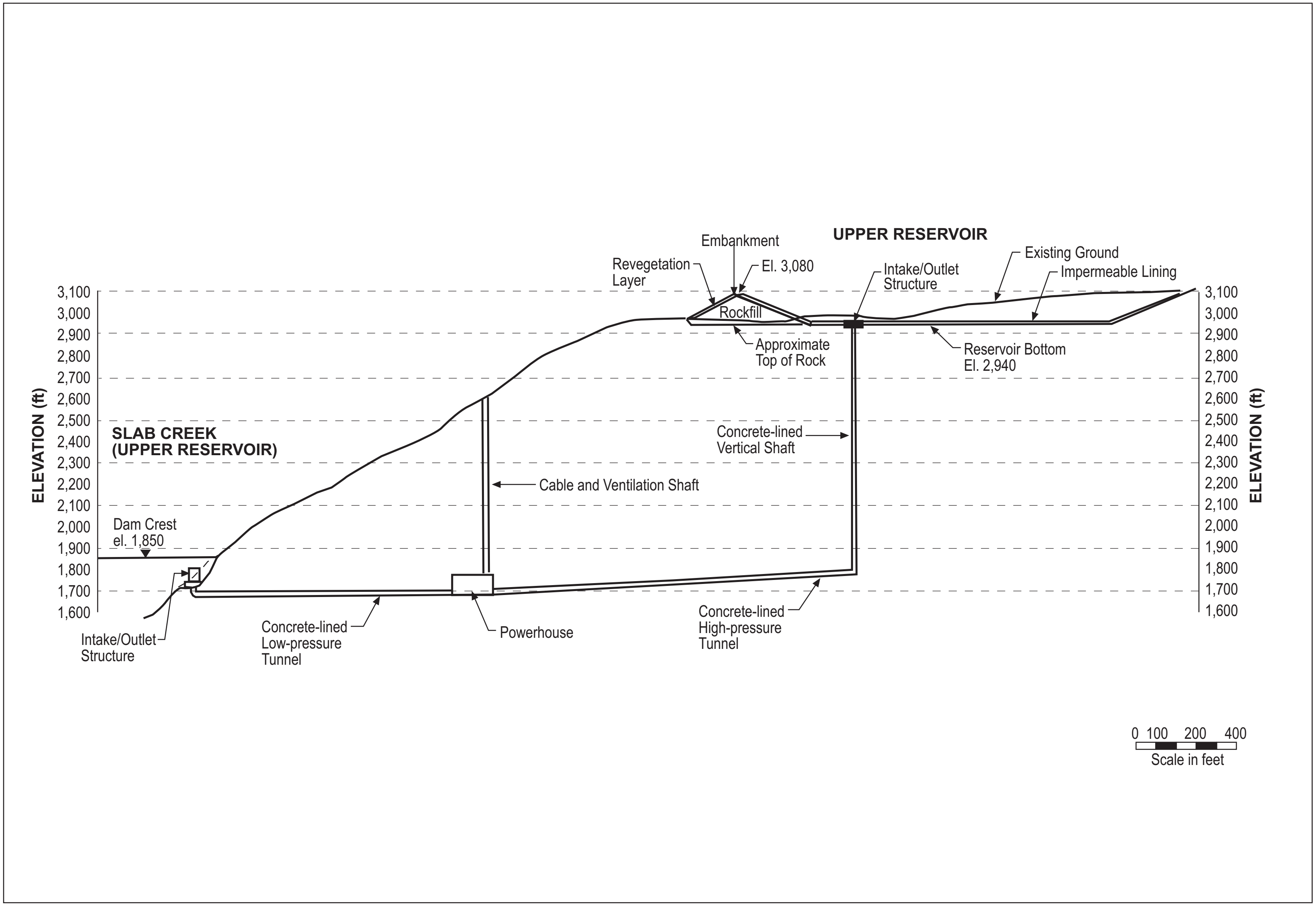

Figure 2-3. Schematic of the proposed Iowa Hill pumped-storage operation. (Source: SMUD, 2005, as modified by staff)

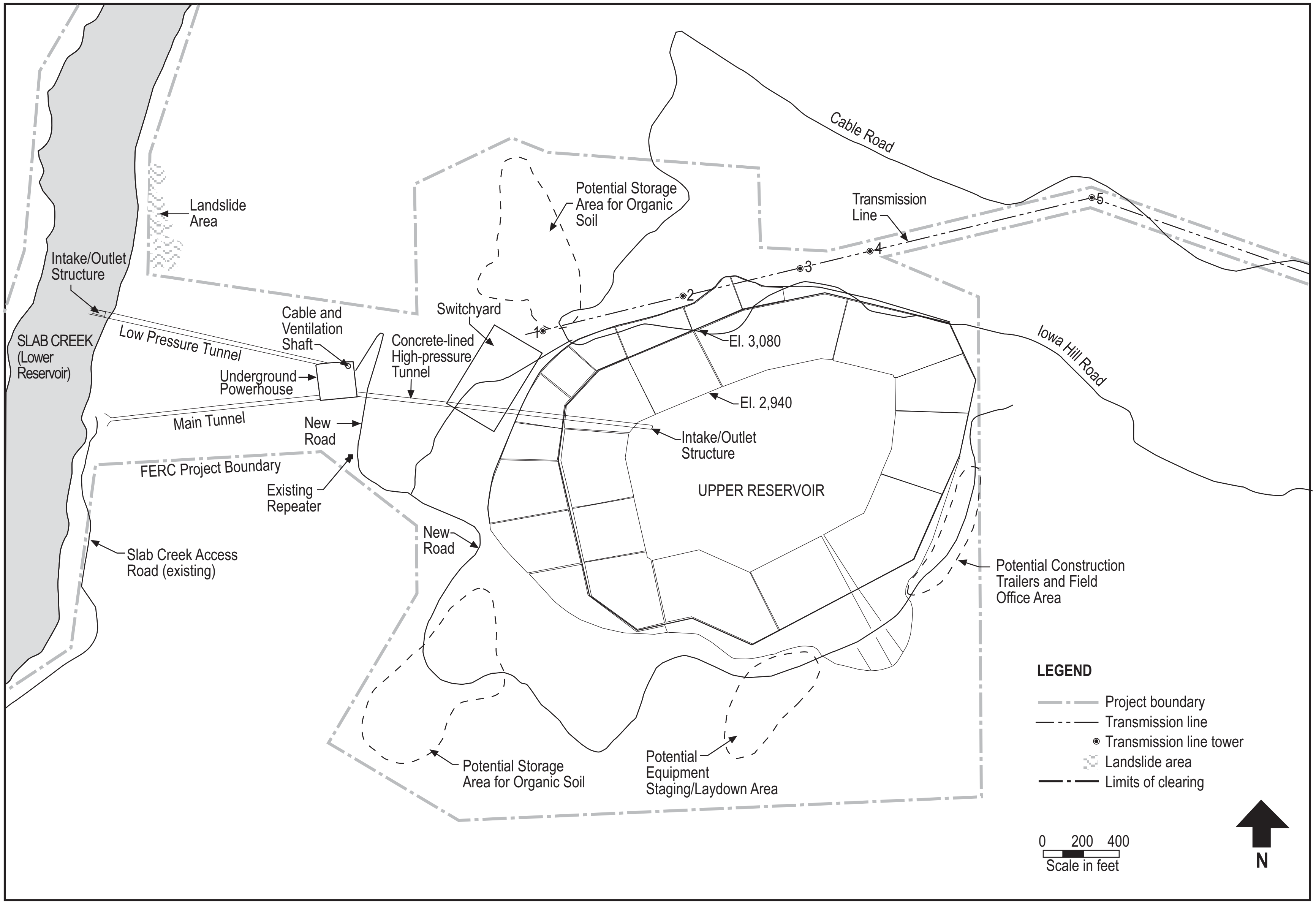

Figure 2-4. Plan view of the Iowa Hill development. (Source: SMUD, 2005, as modified by staff)

In its license application, SMUD proposes that the primary access to the upper reservoir site off of U.S. Highway 50 would be provided by Carson Road to Cable Road to Iowa Hill Road. SMUD would improve the serviceability of 4 miles of the existing Cable Road from the end of the paved portion of Cable Road to the upper reservoir site by either providing an unimproved gravel road or paving the 4 miles of existing roadway. The existing road would not be widened. About 1,200 feet of Carson Road would be included in the proposed Project boundary for the Iowa Hill development. Wide places in the existing road would be improved along with the rest of the road and would function as passing turnouts. Once constructed, the upper reservoir would be fenced, locked, and unavailable for public recreation.

In its license application, SMUD proposes that the primary access to the lower reservoir site off U.S. Highway 50 would be provided by Carson Road to Larsen Drive to the Slab Creek reservoir access road. The location of the Project facilities to be constructed at the lower reservoir is at the end of the existing 2-mile-long Slab Creek reservoir access road. SMUD constructed the first 1.1 miles of the existing road, starting from North Canyon Road going to a point near the dam, as a gravel road to provide access for dam construction and for operation and maintenance access to the existing Slab Creek reservoir. The remaining 0.9 mile of the existing access road, starting from near the dam and heading east, was originally constructed as a 10-foot-wide road and currently provides access to the existing, semi-developed boat launch site. This segment of road, which would be included in the Project boundary, would be widened by 2 feet and paved. During construction, the excavated rock and soil from the powerhouse, tunnel, and shaft would be transported to the upper reservoir site to be used for berm construction of the upper reservoir. SMUD proposes to use a vertical material handling system consisting of either a conveyor or bucket-and-cable system located in the cable shaft to transport the excavated material from the main access tunnel for the powerhouse to the upper reservoir site.

In response to comments on the draft EIS, SMUD studied several alternative routes to both the upper and lower reservoir sites. These routes, as well as the proposed routes, are evaluated in this final EIS in sections 3.3.7, *Land Use,* and 3.3.10, *Socioeconomic Resources*.

The electrical power output would be carried by the existing three 230-kV transmission lines that move power from the UARP to SMUD's load center. The only new transmission line would be a generation tie-line about 2 miles long that would tie the Iowa Hill development into the UARP system by looping the Camino/White Rock circuit through the development switchyard to an interconnection point on the Camino-White Rock transmission line. This same tie-line would also be used for the development when it is operated in the pumping mode. The tie-line would start at the proposed switchyard, to be located adjacent to the upper reservoir berm (northwest of the reservoir). From there, the tie-line would lie in a generally easterly direction just north of the reservoir toward the existing UARP transmission corridor, which passes by the development to the south and southeast. The connection point along the transmission corridor is just southwest of the Cable Road crossing.

2.4.2 Proposed Operations

Slab Creek reservoir, the lower reservoir of the Iowa Hill development, is currently operated as a re-regulating afterbay/forebay. The reservoir serves as an afterbay to the Camino powerhouse and a forebay for the White Rock powerhouse. The reservoir currently receives water from Camino powerhouse and inflow from the SFAR. Because of this re-regulating mode of operation, water levels in the reservoir may fluctuate daily with changing volumes of inflow and powerhouse flow. Typical weekly fluctuation is no more than 30 feet, ranging between the operation pool levels of 1,820 feet and 1,850 feet.

In the pumping mode for a 400-MW powerhouse, the estimated discharge capacity of the tunnels (i.e., the rate of withdrawal from Slab Creek reservoir) would range between 3,600 and 4,200 cfs and in the generating mode the discharge capacity of the tunnel (i.e., the rate of release to Slab Creek reservoir) would range between 4,800 and 5,200 cfs. The “rated” condition is based on the need to be capable of delivering 400 MW in the generating mode under adverse conditions (i.e., when the upper reservoir is nearly empty and the lower reservoir is near its normal maximum elevation of 1,850 feet).

Early evaluations of the Iowa Hill development indicated small changes to the current levels of fluctuation of Slab Creek reservoir. For example, if the Slab Creek reservoir is at elevation 1,830 feet, a release of 5,200 cfs would increase the reservoir elevation by about 2 feet per hour. Thus, with minimal change in the pattern of reservoir elevation, there should be no increased incidence of spill at the dam, no effect on the ability to release minimum flows into the Slab Creek dam bypassed reach, and no change in the volume of water released through the White Rock powerhouse.

2.4.3 Proposed Environmental Measures under the Settlement Agreement

SMUD proposes a comprehensive set of measures covering the full range of resources in the Upper American River Basin. Table 2-3 summarizes those proposed measures under the Settlement Agreement.[18]

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[18]The precise wording of the measure summaries in this table differs from the specific language of the Settlement Agreement. Individual measures (Proposed Articles in the Settlement Agreement) include programmatic elements for scheduling and developing plans, monitoring, evaluation, and reporting that are not listed in this table. Characterizations of these measures are primarily the result of our attempt to provide a concise summary of the measures for this draft EIS and are not intended to modify any of the terms of the Settlement Agreement.

Table 2-3. Proposed environmental measures for the UARP under the Settlement Agreement. (Source: SMUD and PG&E, 2007)

Article	Measure	Elements
Measures Specific to the Upper American River Project		
1-1	**Minimum Streamflows**	Maintain minimum streamflows in Rubicon River below Rubicon dam, Little Rubicon River below the Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, SFAR below Slab Creek dam, and SFAR within 3 days of determining base water year types and operations consistent with California Department of Water Resources (DWR) Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. Specific minimum flow schedules for each river reach, the specific factors to be applied to each river reach, and the compliance points for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*.[19]
1-2	**Pulse Flows**	Provide annual pulse flow events beginning as early as reasonably practicable within 3 months after license issuance, but not prior to the implementation of the new minimum streamflows, in Rubicon River below Rubicon River dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam. Specified pulse flows do not need to be implemented in water years where natural spill provides flows of equivalent magnitude and duration during spring snowmelt runoff or a natural storm event that occurs in the months of January through May in each of the specified watersheds. **Rubicon River Below Rubicon Dam** Provide a pulse flow of 600 cfs for 3 days that coincides with winter storm events or spring snowmelt runoff in the Rubicon River watershed during below normal (BN), above normal (AN), and Wet water years if a natural spill of 3,600 acre-feet or more within 3 consecutive days does not occur. Implement the specified pulse flow using the existing flashboards at the Rubicon tunnel headworks and either meet annually or develop a tunnel gate operation plan for future pulse flows.

[19] Definitions of critical dry (CD), dry, below normal (BN), above normal (AN), and wet water year types are also provided in section 3.3.3.2, *Aquatic Resources*.

Article	Measure	Elements
		Gerle Creek Below Loon Lake Dam
		Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type as follows:

	BN	AN	Wet
Day 1	125	200	600
Day 2	125	200	600
Day 3	180	250	740*
Day 4	125	200	600
Day 5	125	200	600

*or maximum capacity of outlet works, whichever is less.

Complete a sensitive site investigation that includes additional permanent cross-sections that characterize the upper and middle Rosgen[20] Level 3 analysis reaches and mapping of unstable banks and downed logs that are obstructing streamflow, and test pulse flows at levels up to 740 cfs or the maximum capacity of the outlet works, to determine the appropriate pulse flows to meet desired channel conditions.

[20] This is a classification system developed by Dave Rosgen and described in *Applied River Morphology* (Rosgen, 1996).

Article	Measure	Elements
		SFSC Below Ice House Dam Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type, below.

	BN	AN	Wet
Day 1	450	550	600
Day 2	450	550	600
Day 3	550	650	780*
Day 4	450	550	600
Day 5	450	550	600

*or maximum capacity of outlet works, whichever is less.

Article	Measure	Elements
		Pulse flows may be timed to coincide with winter storm events between December 15 and April 10. Base pulse flows implemented during this period on the prior water year type, and regardless of water year type revisions after the event.
1-3	**Ramping Rates**	Use a ramping rate of 1 foot per hour for pulse flow releases in Gerle Creek below Loon Lake dam and SFSC below Ice House dam; minimum streamflow releases in Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam; and recreational streamflow releases in SFSC below Ice House dam and SFAR below Slab Creek dam.
1-4	**Coordinated Operations**	Develop and implement a plan to coordinate operations with the licensee of the Chili Bar Project to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects. Consult and coordinate with the licensee of the Chili Bar Project in the implementation of Proposed Articles 2-1 (minimum streamflows), 2-2 (ramping rates), 2-4 (monitoring program), 2-5 (adaptive management program), 2-6 (sediment management plan), 2-14 (public information services), and 2-15 (recreational streamflows).
1-5	**Monitoring Program**	**General Monitoring Program Requirements** Monitoring plans for items (11) recreation survey, (14) heritage resources, (15) review of recreational developments, and (16) reservoir level evaluation are described in Proposed Articles 1-16, *Recreation Survey*, 1-29, *Heritage Resource Discover*, 1-18, *Review of Recreation Developments*, and 1-26, *Fish Stocking*).

Article	Measure	Elements
	1. Fish Population	Develop a plan to (a) monitor rainbow trout fish populations by electrofishing and/or snorkeling during late summer/fall in 10 river reaches; (b) monitor hardhead by snorkel surveys in SFAR below Slab Creek dam reach, only, from immediately downstream of Mosquito Road Bridge to, and including site SCD-F2; and (c) monitor brown trout in the Gerle Creek below Loon Lake dam reach.
	2. Aquatic Benthic Macroinvertebrate Monitoring	Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at: Rubicon river below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFFR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam.
	3. Amphibian and Reptile Monitoring	Develop a plan to (a) monitor the foothill yellow-legged frog in Silver Creek below Junction dam, Silver Creek below Camino dam, SFAR below Slab Creek dam, and Rock Creek (tributary upstream of White Rock powerhouse), and (b) monitor the mountain yellow-legged frog in Rubicon reservoir, Rockland lake, and Buck Island reservoir.
	4. Foothill Yellow-legged Frog Flow Fluctuation Monitoring	Develop a plan to conduct visual surveys for the foothill yellow-legged frog in Silver Creek below Camino dam in June through September when streamflows are 100 cfs or less and flows fluctuate more than 40 cfs or more over 1 week's time.
	5. Riparian Vegetation Monitoring	Develop a plan to conduct aerial photo flights and Greenline method at the 15 intensive field study sites, and collect data to document species composition, percent cover, and length and width of riparian community.
	6. Algal Species Identification and Monitoring	Develop a plan to collect, identify, and archive samples of the species of algae in Silver Creek below Junction dam and additional baseline samples in SFRR below Robbs Peak dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam, and add additional sites or reaches if it is determined that the algal species have negative effects on the aquatic ecosystem.
	7. Geomorphology, Sensitive Site Investigation and Mitigation	Complete a detailed field investigation of Gerle Creek fluvial, geomorphic properties below Loon Lake dam at LL-DG1 and LL-G2 in years 1 and 2 and develop a Gerle Creek Geomorphology Mitigation Plan that includes channel stabilization recommendations.

Article	Measure	Elements
	8. Geomorphology, Continuing Evaluation	Develop a geomorphology continuing evaluation of representative channel areas monitoring plan providing for establishing permanent transects and monitoring channel cross-sections, longitudinal profiles, substrate composition, and other geomorphic properties (Rosgen Level 3) in representative areas, including in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam.
	9. Water Temperature	Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 17 locations immediately above and below Project dams and at the confluence with tributaries and monitor stream temperatures from March 15 to September 30 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies.[21]
	10. Water Quality	Develop a water quality monitoring plan addressing the water quality monitoring elements listed below, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program.

[21]The Agencies include CDFG, the Forest Service, FWS, and the Water Board.

Article	Measure	Elements
		Water Chemistry Monitoring—Conduct a water chemistry sampling program using U.S. Environmental Protection Agency (EPA) standard methods for parameters designed to demonstrate seasonal conditions at all reservoir and stream locations described in the UARP relicensing *Water Quality Study Plan* (Plenary approval, January 8, 2003). Sample in situ physical parameters (pH, water temperature, dissolved oxygen [DO], specific conductance, and turbidity) at representative locations on diverted stream reaches downstream of all Project reservoirs and at 1-meter intervals in Loon Lake, Gerle reservoir, Ice House reservoir, Union Valley reservoir, Junction reservoir, Camino reservoir, and Slab Creek reservoir. Collect general chemistry samples of minerals, nutrients, metals (total and dissolved fractions), measured hardness, and petroleum products from all Project reservoirs and in stream locations, dam release points from reservoirs, and representative sites along all diverted stream reaches greater than 1 mile in length. Collect samples of minerals, nutrients, and metals at the surface and near the bottom at multiple, representative locations within each reservoir. Collect secchi disc measurements of water clarity from Loon Lake, Ice House reservoir, Union Valley reservoir, and Slab Creek reservoir seasonally in summer and fall once every 5 years after license issuance. The locations and frequency of monitoring are provided in table 3-28.
		Bacterial Monitoring—Conduct bacterial monitoring consistent with Central Valley Regional Water Quality Control Board's (Central Valley Water Board) water quality control plan (Basin Plan) objectives for protection of the REC-1 beneficial uses annually, at a minimum of 15 shoreline recreational locations within the Project boundary that have swimming and other water contact recreational activities in the area and sources for potential introduction of pathogens to the water column in the immediate vicinity for the first 5 years after license issuance (Central Valley Water Board, 2004).
		Metals Bioaccumulation Monitoring—Collect resident fish tissue samples from Loon Lake, Gerle, Ice House, Union Valley, Camino, and Slab Creek reservoirs to analyze for rates of bioaccumulation and tissue residue levels of mercury, copper, lead, and silver using target fish species, numbers of individuals, sampling strategy, and analytical methods that are consistent with current *Surface Water Ambient Monitoring.*
	12. Robbs Peak Powerhouse Entrainment	Develop a monitoring plan to determine when and at what flows flow fish migration is occurring, and if fish are being entrained.

Article	Measure	Elements
	13. Terrestrial Wildlife Monitoring	Develop a bear management monitoring plan and a bald eagle monitoring plan.
1-6	**Adaptive Management Program**	**General Adaptive Management Program Requirements—** Implement an *Ecological Resources Adaptive Management Program* as early as reasonably practicable within 3 months after license issuance generally consisting of implementing a monitoring program (Proposed Article 1-5, *Monitoring Program*), and specific adaptive management measures. Conduct monitoring to determine if the applicable ecological resource objectives are achievable and being met. Implement adaptive management if the monitoring program and other scientific information indicate that it is likely the applicable ecological resource objectives identified in the Rationale Report (CDFG, 2007) will not be met without adaptive management changes. Adaptive measures include (1) cancellation of pulse and recreational streamflows in SFSC if water temperatures at SFSC rise above 12 degrees Celsius (ºC) mean daily temperature for a 7-day running average, (2) cancellation of recreational streamflows in SFAR due to water temperatures, (3) control of untimely spill events below Slab Creek and Camino dams, (4) cancellation of October recreational streamflows below Slab Creek dam if amphibian monitoring show unacceptable impacts; (5) measures to address fish entrainment in the SFRR if monitoring indicates fish are being entrained during fish migration, (6) placement of sediment downstream or dredging based on geomorphology monitoring, (7) management of algae growth in Silver Creek below Junction dam if the new streamflow regime does not reduce algae growth, (8) performance of additional studies if results of monitoring metals bioaccumulation suggest that metals are adversely affecting aquatic species; (9) adjustment of water temperature indicator for the foothill yellow-legged frog, (10) additional measures to reduce bear/human interactions if monitoring indicates that such interactions have not declined, and (11) investigation of other measures if annual review of coordinated operations shows they are not effective.
1-7	**Gerle Creek Channel Stabilization**	Develop and implement a stabilization plan for the Gerle Creek channel below Loon Lake dam.
1-8	**Gerle Creek Fish Passage**	Maintain the reservoir level at Gerle Creek that provides fish passage into Gerle Creek from August through October 31.
1-9	**Large Woody Debris**	Ensure that mobile, instream large woody debris greater than 20 centimeters wide and 12 meters long continues to move downstream beyond Robbs, Junction, Camino, and Slab Creek dams.

Article	Measure	Elements
1-10	**Streamflow and Reservoir Elevation Gaging**	Develop and file a Streamflow and Reservoir Elevation Gaging Plan that meets U.S. Geological Survey (USGS) standards and includes a minimum of 10 streamflow gage locations, 9 reservoir elevation compliance gaging locations, and provides for simple staff gages at the Slab Creek and Ice House recreational boating put-ins and the installation of telemetry equipment if such equipment is economically and technologically feasible, and can be installed in a manner consistent with the laws, regulations, and policies applicable to the Congressionally designated Desolation Wilderness.
1-11	**Canal and Penstock Emergency and Maintenance Release Points**	Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality impacts when the release points are used.
1-12	**Wildlife and Plant Protection Measures**	(1) **Project Canals and Wildlife**—Maintain and operate in working condition all devices and measures for wildlife protection along Project canals; provide an annual report of deer or other wildlife found in Project canals; and, should wildlife mortality exceed three individuals, develop and implement a wildlife exclusion plan. (2) **Future Need for Biological Evaluation/Assessment**—Before commencing any new construction or maintenance (including but not limited to proposed recreational developments) on National Forest System lands that may affect state or federally listed sensitive plant or wildlife species or its habitat, ensure that a biological evaluation (including necessary surveys) is prepared for Forest Service approval, and for any activity that might affect a species proposed or listed under the Endangered Species Act (ESA), or its critical habitat, ensure that a biological evaluation is prepared for the relevant federal agency (U.S. Fish and Wildlife Service [FWS] or National Marine Fisheries Service [NMFS]). (3) **Sensitive Plants**—Immediately notify agencies if occurrences of sensitive plants or wildlife species are detected prior to or during ongoing construction, operation, or maintenance of the Project. If Forest Service, California Department of Fish and Game (CDFG), or FWS determines that the Project-related activities are adversely affecting the sensitive species, then develop and implement appropriate protection measures.

Article	Measure	Elements
		(4) **TES and Special Status Species Review**—Annually review the current list of special status plant and wildlife species (federal ESA or Eldorado National Forest Watch List) and if species are added, determine if the species or unsurveyed habitat for the species might occur on National Forest Systems lands and if so, develop and implement a study plan to assess the effects of the Project on the species.
		(5) **Pine Hill Rare Plant Preserve**—Consult with BLM, FWS, and CDFG prior to undertaking maintenance under transmission lines within the Pine Hill Rare Plant Preserve.
		(6) **Avian Protection**—Develop and implement an avian protection plan that addresses retrofitting transmission lines as described in the Bird-Powerline Associations Technical Report to meet the Avian Power Line Interaction Committee (APLIC) design and siting standards
1-13	**Vegetation and Invasive Weed Management**	**Invasive Weed Management**—Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations.
		Vegetation Management—Develop and implement a vegetation management plan that addresses hazard tree removal and trimming; transmission line clearing; habitat improvement; revegetation of disturbed sites; soil protection and erosion control; revegetation with culturally important plant populations; and use of clean, weed free, and preferably locally collected seed.
1-14	**Annual Review of Ecological Conditions**	Annually schedule and facilitate a meeting with the Agencies to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year.
1-15	**Recreation Implementation Plan**	Develop and implement a recreation implementation plan including a construction schedule for the recreational facilities specified in Proposed Article 1-19, *Specific Recreation Measures*, and other issues including but not limited to signing and sign placement, dissemination of public information, and a schedule for the design of facilities to be reconstructed.

Article	Measure	Elements
1-16	**Recreation Survey**	Conduct a recreational survey and prepare a report on recreational resources every 6 years from the date of license issuance, including, but not limited to, changes in use and use patterns, levels of use, user preferences, kinds and sizes of recreational vehicles, carrying capacity information sufficient to indicate change in capacity, and recreational user trends in the Project area.
1-17	**Forest Service Liaison**	Provide an individual for liaison with the Forest Service whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place within the Eldorado National Forest.
1-18	**Review of Recreation Developments and Facilities within the Project Boundary**	Schedule a meeting with the Forest Service every 6 years to review all Project recreational facilities described in Proposed Articles 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures*, and to agree upon the need and timing for maintenance, rehabilitation, construction, and reconstruction work. Keep or include Project recreational facilities within the Project boundary as shown in Attachment 1, and include the listed 34 recreational facilities constructed or reconstructed by SMUD in the future within the Project boundary.
1-19	**Specific Recreation Measures**	Complete the construction, reconstruction, and restoration to meet current Forest Service design standards and the requirements of the Americans with Disabilities Act (ADA) including all the pre-construction survey, design, permitting, analysis, and specifications for the initial recreational projects identified at the time of license issuance, including Buck Island development; High Country are trails; formal recreational facilities in Crystal Basin at Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs; recreational facilities in the Canyonlands at Junction, Brush Creek, and Slab Creek reservoirs; and developing and implementing a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities identified as lacking such facilities The specific sites and elements at each site are described in detail in table 3-65 in section 3.3.6, *Recreational Resources*.
1-20	**Heavy Maintenance**	Maintain, rehabilitate, and reconstruct, including paying the costs of design and administration, Project recreational facilities as determined through the Review of Recreation Developments.

Article	Measure	Elements
1-21	**Recreation, Operation, Maintenance, and Administration**	Beginning in the first full year after license issuance, pay the Forest Service $1,000,000 (year 2007 cost basis and escalated based on the GDP-IDP[22]) annually for the Forest Service to provide for operation, maintenance, and administration of those developed recreational sites adjacent to or in the vicinity of Project reservoirs and facilities listed in Proposed Article 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures* (either developed as part of the original/amended license or affected by operations).
1-22	**Carrying Capacity on Lands Affected by the Project**	Provide data to support the Forest Service determination of carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of "desired conditions," user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience.
1-23	**Reservoir Levels**	Beginning as early as reasonably practicable within 6 months after license issuance: (1) meet or exceed the end-of-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs; (2) maintain water surface at as high elevations as possible in Gerle Creek reservoir from May 1 to September 10 and in Slab Creek reservoir from July 1 through September 30, and limit daytime fluctuations to less than 6 feet (3) maintain seasonal reservoir levels at Junction and Brush Creek reservoirs within the range of levels measured between 1975 and 2000; (4) make every reasonable effort to maintain the water surface in Rubicon and Buck Island reservoir at as high as possible with minimum fluctuation between May 1 and September 10; (5) maintain an overwintering minimum pool elevation of 6,527 feet msl in Rubicon reservoir; (6) follow procedures and protocols for super dry (SD) water years, interim modification, conferences on abnormal water years, and reservoir level monitoring and adjustments; and (7) measure compliance at the reservoir elevation gages as published by the USGS. The specific elevations are detailed in section 3.3.2.1, *Water Quantity, Reservoir Levels*

[22]GDP-IDP is the U.S. Gross Domestic Product—Implicit Price Deflator.

Article	Measure	Elements
1-24	**Recreation Streamflows**	Based on the determination of water year type, provide recreational streamflows (1) in the SFAR below Slab Creek in BN, AN, and wet water years by spilling water between 850 and 1,500 cfs between 10:00 a.m. and 4:00 p.m. for 6 days in not less than 3 events from March 1 through May 31 and, if conditions permit, one of the events will be replaced with a 3-day event on the Memorial Day weekend in which case the total number of days would be increased to 7, until the Iowa Hill development is constructed or 15 years and longer if specific triggers are met, and prepare and implement a recreation management plan to address the whitewater recreational needs in reach from the Slab Creek dam to White Rock powerhouse; and (2) in Silver Creek below Ice House dam from 10:00 a.m. and 1:00 p.m. from 300 cfs to 500 cfs for 1 to 4 weekend days as determined by water year type, and if construction of the Iowa Hill development has not commenced within 5 years of license issuance, prepare and implement a whitewater recreation plan to determine triggers for establishing when the number of days of recreational streamflows could be increased. The specific recreation streamflow schedules are described in detail in section 3.3.6.2, *Recreational Resources, Whitewater Boating.*
1-25	**Public Information Services**	Provide (1) real-time streamflow information for 10 reaches via a toll-free telephone number and website and real-time reservoir level information for 10 reservoirs including two simple staff gages for use by the public on two stream reaches proposed for whitewater boating—SFAR downstream of Ice House reservoir dam and SFAR downstream of Slab Creek reservoir dam; (2) a Project recreation brochure/map that describes the recreational opportunities, facilities, rules, and responsibilities for the Project area; and (3) an interpretive, education, and public information plan within 2 years.
1-26	**Fish Stocking**	Provide up to a total of 50,000 pounds of fish per year but not less than 25,000 pounds of fish per year to be distributed among Loon Lake, Union Valley, and Ice House reservoirs as determined by CDFG.
1-27	**Visual Resource Protection**	Meet every 5 years with the Forest Service to review opportunities to improve how well Project facilities blend in with the surrounding landscape, during planning and prior to any new construction or maintenance of facilities that have the potential to affect visual resources of National Forest System lands (including but not limited to the recreation-related construction), prepare and implement a plan for the protection and rehabilitation of National Forest System visual resources affected by the Project, and perform 10 specific mitigation measures to existing facilities to improve visual quality within 2 to 8 years of license issuance.

Article	Measure	Elements
1-28	**Heritage Resources**	Develop and implement a Historic Properties Management Plan (HPMP) that would be incorporated into the programmatic agreement (PA) by reference.
1-29	**Heritage Resource Discovery**	Immediately cease work and notify the Forest Service and do not resume work until the Forest Service provides written approval if, prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on National Forest System lands and adjoining property, and perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service.
1-30	**Transportation System Management**	Develop and implement a transportation system management plan for roads on or affecting National Forest System lands addressing SMUD's primary responsibility for non-system roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads.
1-31	**Trails System Management**	Develop and implement a trails system management plan for the trails that are needed for Project operations and are located on or affect National Forest System lands, including a map developed based on GIS locations, showing the location of all trails associated with the Project; the seasons and amount of use of the trails by SMUD, the conditions of the trails indicating construction or maintenance needs, and a provision for identifying maintenance and reconstruction needs for trails required for Project operations every 5 years.
1-32	**Facility Management**	Develop and implement a facility management plan including (1) a map showing all Project facilities, including structures on or affecting National Forest System or BLM lands (and associated water and septic systems, and other utilities); above- and below-ground storage tanks; etc.; (2) the type and season of use of each structure; (3) the condition of each structure and planned maintenance or removal; and (4) provision for a plan every 5 years identifying the maintenance, reconstruction, and removal needs of Project facilities.
1-33	**Vegetation Management Plan**	Prior to any ground-disturbing activities, provide to Forest Service, a vegetative management plan that (1) identifies and prioritizes all inadequately vegetated areas to be revegetated or rehabilitated along with an implementation schedule, (2) lists the plants to be used along with planting locations, methods, and densities, giving an emphasis to native plant species, especially those of cultural importance and to using seed from certified weed-free sources and local sources.

Article	Measure	Elements
1-34	**Fire Management and Response Plan**	Develop and implement a fire prevention and response plan that is developed in consultation with appropriate state and local fire agencies and that sets forth in detail SMUD's responsibility for the prevention, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations.
1-35	**Reservation of Authority under Section 18**	SMUD recognizes the NMFS and U.S. Department of the Interior (Interior) right to reserve authority to prescribe the construction, operation, and maintenance of fishways at the Project, including measures to determine, ensure, or improve the effectiveness of such fishways.
1-36	**BLM Reservation of Authority under Section 4(e)**	Under the separate off-license Recreation Payment Agreement filed as appendix 6 to the Settlement Agreement for information purposes only, make a one-time payment to BLM of $270,000 and annual payments of $270,000, as annually adjusted based on the GDP-IDP with 2007 as the base year, on or before October 1 of each year during the term of the license and all annual renewals thereof.
1-37	**Implementation Schedule**	Develop and implement an implementation plan that includes (1) a schedule for implementing the articles in any license issued for the Project; (2) a schedule for filing the plans and related documents in Proposed Articles 1-1 through 1-50; and (3) documentation of consultation with the Consultation Group.
Measures Specific to the Iowa Hill Development		
1-38	**Special Use Authorization**	Obtain a special-use authorization from the Forest Service for the occupancy and use of National Forest System lands.
1-40	**Aquatic Resources (hardhead)**	To protect hardhead in the Slab Creek reservoir (1) monitor hardhead during all four seasons of the year to establish the locations of all life stages in Slab Creek reservoir (including edgewater locations) and in the water fluctuation zone upstream on SFAR above and below the Iowa Hill development for 2 years prior to and 2 years after commencement of operations; (2) monitor edgewater temperatures of Slab Creek reservoir between May and September to demonstrate that temperatures in shallow water areas of the Slab Creek reservoir are not affecting hardhead distribution by pump discharge; (3) maintain at least 12°C during the months of June (after the descending limb of the hydrograph), July, and August in the SFAR Slab Creek dam reach below Mosquito Bridge; (4) ensure that flow fluctuations in the SFAR below Slab Creek dam do not occur as a result of the Iowa Hill development; and (5) monitor hardhead to determine whether entrainment is occurring as a result of the Iowa Hill development.

Article	Measure	Elements
1-41	**Terrestrial Resources**	Prior to initiating construction of the development, purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license to mitigate the loss of wildlife habitat associated with the Iowa Hill development. The Forest Service and CDFG would determine the in-kind value of lands proposed for this purpose.
1-42	**Water Quality and Water Pollution**	No later than 90 days before initiating ground-disturbing activities for construction of the Iowa Hill development, file with the Commission a storm water pollution prevention plan to describe the measures SMUD would implement to protect water quality and manage hazardous substances during construction of the Iowa Hill development, and obtain all necessary permits.
1-43	**Groundwater**	Develop and implement a plan for managing groundwater inflows during construction and for groundwater monitoring and management once construction is completed including provisions for (1) a completed survey of the Project area that would be affected by the proposed tunnel; (2) monitoring springs and creeks for 5 years after the tunneling operation is completed; (3) a method for quantifying groundwater encountered during tunneling boring operations; (4) a method for verifying is not occurring or has been minimized after tunnel construction; (5) identification of corrective measures if tunnel boring operations encounter more groundwater than predicted; and (6) mitigation of any and all identified impacts.
1-44	**Visual Resources**	Develop a design for the Iowa Hill development that meets the visual quality objectives (VQOs) of the Eldorado National Forest Land and Resource Management Plan.
1-45	**Heritage Resource Protection**	Comply with section 106 requirements of the National Historic Preservation Act (NHPA) and its implementing regulations, found at 36 Code of Federal Regulations (CFR) 800, prior to the licensee undertaking activities on National Forest System lands.
1-46	**Road Use**	File a road use permit for all National Forest System roads that would be used for construction activities for the Iowa Hill development.
1-47	**Spoils Disposal**	Obtain permitting approvals, as necessary, for discharge of spoils to land and avoid depositing spoils on National Forest System lands without prior review and approval by the Forest Service.

Article	Measure	Elements
1-48	**Construction Noise**	Prior to undertaking construction activities affecting National Forest System lands, develop and implement a plan to address construction noise, including measures to address (1) vehicle idling, (2) advance notification of any material transport and construction activities with 0.5 mile of the tract; (3) notices for residents indicating the nature, timing, and duration of all materials transport and construction occurring with 0.5 mile for their residences; (4) a noise hot line telephone system for reporting construction noise disturbances; (5) monitoring to address compliance with items (1) through (4), and (6) actions to mitigate violations of the above measures.
1-49	**Recreation Access Plan for Slab Creek Reservoir**	Develop and implement a recreation access plan that addresses recreational access to the reservoir (1) during the time of construction of Iowa Hill reservoir and the tunnel connecting to Slab Creek reservoir, and (2) when Iowa Hill reservoir and associated powerhouse are operational.
1-50	**Future Revisions to the Iowa Hill Development**	The Agencies and BLM reserve the right to seek modification of Proposed Articles 1-38 through 1-49 (related to the Iowa Hill development) if SMUD seeks a revision or amendment to the description and/or proposed operation of the Iowa Hill development as approved in any license for the Project and such revision would affect resources under their jurisdiction.

In addition to the proposed measures in the Settlement Agreement, SMUD would file a final transportation management plan for the Iowa Hill development.

2.4.4 Project Boundary

As part of the Proposed Action, SMUD proposes to exclude from the Project description and Commission Project boundary certain transmission line sections included in the current license and Commission Project boundary. The excluded sections are (1) a 9.3-mile-long section of 230-kV line from Folsom Junction to Orangevale Substation; (2) a 17.8-mile-long section of 230-kV line from Folsom Junction to Hedge Substation; and (3) a 1.9-mile-long section of 230-kV line from Folsom Junction to Lake Substation.

SMUD states that these three line sections (lines) would still exist even if the UARP were retired, since they are needed for system reliability. If the Project were retired, the lines would require minor reconfiguration to provide power flow between the three substations as part of SMUD's interconnected system. Therefore, we recommend that these three line sections be excluded in any license issued for the UARP.

The Settlement Agreement includes a provision to include all of the 34 recreational facilities that would be upgraded or otherwise improved within the Project boundary, if they are not already included.

2.4.5 Alternative Sites Analysis

Before selecting the Iowa Hill site for development of a pumped-storage facility, SMUD conducted an alternative sites analysis that included 158 different sites and configurations in 12 California watersheds, including 59 locations within the vicinity of the UARP. SMUD applied four screening factors to every site: (1) minimum capacity requirements for 12 hours of storage and 400 MW of capacity with SMUD being able to control water in both the upper and lower reservoir; (2) a location that was within 10 miles of SMUD's 230-kV transmission lines; (3) no new dam or impoundment on any unimpaired stream or reach; and (4) a tunnel-to-height ratio that favors a shorter tunnel.

The analysis yielded four potential sites near the Ice House development (Granite and Peavine configurations), Union Valley development (Big Hill), and Iowa Hill. The Granite and Peavine configurations would require off-stream impoundments upstream of Ice House reservoir, would not be able to provide year-round capacity, and would affect recreational use of the popular Ice House reservoir. The configuration that would place an upper reservoir on Big Hill would require the relocation of a Forest Service heliport, would not be able to provide year-round capacity, and would disturb recreation and bald eagle nesting. We assume that any site considered at Deer Knob, on the opposite side of the Union Valley reservoir, also would not meet the year-round capacity criterion. The Iowa Hill site was selected because it would require the least amount of underground construction, it would have the shortest transmission line tie-in, it would have the lowest tunnel length to height ratio, it would create least disturbance to recreational use, and because Slab Creek is not drawn down in the winter months, the site can provide year-round capacity.

After reviewing the criteria and alternative sites considered by SMUD in its analysis, we find the analysis to be reasonable from both business and operations perspectives. To economically and efficiently provide SMUD with the flexibility necessary to meet peak demand periods, the pumped-storage facility needs to be near its reservoir and distribution system. The Iowa Hill location meets those criteria.

2.5 PG&E'S PROPOSAL

2.5.1 Proposed Project Facilities

PG&E does not plan any changes to the Chili Bar Project facilities. The Project would continue to be operated as it has been in the past with modifications only as needed to complete maintenance activities.

2.5.2 Proposed Operations

PG&E does not plan any changes to the operation of the Chili Bar Project. The Project would continue to be operated as it has been in the past, with modifications only as needed to implement any resource management measures that are adopted as conditions of the new license.

2.5.3 Proposed Environmental Measures

PG&E proposes a comprehensive set of measures covering the full range of resources in the SFAR Basin. Table 2-4 summarizes those proposed measures under the Settlement Agreement.[23]

Table 2-4. Proposed environmental measures for the Chili Bar Project under the Settlement Agreement. (Source: SMUD and PG&E, 2007)

Article	Measure	Elements
2-1	**Minimum Streamflows**	Maintain minimum streamflows in the SFAR below Chili Bar dam provided inflow to the Project is sufficient within 3 days of determining base water year types and operations consistent with the DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. The minimum streamflow schedule, the specific factors to be applied, and the compliance point for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*.
2-2	**Ramping Rates**	Implement upramping rates for licensee-controlled streamflow releases of 500 cfs per hour for flows between 150 and 1,000 cfs and 1 foot per hour for flows between 1,000 cfs and 1,950 cfs. Implement downramping rates of 1 foot per hour for flows between 1,950 and 1,000 cfs, 500 cfs per hour for flows between 1,000 cfs and 600 cfs and 250 cfs for flows between 600 cfs and 150 cfs provided that inflow to the Project is sufficient.
2-3	**Coordination with UARP License**	Develop and implement a plan to coordinate operations with the licensee of the UARP to enable PG&E to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects.

[23]The precise wording of the measure summaries in this table differs from the specific language of the Settlement Agreement. Individual measures (Proposed Articles in the Settlement Agreement) include programmatic elements for scheduling and developing plans, monitoring, evaluation, and reporting that are not listed in this table. Characterizations of these measures are primarily the result of our attempt to provide a concise summary of the measures for this draft EIS and are not intended to modify any of the terms of the Settlement Agreement.

Article	Measure	Elements
2-4	**Monitoring Program**	**General Monitoring Program Requirements**
		Implement the monitoring program in coordination with SMUD after license issuance and through the term of the new license and any annual licenses, in coordination with the Agencies. Monitoring may be reduced or terminated at any time if the relevant ecological resource objective(s) have been met or no changes in resource response(s) are expected. Monitoring plans for heritage resources would be described in the HPMP.
		File with the Commission by June 30 of each year an annual monitoring report fully describing the monitoring efforts and results of the previous calendar year. The Agencies have at least 30 days to review and comment on the draft monitoring report prior to filing with the Commission.
	1. Fish Population	Develop a plan to (a) monitor rainbow and brown trout fish populations by electrofishing and/or snorkeling at SFAR below Chili Bar dam and note any hardhead detected.
	2. Aquatic Benthic Macroinvertebrate Monitoring	Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at SFAR below Chili Bar dam
	3. Amphibian and Reptile Monitoring	Develop a plan to monitor the foothill yellow-legged frog, western pond turtle, and California red-legged frog in the SFAR below Chili Bar dam (entire reach from CB-AI5 to Ponderosa Campground on right and left banks).
	4. Riparian Vegetation Monitoring	Develop a plan to conduct aerial photo flights and Greenline method at the 5 intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community.
	5. Water Temperature	Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 4 locations in the SFAR immediately below Chili Bar dam, upstream of Dutch Creek confluence, upstream of Camp Lotus, and upstream of Greenwood Creek and monitor stream temperatures from March 15 to October 15 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies.

Article	Measure	Elements
	6. Water Quality	Develop a water quality monitoring plan addressing the water quality monitoring elements listed below, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. **Water Chemistry Monitoring**—Conduct a water chemistry sampling program using EPA standard methods designed to demonstrate seasonal conditions at all reservoir and stream locations described in the Project No. 2101/2155 relicensing *Water Quality Study Plan* (Plenary approval, January 8, 2003). Conduct laboratory analyses using EPA standard methods adequately sensitive to detect constituent levels for determination of compliance with recognized state and federal criteria. Sample in situ physical parameters (pH, water temperature, DO, specific conductance, and turbidity) at representative locations in the SFAR downstream of the Chili Bar reservoir and as vertical profiles collected at 1-meter intervals from surface to bottom in the reservoir. Collect general chemistry samples of minerals, nutrients, metals (total and dissolved fractions), measured hardness, and petroleum products from Chili Bar reservoir and at a minimum of three representative sites along the SFAR between Chili Bar dam and the confluence of Greenwood Creek. Collect samples at the surface and near the bottom at multiple, representative locations in the reservoir. The details for the locations and frequency of monitoring are provided in table 3-28. **Bacterial Monitoring**—Conduct bacterial monitoring consistent with *Basin Plan* objectives for protection of the REC-1 beneficial uses annually, at a minimum of 8 shoreline recreational locations within the Project boundary that have swimming and other water contact recreational activities in the area and sources for potential introduction of pathogens to the water column in the immediate vicinity for the first 5 years after license issuance. Continue annual monitoring if data demonstrates bacterial concentrations present risks to human health at specific reservoir(s) or riverine sites, through the life of the license. **Metals Bioaccumulation Monitoring**—Collect resident fish tissue samples from Chili Bar reservoirs to analyze for rates of bioaccumulation and tissue residue levels of mercury, copper, lead, and silver using target fish species, numbers of individuals, sampling strategy, and analytical methods that are consistent with current *Surface Water Ambient Monitoring Program*.

Article	Measure	Elements
		Algae Monitoring—Monitor for didymosphenia genimata in conjunction with the annual water quality monitoring in the SFAR downstream of Chili Bar dam.
2-5	**Adaptive Management Program**	Implement in coordination with SMUD an adaptive management program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Proposed Article 2-5, *Adaptive Management Program*), and specific adaptive management measures. Conduct monitoring to determine if the applicable ecological resource objectives are achievable and being met. Implement adaptive management if the monitoring program and other scientific information indicate that it is likely the applicable ecological resource objectives identified in the Rationale Report (CDFG, 2007), will not be met without adaptive management changes. Annually review the coordinated operations and determine the need for placement of sediment downstream or dredging based on geomorphology monitoring (Proposed Article 2-6, *Sediment Management Plan*)
2-6	**Sediment Management Plan**	Develop a geomorphology monitoring plan in coordination with SMUD include be profile measurements at three cross-sectional transects, longitudinal profiles, substrate composition, and other geomorphic properties three sampling sites (CB-G1, CB-G2 and CB-G3) to be performed every 5 years.
2-7	**Large Woody Debris**	Ensure, provided conditions permit safe and reasonable access and working conditions, that mobile instream large woody debris in Chili Bar reservoir, including at a minimum, all sizes greater than 20 centimeters wide and 12 meters in length, continues downstream beyond Chili Bar dam using reasonable means that include short-term spill flows at the dam and shall be allowed to continue downstream beyond the dam.
2-8	**Streamflow and Reservoir Elevation Gaging**	Develop and implement a streamflow and reservoir elevation gaging plan that meets USGS standards and approved by the Water Board at a minimum addressing compliance gaging at SFAR below Chili Bar dam (existing USGS gage no. 11444500 or its successor) and in the Chili Bar reservoir
2-9	**Wildlife and Plant Protection Measures**	**TES and Special Status Species Review**—Annually review the current list of special status plant and wildlife species (federal ESA or BLM sensitive) and if species are added, determine if the species or un-surveyed habitat for the species might occur on BLM lands and if so, develop and implement a study plan to assess the effects of the Project on the species.

Article	Measure	Elements
2-10	**Invasive Week and Vegetation Management Plan**	**Invasive Weed Management**—Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations. **Vegetation Management**—Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed.
2-11	**Annual Review of Ecological Conditions**	Annually schedule and facilitate a meeting with the Agencies and BLM to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year.
2-12	**BLM Liaison**	Provide an individual for liaison with the BLM whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place on BLM lands with the Chili Bar Project boundary.
2-13	**BLM Recreation Improvements**	Construct (1) a gravel parking area for three to four vehicles off Rock Creek Road, (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir, (3) a kiosk sign along the trail near the beginning, explaining the rules of the area, and (4) one picnic table of coated wire mesh material will be provided in a leveled out area that is outside of the floodplain.
2-14	**Public Information Services**	Provide in coordination with the UARP licensee (1) real-time lake stage height and storage information for Chili Bar reservoir, installation of up to two simple staff gages for use by public, real-time streamflow and reservoir level information via a toll-free telephone number and web site, and collection of streamflow information consistent with the standard USGS gaging practices for the existing stream gage facilities downstream of Chili Bar reservoir dam ; and (2) in coordination with the UARP licensee pay BLM $15,000 annually for BLM to provide a Project recreation brochure/map that describes the recreational opportunities, facilities, rule, and responsibilities for the Project area; and an interpretive, education, and public information plan.

Article	Measure	Elements
2-15	**Recreational Streamflows**	Based on the determination of water year type, provide recreational streamflows (1) in the SFAR below Chili Bar dam provided that inflows to the Project are sufficient. The specific recreation streamflow schedule is described in detail in section 3.3.6.2, *Recreational Resources, Whitewater Boating.*
2-16	**Visual Resource Protection**	Meet every 5 years with BLM to review opportunities to improve how well Project facilities blend in with the surrounding landscape, during planning and prior to any new construction or maintenance of facilities that have the potential to affect visual resources on BLM lands (including but not limited to the recreation-related construction), the licensee prepare and implement an plan for the protection and rehabilitation of BLM visual resources affected by the Project.
2-17	**Heritage Resources**	Develop and implement an HPMP that would be incorporated into the PA by reference.
2-18	**Heritage Resource Discovery**	Immediately cease work and notify BLM and not resume work until BLM provides written approval if, prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on BLM lands and licensee adjoining property, and perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by BLM.
2-19	**Reservation of Authority under Section 18**	PG&E recognizes the NMFS and Interior right to reserve authority to prescribe the construction, operation, and maintenance of fishways at the Project, including measures to determine, ensure, or improve the effectiveness of such fishways.
2-20	**BLM Reservation of Authority under Section 4(e)**	Under the separate off-license Recreation Payment Agreement filed as appendix 6 to the Settlement Agreement for information purposes only, make a one-time payment to BLM of $30,000 and annual payments of $30,000, as annually adjusted based on the GDP-IDP with 2007 as the base year, on or before October 1 of each year during the term of the license and all annual renewals thereof.
2-21	**Implementation Schedule**	Develop and implement an implementation plan that includes (1) a schedule for implementing the articles in any license issued for the Project; (2) a schedule for filing the plans and related documents in Proposed Articles 2-1 through 2-21; and (3) documentation of consultation with the Consultation Group.

2.5.4 Project Boundary

PG&E proposes to revise the Project boundary. The existing Project boundary includes all the land PG&E owns ranging from about 50 to 250 feet from either side of the river and starting about 320 feet downstream of the Project dam to about 3.2 miles upstream of the Project dam. The proposed Project boundary would be at the normal maximum water surface elevation at 997.5 feet mean sea level. The proposed Project boundary would enclose all Project works including the Chili Bar dam and downstream tailrace, intake structure, powerhouse, switchyard, access roads, stream gage, and reservoir. In addition, the proposed Project boundary would include a 12-foot-wide corridor for a new proposed hiking trail (Sand Bar Trail) to provide public access to the reservoir shoreline. PG&E also proposes to revise the Project boundary to avoid conflicts with the UARP licensee's future Slab Creek reach boating take-out in the vicinity of White Rock powerhouse.

2.6 UPPER AMERICAN RIVER PROJECT-ONLY ALTERNATIVE

Under the UARP-only Alternative, all components of SMUD's Proposed Action would be in place except those dealing with the addition of the 400-MW Iowa Hill development. SMUD would operate the existing UARP facilities in a manner identical to SMUD's Proposed Action, except that the increased frequency of water level fluctuation at Slab Creek reservoir described under the Proposed Action would not occur. The weekly range of Slab Creek reservoir water level fluctuations under this alternative would be the same as the Proposed Action. The release schedule for the Project dams would be the same as SMUD's Proposed Action. Thus, the quantity of water stored in Project reservoirs (with seasonal and daily changes) and the volume of water passing through Project reaches would be the same as the Proposed Action. All environmental measures contained in the Proposed Action would occur except for those pertaining to the Iowa Hill development, and the potential impacts associated with construction and operation of the Iowa Hill development would not occur. If the Iowa Hill development were not constructed and the recreational triggers are met in year 15, SMUD proposes to make physical modifications to the White Rock tunnel to provide enhanced recreational boating flows downstream of Slab Creek reservoir.

2.7 MODIFICATIONS TO APPLICANTS' PROPOSALS

2.7.1 Water Quality Certification

SMUD and PG&E (applicants) applied for section 401 Water Quality Certification for their Projects on September 22 and 18, 2006, respectively, following the Commission's notice for final terms and conditions (UARP) and Ready for Environmental Analysis notice (Chili Bar) on July 28, 2006. In its letters filed with the Commission on March 30 and April 10, 2007, the Water Board requested that SMUD and PG&E, respectively, amend their applications for Water Quality Certification to bring the requests into consistency with the provisions of the Settlement Agreement. In response to the Water Board's request, PG&E simultaneously withdrew its application for Water Quality Certification and submitted a new application for Water Quality Certification in a letter dated May 1, 2007, that was acknowledged as received by the Water Board on May 22, 2007. SMUD withdrew its application for Water Quality Certification on September 6, 2007, and resubmitted its application on October 23, 2007. Therefore, state action on the Water Quality Certifications will be required before October 22, 2008, for the UARP and before May 1, 2008, for the Chili Bar Project. If the state does not act on the two applications by these dates, respectively, certification of the two Projects will be deemed waived.

2.7.2 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as the Secretaries of the U.S. Departments of Commerce (NMFS) and Interior (through FWS) may prescribe. NMFS, by letter filed on October 18, 2006, and Interior, by letters filed on October 17, 2006, and January 31, 2007, reserved this authority.

2.7.3 Section 4(e) Federal Land Management Conditions

Section 4(e) of the FPA states that the Commission may issue a license for a Project on a federal reservation only if it finds that the license will not interfere or be inconsistent with the purpose for which the reservation was created or acquired. Such a reservation includes, without limitation, Forest Service- and BLM-administered land. Section 4(e) of the FPA requires that a Commission license for a Project located on a reservation include the conditions that the Secretary of the department under whose supervision the reservation falls deems necessary for the adequate protection and utilization of such reservation.

The Forest Service filed preliminary 4(e) conditions on October 18, 2006, and revised preliminary conditions on January 30, 2007, for the UARP. Interior, on behalf of FWS and BLM, filed preliminary 4(e) conditions on October 17, 2006, and revised preliminary 4(e) conditions on January 31, 2007, for both the UARP and the Chili Bar Project. Both agencies state that their revised preliminary 4(e) conditions are intended to be consistent with the Settlement Agreement. Interior, on behalf of BLM, filed only standard general conditions and its filing did not include any Project-specific conditions for either Project.

In its revised preliminary conditions for the UARP, the Forest Service put into italics the portions of its conditions that the Forest Service determined to be outside its jurisdiction, but indicated that the Forest Service fully supports the italicized wording and recommends it be included in any licenses issued for the Projects. The italicized wording is found in the Project-specific conditions and pertains generally to all references to consultation with other agencies and specifically to: (1) locations that are not within or adjacent to the Eldorado National Forest, including monitoring the foothill yellow-legged frog in Rock Creek (condition no. 31, item 3), and maintenance under transmission lines in the Pine Hill Rare Plant Preserve (condition no. 38); or (2) issues that are under the purview of other agencies, including water temperature monitoring (condition no. 31, item 9), water quality (condition no. 31, item 10), adjustments to the Project boundary to include all Project recreational facilities (condition no. 44), fish stocking in Loon Lake, Union Valley, and Ice House reservoirs (condition no. 52), reservation of authority under section 18 of the FPA (condition no. 61), and BLM reservation of section 4(e) authority (condition no. 62).

Because the revised preliminary conditions filed by the Forest Service and Interior are consistent with the provisions of the Settlement Agreement, we discuss these terms and conditions in the context of our discussions of the Settlement Agreement measures throughout this EIS

2.7.4 Section 10(j) Recommendations

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the Project.

Section 10(j) also states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purpose and the requirements of the FPA or other applicable laws, the Commission and agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibility of the agency.

In response to the Commission's Ready for Environmental Analysis notice issued on July 28, 2006, Interior (on behalf of FWS), CDFG, and NMFS filed comment letters that included section 10(j) recommendations.[24] Interior and CDFG, parties to the Settlement Agreement, filed revised 10(j) recommendations on January 31, 2007, that are consistent with the Settlement Agreement. NMFS did not file revised 10(j) recommendations. We discuss the 10(j) recommendations in the context of our discussion of the Settlement Agreement measures throughout the EIS.

2.7.5 Proposed Action with Staff Modifications (Staff Alternative)

After evaluating the Proposed Actions, including the terms and conditions filed pursuant to section 4(e) of the FPA, and other recommendations from resource agencies and interested entities under section 10(a) and 10(j) of the FPA, we considered what, if any, additional measures may be necessary or appropriate for the continued operation of the UARP and Chili Bar Project.

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[24]NMFS letter filed October 18, 2006, Interior (FWS) letter dated October 17, 2006, and CDFG letters dated October 16, 2006.

UARP

In addition to the applicant's proposed Project-related environmental measures for UARP, the Staff Alternative includes provisions to:

- file a report with the Commission by July 31 of each year stating the dates when the pulse flows were provided or an explanation of why they were not provided;
- prepare a Gerle Creek fish passage plan for brown trout with measures to maintain the Gerle Creek reservoir at an elevation sufficient to provide fish passage into Gerle Creek from August 1 through October 31;
- expand the geographic scope of the invasive weed and vegetation management plans to cover all land within the Project boundary affected by Project activities;
- include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats;
- prepare a transportation system management plan for roads on or affecting National Forest System lands and non-National Forest System roads that are primarily used for Project purposes and within the Project boundary;
- prepare a plan for extending and formalizing trails primarily used for Project operations that are located on or affect National Forest System lands and are located or would be located within the Project boundary;
- prepare a wildlife lands mitigation plan for construction of the Iowa Hill development; and
- provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 if environmental and use triggers are met.

Chili Bar Project

In addition to the applicant's proposed Project-related environmental measures for the Chili Bar Project, the Staff Alternative includes provisions to:

- expand the geographic scope of the invasive weed and vegetation management plans to cover all land within the Project boundary affected by Project activities.
- include in the vegetation management plan an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats.
- develop and implement a recreation plan.

2.8 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

We propose eliminating the following alternatives from detailed study in the EIS.

2.8.1 Federal Government Takeover

We do not consider federal takeover to be a reasonable alternative. Federal takeover of the Projects would require Congressional approval. Although that fact alone would not preclude further consideration of this alternative, there is currently no evidence showing that a federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed an interest in operating the UARP or Chili Bar Project.

2.8.2 Nonpower License

A nonpower license is a temporary license the Commission would terminate whenever it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. At this time, no governmental agency has suggested a willingness or ability to takeover the Projects. No party has sought a nonpower license, and we have no basis for concluding that the UARP and Chili Bar Project should no longer be used to produce power. Thus, we do not consider a nonpower license a reasonable alternative.

2.8.3 Project Retirement

Retiring the Projects would require denying SMUD and PG&E's license applications and require the surrender and termination of the existing licenses with any necessary conditions. The Projects would no longer be authorized to generate power. Retiring the Projects would involve significant cost and would foreclose any opportunity to add environmental enhancements to the existing UARP or Chili Bar Project. For these reasons, we do not consider Project retirement to be a reasonable alternative.

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 3
Environmental Analysis
Pages 3-1 through 3-360

FEIS

3.0 ENVIRONMENTAL ANALYSIS

In this section, we first describe the general environmental setting in the Project vicinity and any environmental resources that could be cumulatively affected by relicensing the UARP and Chili Bar Project. Then, we address each affected environmental resource. For each resource, we first describe the affected environment—the existing condition and the baseline against which to measure the effects of the proposed Project and any alternative actions—and then the environmental effects of the proposed Project, including proposed articles included in appendix 1 and 2 of the Settlement Agreement for the UARP and Chili Bar Project, respectively. Unless otherwise stated, the sources of our information are the license applications for the Projects (SMUD, 2005; PG&E, 2005).

3.1 GENERAL DESCRIPTION OF THE RIVER BASINS

3.1.1 Rubicon River

The Rubicon River originates near Clyde Lake in the Desolation Wilderness. Upstream of UARP's Rubicon reservoir, the major tributary on the Rubicon River is Phipps Creek. From its headwaters, the Rubicon River flows generally north to Rubicon reservoir, then northwest to the mouth of the Little Rubicon River, and to Placer County Water Agency's 209,000 acre-foot Hell Hole reservoir. The Rubicon River flows westerly from the Hell Hole reservoir until it joins the Middle Fork American River, then to the North Fork American River near Auburn, California. This confluence forms the main stem of the American River. Besides the main stem of Rubicon River on which Rubicon dam is located, UARP facilities are located on three tributaries to the Rubicon River: Little Rubicon River (Buck Island dam), Gerle Creek (Loon Lake and Gerle Creek dams), and the SFRR (Robbs Peak dam).

The Little Rubicon River headwaters originate near Highland Lake in the Desolation Wilderness. Highland Creek is the major tributary to the Little Rubicon and generally flows north to Rockbound Lake and then to Buck Island reservoir. Upstream of Buck Island reservoir lay the natural Rockbound and Highland lakes. From Buck Island reservoir, the Little Rubicon flows generally northwesterly to its mouth at the Rubicon River.

3.1.2 Silver Creek

The Silver Creek headwaters originate in the Desolation Wilderness at the confluence of Tells, Big Silver, and Jones Fork Silver creeks at Union Valley reservoir. From the reservoir, Silver Creek flows generally southwesterly to its terminus at the SFAR. Major tributaries of the Silver Creek downstream of Union Valley reservoir include SFSC, Little Silver, Onion, Jaybird Canyon, and Round Tent Canyon creeks. Three UARP facilities occur along the main stem of Silver Creek: Union Valley, Junction, and Camino dams. One UARP facility, Ice House dam, is located on the SFSC, a tributary to Silver Creek. The SFSC headwaters also originate in the Desolation Wilderness and flow generally westerly and northerly to Silver Creek Junction reservoir. Major tributaries of the SFSC include Lyons and Peavine creeks and Big Hill Canyon. No reservoirs occur on the SFSC upstream of Ice House dam.

3.1.3 South Fork of the American River

SFAR headwaters originate in the Crystal Range and flow generally westerly to its terminus at the American River at Folsom Lake. Major tributaries of the SFAR above Slab Creek dam include Pyramid, Strawberry, Alder, Silver, Brush, and Slab creeks and the Silver Fork American River. Downstream of Slab Creek dam, Rock and Iowa Canyon creeks are the primary tributaries. UARP facilities are located on the Brush Creek and in the Silver Creek watershed. The headwaters of Brush Creek originate near Little Sugar Pine Mountain and then flow generally southwesterly to the SFAR at Slab Creek reservoir. No reservoirs occur on Brush Creek upstream of Brush Creek reservoir.

3.2 CUMULATIVELY AFFECTED RESOURCES

According to the Council on Environment Quality's regulations for implementing NEPA (§1508.7), a cumulative effect is the effect on the environment that results from the incremental effect of the actions when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, to include hydropower and other land and water development activities. Resources that could be affected cumulatively by continued operation of the UARP and Chili Bar Project, and construction of the Iowa Hill development, in combination with other activities in the SFAR Basin, include sediment supply; water quality; water temperature; aquatic resources including fisheries, benthic macroinvertebrates, and amphibian populations; botanical resources; and recreation.

3.2.1 Geographic Scope

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the Projects' effects on resources. The geographic scope is defined by the physical limits or boundaries of (1) the UARP's and Chili Bar Project's effects on the resources, and (2) the contributing effect from other hydropower and non-hydropower activities. In this case, the overall scope of analysis for the potentially cumulatively affected resources encompasses the SFRR from the upstream influence of the Rubicon reservoir downstream to the confluence with the SFAR and then downstream to Folsom Lake. Additionally, the geographic scope of the recreation analysis for the UARP encompasses the Eldorado National Forest.

UARP operations, in conjunction with Chili Bar Project operations, interact in a cumulative sense. The operation of the UARP 7.5 miles upstream controls the waters that flow into the Chili Bar Project. Therefore, the waters in the 19.1-mile reach downstream of the Chili Bar dam are controlled mainly by the UARP but also by Chili Bar Project operations

3.2.2 Temporal Scope

The temporal scope of the cumulative effects analysis in the EIS includes past, present, and reasonably foreseeable future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion is, by necessity, limited to available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

Geological resources in the vicinity of the Projects that could be affected by the Proposed Actions include the reservoir shorelines, channel attributes of the 12 river reaches (totaling 81 river miles, excluding reservoirs), the extent and quality of large woody debris within those channels, and selected upland watershed areas, mostly related to recreation and roads.

Geology

The rocks of the UARP area are part of the Sierra Nevada metamorphic belt, a 200-mile-long, northwest-trending belt that makes up the western foothills of the Sierra Nevada Mountains. The geology within and surrounding the UARP can be divided into two general categories in relation to the location of Union Valley reservoir, which is about mid-elevation within the Project area. Reservoirs upstream of Union Valley reservoir are underlain primarily by the Sierra Nevada batholith,[25] which is of Mesozoic age – about 80 to 130 million years old. Downstream of Union Valley reservoir, reservoirs are chiefly underlain by older sedimentary rocks deposited 350 to 400 million years ago. The dominant rocks in this category are quartzite, schists, crystalline limestone, and dolomite. These rocks underlie most of the lower watershed area and are capped by volcanic rocks formed about 2 to 24 million years ago. Except for the main

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[25] A batholith is an exposed area of mostly continuous plutonic (granite) rock that covers an area larger than 100 square kilometers. The Sierra Nevada batholith is a continuous granitic formation that forms much of the Sierra Nevada in California.

stem SFAR, which cuts a gorge across the rock formations, all high-order streams in the Project area have developed deep canyons only in the sedimentary rock reaches.

The geology in the area of the proposed Iowa Hill development includes the northwest flank of Iowa Hill (situated above the east shore of Slab Creek reservoir) and the surrounding area. The Iowa Hill area is underlain by bedrock shown on state geologic maps as consisting of undifferentiated Paleozoic rocks. More specifically, the proposed site of the Iowa Hill development is located within the eastern metamorphic terrane of the Sierra Nevada Mountains. This terrane, known as the Shoo Fly Complex, is bound on the east by rock of the Sierra Nevada batholith, and on the west by the Melones fault (northern branch) and the Calaveras-Shoo Fly thrust fault. Rocks in this terrane originally consisted of sand and clay probably deposited on the slopes of the continental margin during early Paleozoic time.

Regional Faulting and Seismicity

The proposed Iowa Hill development lies in central California, an area that has historically experienced relatively low seismic activity. Most seismic activity in the region is concentrated in the region from the northwest to the east and southeast of Lake Tahoe, as well as the area immediately south of Lake Oroville. According to the California Geological Survey, no active or potentially active faults pass through or near the site of the proposed Iowa Hill development.

Five faults or fault systems within a 62-mile radius of the proposed Iowa Hill site are active. The North Tahoe fault and the Genoa fault are located 38 miles northeast and 47 miles east of the proposed site, respectively. Neither of these has produced an earthquake of magnitude 5.0 or greater in known history, but the Genoa fault is believed to be capable of producing an earthquake with a moment magnitude[26] of 6.9. The remaining three faults or fault systems are described in the following section.

The Truckee fault is about 10 miles long and is located about 50 miles northeast of the Iowa Hill site. A 1966 earthquake associated with the fault registered a magnitude of 6.0. Most of the Foothills fault system, approximately 7 miles southwest of the Iowa Hill site, is inactive; however, there are potentially active portions of this fault system across the Bear Mountain and Melones fault segments that are capable of producing an

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[26]The moment magnitude scale is a successor to the Richter scale and is used by seismologists to compare the energy released by earthquakes. The constants used in the equation to determine moment magnitude are chosen so that estimates of moment magnitude roughly agree with estimates using other scales such as the Richter magnitude scale. One advantage of the moment magnitude scale is that, unlike other magnitude scales, it does not saturate at the upper end—e.g., there is no particular value beyond which all large earthquakes have about the same magnitude. For this reason, moment magnitude is now frequently used to estimate large earthquake magnitudes.

earthquake with a maximum moment magnitude of 6.5. The Cleveland Hill fault segment, a portion of the Foothills fault system (located about 60 miles northwest of the proposed site), ruptured in 1975, triggering the Oroville earthquake that registered 5.7 on the Richter scale.

The Dunnigan Hills fault is located about 62 miles west of the proposed site, and is about 12 miles long. Historically, no earthquakes of magnitude 5.0 or greater have occurred on the Dunnigan Hills fault; however, it is believed that this fault is capable of generating a maximum credible earthquake with a moment magnitude of 6.5.

Other faults and fault systems within a 62-mile radius of the proposed site are considered to be potentially active. The Maidu fault and an unnamed east-dipping fault that is located near the community of Rescue are both about 14 miles west of the proposed site. They both show evidence of prehistoric displacements, though not historic displacements. As described above, they are both part of the Bear Mountains Fault Zone within the Foothills fault system. SMUD reported that "an assumed maximum credible earthquake of 6.5 magnitude occurring on the most easterly, possibly active strand of the Bear Mountains fault zone (also referred to as the Rescue fault)…represents the potential earthquake that would give rise to the most severe ground motion at…Slab Creek Dam." According to SMUD, the maximum peak ground acceleration expected at Slab Creek dam resulting from the maximum credible earthquake on this fault is 0.30 g (horizontal ground acceleration).

Unnamed faults near the community of Volcanoville and Jenkinson Lake also show evidence of prehistoric displacements, though not historic displacements. The unnamed normal fault near Volcanoville is located about 12 miles north-northwest of the proposed Iowa Hill development. Two additional unnamed faults, one on the east side and one on the west side of Jenkinson Lake, are located about 7 miles east-southeast of proposed site.

The geology within and downstream of the Chili Bar Project area is similar to that described above for the areas downstream of Union Valley reservoir. The geology of the SFAR from the confluence with Rock Creek (just upstream of Chili Bar reservoir) to Folsom Lake includes granite rocks and sedimentary rocks that have recrystallized over time. As the SFAR flows through the town of Coloma, it also passes through a granite inclusion from the Sierra Nevada batholith before changing back to the Calaveras Complex geology. Serpentine rock masses also occur where the SFAR enters into Folsom Lake.

Reservoir Shorelines

The shorelines of the UARP reservoirs exhibit a wide range of characteristics, owing in part to their differing elevations, geologic settings, and reservoir water elevation changes (annually and daily). Studies examining reservoir shorelines focused on warmwater or reservoir-spawning fish species. Buck Island, Rubicon, and Brush Creek reservoirs are generally composed of erosion-resistant rock and do not support warmwater fish species, so were not studied. Camino reservoir, a reregulating reservoir with daily water level fluctuations of up to 15 feet, was also removed from the study because of safety and access constraints; no shoreline erosion data are available for that reservoir.

Gerle Creek and Robbs Peak reservoirs are smaller reservoirs that are largely ringed by either stable vegetation or bedrock/boulders. Gerle Creek reservoir impounds only 1,260 acre-feet and has an average annual water level fluctuation of 9 feet, with an average daily water level fluctuation of 1.5 feet. Robbs Peak reservoir is much smaller, impounding only 30 acre-feet in an on-channel reservoir with bedrock and boulder banks. The average annual water level fluctuation is 5 feet, while the average daily fluctuation is less than 0.5 foot. Shoreline erosion on these two reservoirs is minimal.

Table 3-1 shows information on the shorelines of the remaining five reservoirs in the UARP. Changes in operations are not proposed or recommended that would affect average water surface level fluctuations and reservoir shoreline erosion except for development of Iowa Hill, which would affect the frequency of water level fluctuations in Slab Creek reservoir but not the weekly range of fluctuations.

Chili Bar reservoir shoreline has very little erosion. Emergent vegetation is present on 94 percent of the shoreline although more than 80 percent of the shoreline is steeply (30 to 45 percent) sloped. The shoreline is mostly composed of sand-silt substrate. Data on daily fluctuations (based on 2002 hourly data) shows an average of 4.2 feet of fluctuation, and a maximum of 7 feet.

Reservoir Sedimentation

No issues regarding reservoir sedimentation were identified during scoping, so no studies were conducted during relicensing to consider loss of reservoir storage or other sedimentation effects on UARP operations. However, sources of sediment and potential future erosion were identified.

Upland Erosion and Sediment Sources

SMUD investigated erosion caused by the use of the approximately 104 Project roads (see section 3.3.7, *Land Use*) including: (1) main access roads that are paved and have structured drainage systems, (2) transmission line maintenance roads, and (3) unpaved surface roads that are near water bodies. The study concluded that main roads, which are paved, and transmission line maintenance roads, which are rarely used and tend to be located farther away from shorelines, contribute insignificant amounts of sediment supply or erosion to the Project waters. Unpaved roads contribute some sediment, but the amount is insignificant relative to the capacity of the Project water bodies, and these roads have both higher usage and better maintenance. Project owners and local agencies maintain the roads and drainage features to prevent sediment runoff from entering streams and reservoirs.

Table 3-1. Reservoir shoreline data within the UARP. (Source: SMUD, 2005)

Reservoir	Shoreline Slopes (%)	Shoreline Substrate (%)	Emergent Vegetation (% of shoreline)	Shoreline Erosion (%)	Average Annual Water Level Fluctuation		Notes
					Annual	Daily	
Loon Lake	Flat to moderate (0–5 to 10–30)	Bedrock and boulder (approx. 70)	(65) covered	Mild erosion (2)	43.6 feet	NA	Loon Lake is part of a storage reservoir that experiences gradual changes in water surface elevation
Union Valley	Gradual to steep (5–10 to 30–44)	Sand and silt dominant; some boulder and bedrock	NA	Mild erosion (80); significant erosion (> 14)	60 feet	< 0.5 foot	Mild erosion is largely a slow, progressive shoreline retreat. Slumping also occurs along a peninsula.
Ice House	Moderate to steep (10–29 to 30–44)	Sand and silt dominant; some cobble and boulders	(5) covered	Mild erosion (74); remainder stable	37 feet	NA	NA
Junction Reservoir	Steep (30–45) to over 45	Bedrock and cobble (85)	(6) covered	Mild erosion (1)	NA	20 feet	Junction reservoir is a re-regulating reservoir with frequent daily water level elevation changes.
Slab Creek	Steep (30–45) to over 45	Bedrock (> 70)	(> 50) covered	Mild erosion (18); significant erosion (< 1); remainder stable	30 feet	6 feet	Slab Creek reservoir is in a steep canyon, contributing to its frequent water surface elevation changes

Spoil Piles

SMUD investigated the stability of the three piles in the Project boundary that could erode and add sedimentation in the channels and reservoirs: the Jaybird Tunnel Adit spoil pile, the Camino Tunnel Adit spoil pile, and the White Rock Tunnel Adit No. 2 spoil pile. They are upslope of the waterways within the Junction dam reach, the Camino dam reach, and the Slab Creek dam reach, respectively. The material has historically been used for roadway maintenance.

All three piles show no signs of erosion and exist in stable angles of repose. The first two piles are mostly covered with rock and therefore are not susceptible to erosion from normal rainfall. They are also surrounded with diversion ditches to prevent runoff from causing erosion by mobilizing the piled material. Also, the UARP relicensing water quality study (see section 3.3.2, *Water Resources*) did not detect any elevated levels of chemical or foreign substances that might have leached from the piles.

Bathymetry studies indicate that total storage in Chili Bar reservoir has been reduced by 1,011 acre-feet, and useable storage (storage between the spillway crest and the preferred operating minimum) has been reduced by 252 acre-feet. About 13 percent of the annual or long-term incoming sediment load is trapped in the Chili Bar reservoir, and the remaining 87 percent is passed downstream. Based on observations made at the upstream end of the reservoir and the upstream face of the dam during valve maintenance activities, it appears that most particles greater than 2 millimeters (mm) settle out, while particles being transported downstream are virtually all fine material (less than 2 mm).

Stream Channel Morphology

In general, the channel beds within the reaches comprise a veneer of cobble, with numerous boulders and small amounts of gravel and sand overlying bedrock. The channels are typically narrow and located within bedrock-controlled canyons of moderate to steep slopes. Sections of channel with changing silt and sand deposits are the exception and occur in isolated reaches defined by topography.

Generally, very little fine sediment occurs in the stream channel or in the pools, although small pockets of fine sediment are deposited behind large flow obstructions and in low-velocity zones along the channel margins. Sections of stream channels that are relatively resilient and insensitive to changes in flow and/or sediment supply are termed "transport reaches" or "transport segments." Channel character in these transport sections is primarily controlled by bedrock geology and coarse boulder substrate emplaced largely by processes such as glaciers. In these channels, the available capacity of the stream to transport sediment is greater than the local sediment supply, and most sediment supplied to the channel is transported downstream while coarser material (e.g., cobbles and boulders) remains either as a result of size (boulders) or local hydraulic conditions (gravels upstream of local in-channel or channel margin obstructions).

Because the channel morphology is essentially unrelated to the supply of sediment, any net loss in sediment supply from Project operations is less likely to have any morphologic significance.

Transport channel types dominate much of the stream reaches. Eight of the eleven UARP reaches (Rockbound dam, Buck Island dam, Gerle Creek dam, Junction dam, Camino dam, SFAR dam, Slab Creek dam, and Brush Creek dam)[27] are considered transport sections of stream throughout the entire length of each reach.

Response sections of streams, in contrast to transport sections, contain stream channels that are likely to be affected by changes in hydrology or sediment supply. Response sections of stream are generally defined as having channels with low slope (<4 percent); mostly silt, sand, or clay bed and banks (cobble-gravel or finer); and plane bed or pool-riffle characteristics. There are seven sections of channel with response characteristics that occur in four of the stream reaches: three in the Loon Lake dam reach; two in the Ice House dam reach; and one section each in the Rubicon dam reach and Robbs Peak dam reach. These response sections are generally short, between 400 and 1,300 feet long.

Because these seven response sections may be responsive to changes in hydrology and sediment supply, survey sites were established at each section during the relicensing studies to investigate their geomorphic condition. Two response sections exhibited very little effect from the existing hydrology: the Middle Loon Lake dam reach section and the Upper Ice House dam reach section. In these sections, the channel bed, bars, and banks are generally stable; vegetation on the banks is well-established; and fine sediment was not being deposited in areas of slower flow. The other five sections in the Rubicon, Loon Lake, and Ice House dam reaches showed that changes in hydrology could affect the characteristics of their geomorphology.

Rubicon Dam Reach

The 4.2-mile-long Rubicon dam reach on the Rubicon River extends from the base of Rubicon dam downstream to the confluence with Miller Creek, and has a low mean gradient. The entire reach is over 6,000 feet in elevation and drains a glaciated watershed, much of which is designated as federal wilderness, and flows through many sections of exposed granite and steep, confined bedrock chutes. No major tributaries enter this reach. On-the-ground stream mapping shows that bedrock and boulder comprise up to 70 percent of the dominant substrate over the length of the Project reach, indicating that a majority of the stream channel within the reach is transport dominated. The response channel portions of the reach are mostly in a low gradient, 1.9-mile-long segment near Rubicon Springs, a private land parcel owned by parties involved in off-highway vehicle recreation. This section is in a mature conifer forest and contains

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[27] These reaches are generally not included in the Project boundaries.

deposits of gravel, sand, and silt with a number of beaver dams present. Studies show movement of the substrate depending on the level of flow, but the section is mostly stable bed, bars, and vegetated banks, and the sediment supply is virtually balanced with the flows.

Loon Lake Dam Reach

The 8.5-mile Loon Lake dam reach on Gerle Creek extends downstream from the base of Loon Lake dam to the normal high water line of Gerle reservoir, and has a mean gradient of about 2.3 percent. Tributaries in this reach include Jerrett, Barts, Dellar, and Rocky Basin creeks. From the Loon Lake reservoir outlet, Gerle Creek flows initially to the west through a wide and swampy valley that is surrounded by moderately sloping and glaciated hillsides. This upstream portion meanders for about 5 miles across the alluvial valley before the bedrock slopes constrict the channel near Wentworth Springs. Below the bedrock constriction, the valley widens and the stream channel is free to meander again through the middle portion of the reach (Neck and Gerle meadows). Before reaching Gerle reservoir, the creek flows through a steeper, lower portion (about 3 miles long) along a contact between granitic rocks and glacial till deposits.

Broad-scale geomorphic characterization (Rosgen Level I [Rosgen, 1996]) suggests 20 percent of the Loon Lake dam reach on Gerle Creek is composed of transport-dominated channel types; the other 80 percent is characterized by response channels. Results from field surveys corroborate this, indicating that sediment, cobble, and fine particles represent more than 50 percent of the substrate of the channel throughout the length of the reach.

The upper response section of Gerle Creek is located 0.5 mile downstream of Loon Lake dam, and it meanders through most of the Project response sections because it lies in a large, unconfined valley with relatively flat topography. There is a constriction at the lower end of this section, where steep bedrock walls confine the channel near Wentworth Springs. Historically, the meadow was probably formed by sediment deposition as a result of the bedrock constriction, causing water storage upstream. This area is still wet during some seasons, but it is likely that the water table is not as high as it was in the past.

The middle response section of Gerle Creek is 2.7 miles downstream of Loon Lake dam, immediately downstream of the confluence with Jerrett Creek, at the head of densely vegetated Gerle Meadow. This section is steeper than the upper response section, median grain sizes are much higher, and the number of bends is significantly lower. Many lateral bars that have bright sediment grains indicate that sediment mobilization likely occurs regularly at moderate flows. Debris jams and numerous pieces of large woody debris create areas of scour and deposition in the channel. In this section, analysis indicates that the sediment would likely mobilize at flows between 149 and 326 cfs. These flows correspond to the 1.5- to 4-year recurrence floods under the existing flow regime, which suggests that sediment and bed transport probably occurs with this frequency. Young vegetation on some of the bars and banks provides evidence of this.

The lower response section of Gerle Creek is 7.5 miles downstream of Loon Lake dam and has discrete pool-riffle sequences. Approximately 30 to 50 percent of the channel area has erosion and deposition at obstructions, bends, and constrictions. Many high-flow side channels and woody debris jams are present well above the streamflow surface elevation along the right bank. Sand deposits are present in low velocity zones behind larger obstructions and along the channel banks. Based on analysis, sediment would likely mobilize in this section at flows between 940 and 1,241 cfs. These flows reflect floods with 4- to 5-year recurrence intervals under the existing flow regime, so bed mobilization would not occur as often as in the middle section. This section is a multi-channel reach so the recurrence intervals for bed mobilization in the main channel would be less frequent because flows are distributed among various channels. The main channel bed is likely to have become more armored than the side channels by the higher flows it carries

Robbs Peak Dam Reach

The 5.9-mile-long Robbs Peak dam reach on the SFRR extends from the base of the Robbs Peak forebay downstream to the confluence with the Rubicon River. It has a mean gradient of about 5.5 percent, although some segments of this reach exceed 8 percent slope. Major tributaries to this reach include Gerle and South creeks. Upstream of the Gerle Creek confluence, the river flows through a glaciated, low-relief landscape, and this area contains the main response segment investigated in this reach. Downstream of the Gerle Creek confluence, the river becomes progressively more entrenched within the surrounding canyon. For the first 2 miles, the river is confined by moderate canyon slopes; then a contact between granitic and more erodible rocks marks a transition from the moderate canyon to a deeper gorge with 1,500-foot walls.

Broad-scale reach characterization of the reach shows that about 85 percent of the length of the reach is composed of transport-dominated channel types, while the other 15 percent is response-type channels. The response section investigated during relicensing is about 0.5 mile downstream of Robbs Peak forebay, within private property just upstream of the confluence of the SFRR and Gerle Creek. Here, the stream enters a broader, low-gradient segment of the reach where willows grow on many bars within the channel area and small conifers grow on recently scoured surfaces and other channel bars. Field observations and pebble counts reflect that finer sediments in the channel are likely stored in this section because of a constriction downstream. Valley topography creates a backwater effect during periods of high flow, which likely causes sediment to be deposited within the section. Local timber harvesting also likely adds to the sediment supply.

Ice House Dam Reach

The 11.5-mile-long Ice House dam reach on SFSC extends from the base of Ice House dam to the normal high water line of Junction reservoir and has a mean gradient of about 1.4 percent. The 1992 forest fire known as the Cleveland Fire created a fire-burned area that covers about two-thirds of the total reach length. The reach is characterized by moderate valley walls that confine the channel to a narrow floodplain. Peavine Creek, Winmiller ravine, and Big Hill canyon are the three major tributaries in this reach. In the first 2 miles below Ice House dam, the creek transitions from a steep canyon into a deeper gorge (near the Silver Creek campground) as the geology changes from granite terrain to deposited finer sediments. For the remainder of its 9.5 miles, the reach is confined to a bedrock valley and maintains an average gradient of 2 percent.

Despite the fact that on-the-ground stream mapping indicates that bedrock and boulder make up over 60 percent of the substrate of this reach, there are also substantial portions of the reach that are response-channel types. In the upper response section that was studied, located 1.5 miles downstream of Ice House dam, the channel is generally plane-bed morphology with some bends and bar formation. Mobilization of the sediment occurs at flows ranging from 185 to 393 cfs, which corresponds to floods with 1.5- to 3-year recurrence intervals under the current regulated flow regime. This indicates that bed material is regularly mobilized, and fresh, newly scoured surfaces are visible along the stream banks. Moderately high levels of sand and fine gravel observed in the section suggest that sediment supply from bank runoff and upstream sources may be greater than transport capacity.

The lower response section studied is located 8.6 miles downstream of Ice House dam in an area that was burned during the Cleveland Fire. A narrow band of riparian vegetation has recovered along the banks. Sediment mobilization in this section occurs at flows ranging from 497 to 775 cfs, which corresponds to floods with 1.5- to 2-year recurrence intervals under the existing flow regime. Bed mobilization therefore occurs frequently; however, because of the fire, fine sediment deposits are visible throughout and channel sediments are highly embedded, with many dull surfaces in the section. Sand covers the channel bed with larger deposits in lower flow areas, behind obstructions, and on the floodplain. Higher depositions of fine sediment and woody debris exist in this channel section compared to other Project reaches.

Camino Dam Reach to the South Fork of the American River Reach

Like the Camino dam and Junction dam reaches, the SFAR reach is characterized by steep valley bedrock walls in a highly confined gorge. The reach is 2.8 miles long and extends from the confluence with Silver Creek to the Camino and El Dorado powerhouses. Relatively little vegetation is present along the channel slopes.

Broad-scale geomorphic characterization of the reach concludes that about 10 percent of the reach is made up of channels with transport-dominated characteristics, while the other 90 percent of the reach is characterized as response channel. However, on-the-ground surveys along a 520-foot segment show that the channel is actually a transport-dominated channel. Like the Camino dam and Junction dam reaches, many boulders and bedrock outcroppings are present that do not mobilize even during high-flow events. Cobble substrate does exist as a veneer, but finer sediments are deposited only in low-flow areas near obstructions and along channel margins. Sediment supply is not greater than transport capacity, so the sediments that do exist do not affect channel morphology. The 1992 Cleveland Fire also affected this area of the watershed, so fine sediments probably increased in supply because of increased erosion in the contributing drainage area. However, no evidence of increased sediment was seen in the channel during on-the-ground surveys of the segment.

Slab Creek Dam Reach

The Slab Creek dam reach is an 8-mile reach extending from the base of the Slab Creek dam and powerhouse to the high-water level of Chili Bar reservoir. In this reach, the SFAR again flows through an area dominated by high-gradient channel segments, bedrock and boulder outcroppings, and steep valley slopes in a highly confined gorge. The valley slopes are also sparsely vegetated.

Broad-scale geomorphic characterization of the reach indicated that 40 percent of the reach is made up of transport-dominated channel segments, while the other 60 percent of the reach is characterized as response segments. An on-the-ground survey investigated a 650 foot portion of the Project reach above the Rock Creek confluence, about 4.6 miles below Slab Creek dam. This portion was originally characterized as a response channel, but the survey indicates that the channel is actually a transport-dominated channel. Like other reaches in the UARP watershed, many boulders and bedrock outcroppings are present that do not mobilize even during high-flow events. Cobble substrate does exist as a veneer, but finer sediments are deposited only in low-flow areas near obstructions and along channel margins. Sediment supply is not greater than transport capacity, so the sediments that do exist do not affect channel morphology. There is no evidence of lateral bar movement.

Chili Bar Dam Reach

The SFAR downstream of Chili Bar dam extends to the normal high water line of Folsom reservoir, falling about 500 feet more than 19.1 miles with an average gradient of about 0.5 percent. From upstream to downstream, tributaries to the SFAR include Dutch Creek, Granite Creek, Jacobs Creek, Greenwood Creek, Hastings Creek, Norton Ravine, and Weber Creek. The reach is differentiated into three subreaches of different character, the upper subreach (Upper Canyon site), the middle subreach (Upper and Lower Coloma sites), and the lower subreach (Gorge site). The upper and lower subreaches are characterized by higher channel gradients that create flowing rapids, steeper canyon walls, and fewer deposits of finer material. They are generally bounded by bedrock and boulders, with alluvial deposits only in areas of lower flow. In contrast, the middle subreach channel is wider, more sinuous, and more gently sloping floodplains and channel gradients. Some areas of it were not studied because dredging, associated with gold mining activities, has artificially deepened the channel and altered substrate characteristics.

Broad-scale geomorphic characterization indicates that the reach is dominated by transport sections, where sediment transport capacity does not exceed fine sediment supply. On-the-ground survey confirms this, as fine sediment deposits are not visible in main channel flow areas; only cobble substrate exists that is covering bedrock. The channel slopes are very steep, have little vegetation other than a thin forest, and there is little evidence of bank erosion. The reach also has an average slope of about 1.0 percent, creating higher velocity areas and rapids.

Broad-scale characterization indicates that the Upper subreach is dominated by response sections. The Upper Canyon site is a transitional area exiting the upper subreach, and is characterized by moderately steep slopes with varying levels of vegetation. South-facing slopes that receive more sunlight are generally too dry to support a wide variety of plant life, while north-facing slopes are more densely vegetated. South-facing slopes could contribute to sediment supply, and the gradient at this site is lower than the other sites studied in the reach. The analysis indicates that this subreach is probably a response channel, since a mid-channel bar is present and fines were observed within the coarse substrate. Calculations show that the flow threshold of incipient motion at one cross-section is as low as 1,703 cfs. It is therefore possible that the morphology of the site changes even during flood events that are well below the 1.5-year regulated flood of 5,667 cfs, since Chili Bar reservoir has limited storage.

In contrast, the section at the Lower Coloma site was surveyed to determine if it is characterized as a response section, and it is likely not. Gold mining sites that may have mobilized fines are located between this location and the Upper Canyon, but this subreach has a steeper gradient, and no fines were observed in the main channel areas. Also, much of the channel and banks are stabilized by bedrock outcroppings. Any depositions that exist appear to only occur in low-flow areas behind these types of obstructions. The valley slopes are not as steep and do not appear to be contributing sediment supply, and residential development along the channel banks helps to retain sediment runoff. Based on the analysis of this section, transport capacity exceeds sediment supply.

Like upstream areas of the reach, the slopes are more sparsely vegetated, which appears to contribute to sediment supply. However, the local gradient is steeper, bars that do exist are dominated by cobble, and the lack of algal growth and fines in the main channel areas suggest higher transport capacity. Although this section of the canyon is an alluvial section with some sandy beaches, most of the lower subreach at the Gorge Site is characterized by rapids and bedrock/boulder outcroppings in the channels. All evidence suggests that it is a transport-dominated channel, where sediment transport capacity exceeds supply.

3.3.1.2 Environmental Effects

Upland Erosion and Sediment Sources

Changes in the operation of the UARP could contribute to sediment supply and degradation of water quality.

No changes in Project operations are proposed that would affect upland sediment supply, but SMUD proposes to address the erosion that does occur under existing conditions. Under Proposed Article 1-30, *Transportation System Management*, SMUD would develop a transportation system management plan for roads on or affecting National Forest System lands. As part of this plan, SMUD would address measures to control Project-related erosion including dust and soil movement induced by Project roads and maintenance activities. This proposed plan would address the sediment that currently runs off the unpaved roads near Project shorelines. Although SMUD and other agencies maintain these roads periodically, long-term sediment erosion could affect channel morphology or reservoir storage, and in turn affect biological resources or Project operations.

Our Analysis

Development of a transportation system management plan would allow SMUD to coordinate road maintenance and use of Project roads with the other land-managing agencies to ensure that protocols for erosion control are followed that would minimize sediment disturbance and transport into streams and reservoirs.

Pulse Flows

SMUD's studies showed that sediment deposition occurs in the Rubicon, Robbs Peak, Loon Lake, Ice House, and Slab Creek reaches. Under Proposed Article 1-2, *Pulse Flows*, SMUD would provide pulse flows in three of these reaches: in the Rubicon River below Rubicon dam, in Gerle Creek below Loon Lake dam, and in the SFSC below Ice House dam.

Under Proposed Articles 1-5, *Monitoring Program*, and 2-6, *Sediment Management Plan*, SMUD would monitor reaches with significant response channel segments for changes in geomorphology during the license term: the reaches below Rubicon dam, Loon Lake dam, and Ice House dam, Silver Creek below Camino dam, and Slab Creek below Slab Creek dam. PG&E would monitor the reach below the Chili Bar Project. In addition, SMUD would monitor three of the above-listed reaches that are mostly transport channels for changes in characterization: the reaches below Robbs Peak dam, Camino dam, and Slab Creek dam.

Under Proposed Articles 1-5, *Monitoring Program*, and 2-6, *Sediment Management Plan*, SMUD and PG&E would use this geomorphology monitoring to determine if sediment should be placed in area(s) of the UARP reaches or if reservoirs should be dredged. If dredging of reservoirs is necessary, SMUD and PG&E would place the dredged sediment at locations determined in consultation with the Agencies and BLM.

Rubicon Dam Reach

Proposed Article 1-2, *Pulse Flows*, provides for pulse flows to coincide with high winter flows or spring snowmelt runoff. The goal of Article 1-2 for the Rubicon dam reach is to provide pulse flows of at least 600 cfs for 3 days or a total of 3,600 acre-feet of spill within those 3 consecutive days during BN, AN, and Wet water years. The pulse flows would be delivered to the Rubicon dam reach by inducing spill over Rubicon dam through operation of the flashboard gates at the Rubicon tunnel headworks. The purpose is to provide flows that would imitate natural flushing flow conditions during this time of year, to ensure that the morphology of the reach does not adversely affect biological resources. Proposed Article 1-5, *Monitoring Program*, provides for geomorphological evaluation to monitor changes in channel conditions and the effects from Project operations.

Loon Lake Dam Reach

The upper section's floodplain—a relatively flat meadow—is characterized as somewhat swampy and has unstable banks and fine sediment deposits, which could affect biological or recreational resources if the conditions continue to degrade. Under Proposed Article 1-7, *Gerle Creek Channel Stabilization*, SMUD would develop and implement a plan to stabilize Gerle Creek channel. The plan would require Forest Service approval and involvement in its implementation, and would address the areas of erosion, instability, and sediment deposits to prevent future degradation of the channel conditions and any affected resources.

The proposed pulse flows would provide for ongoing channel flushing, timed to coincide with spring snowmelt runoff. Included would be test pulse releases of up to 740 cfs or the maximum capacity of the outlet works, whichever is less. These test flows would be evaluated based on their impact on channel conditions, bridges, and recreational sites, and then the Forest Service might reduce (but may not increase) the prescribed flows. Currently, flows in wet years are prescribed over a 5-day period: 600 cfs on days 1, 2, 4, and 5 and up to 740 cfs on day 3. Ongoing monitoring of the channel morphology would ensure that channel conditions do not adversely affect area resources in the future. Monitoring would identify how these changes in operations affect the geomorphology of the reach, particularly in the upper response section. Currently, the single point outlet below the Loon Lake dam carves a distinct channel through the meadow. In part, the monitoring would determine if this channel and floodplain would be unchanged regardless of operations—possibly because of the bedrock constriction downstream of the meadow.

Ice House Dam Reach

The 11.5-mile-long Ice House dam reach on SFSC has been significantly affected by Project operations. Compared to the unregulated flow regime, reduced peak flows have allowed fine sediment to build up, especially since the 1992 Cleveland Fire. The reach and surrounding area are still clearly showing the effects of that event. The channel itself is primarily affected by the sediment deposition from that event, and that accumulation may be affecting biological resources in the reach.

Because of these effects, Proposed Article 1-2, *Pulse Flows*, provides for flushing flows timed to coincide with winter storm events and spring snowmelt runoff. These flows would serve as peak flows for channel flushing to imitate the unregulated condition. During wet years, for example, releases of 600 cfs would be provided for 5 days, with 780 cfs—or the maximum capacity of the outlet works—being released on the third day. The flushing flows would influence the geomorphology of the channel sections, scouring the finer sediments in areas where sediment supply has exceeded transport capacity, which in turn would restore the channel condition that existed before the fines from the Cleveland Fire affected the biological resources. The bed of the channel would also continue to be mobilized more frequently, so that future events that affect the channel substrate could be flushed in a more natural period of time and the aquatic resources of the reach could be restored. Proposed Article 1-5, *Monitoring Program*, provides for geomorphology monitoring to develop benchmarks and comparatively study the future effects of these flushing flows.

Chili Bar Dam Reach

Three subreaches were studied in the Chili Bar dam reach on the SFAR. Only one section was found to currently be characterized as a response section, but fines are being transported into the reservoir and downstream of the dam, and they could affect channel conditions throughout the reach. Under Proposed Article 2-6, *Sediment Management Plan*, PG&E would plan and implement a geomorphology monitoring program to evaluate long-term changes in cross-section, longitudinal profile, bed substrate, and channel and bank stability in the sections studied. The purpose would be to verify that Project operations would not be adversely affecting the resources of the reach.

Under Proposed Article 2-6, *Sediment Management Plan*, PG&E could elect to dredge the reservoir to increase reservoir storage, since the waterbody has captured a significant amount of sediment that has been transported from upland sources over the life of the dam. Prior to any dredging activity, PG&E would consult with the Agencies and BLM to develop a sediment management plan to protect the Project resources. The sediment management plan would not only address the potential adverse effects of dredging on the reservoir and related mitigating measures, but it also may include a provision to deposit the dredged material in the downstream reach.

Our Analysis

Under natural conditions, periodic high flows would move sediments through the river system. Based on geomorphology studies, SMUD and the Agencies have identified reaches that would benefit from periodic pulse flows to move sediments downstream. Coordinating the provision of pulse floods with natural high flow events is a reasonable means of achieving that goal.

Monitoring changes in sediment deposition in the reaches prone to sediment deposition would allow SMUD and PG&E, in consultation with the Agencies and BLM, to determine if and when to dredge the reservoirs and where to deposit the dredged materials. Based on our review of the studies, we conclude that pulse flows in the reaches where sediments are trapped or deposited would help to transport these sediments downstream. The downstream reaches are where sediments most likely would have traveled if the impoundment did not exist; however because any added material could threaten the resources of the reach, the development of a sediment management plan would minimize any potential adverse effects.

Reservoir Sedimentation

Construction and operation of the proposed Iowa Hill development could affect soil erosion and water turbidity in stream effluent from the development, as well as in Slab Creek reservoir. Construction of the development would include clearing and grading, cutting, and filling to create the upper reservoir, installation of an underground tunnel/penstock, construction of a multiport (octagonal) intake in Slab Creek reservoir, and construction of about 2 miles of transmission line. During construction, SMUD would prevent water pollution and erosion by implementing management practices described in the storm water pollution prevention plan proposed under Article 1-42, *Water Quality and Water Pollution*, including keeping all equipment staging for construction of the tunnel at least 100 feet from the SFAR and removing all material that is used within the riverbed, including siltation fabric, after completing construction. In addition, SMUD would implement best management practices to stabilize soil and retain sediment during construction as described in the erosion and sedimentation control plan included in appendix A of the license application. Under Proposed Article 1-47, *Spoils Disposal*, Forest Service approval would be required prior to discharging any spoils on National Forest System lands. During operation of the Iowa Hill development, increased reservoir surface fluctuation and turbulence from the proposed intake/outlet could increase turbidity in Slab Creek reservoir.

Our Analysis

Erodible soil is present that could be disturbed by construction activities. Construction of the proposed Iowa Hill development could potentially result in substantial soil effects. An octagonal intake would eliminate the need to alter the mountain slope (both under water and above the shoreline) during construction. The natural slope has existed under water for more than 30 years and has existed in-the-dry for thousands of years. Like the slopes in other UARP reservoirs, it is not anticipated that stability enhancements would be needed. Because of the octagonal configuration, the horizontal net velocity component on the reservoir would be minimal, greatly reducing any concern about stirring up sediment.

The risk of water quality disturbance and soil erosion could be minimized by implementing a storm water pollution preventive plan identifying the best management practices for erosion and sediment control, including the stabilization of spoil piles. This plan would also include the method of installation and removal of a temporary coffer dam in Slab Creek reservoir to prevent any construction disturbance to the water quality in the reservoir. SMUD indicates that construction of the Iowa Hill development would achieve a balance between excavated materials and fill such that there would be no permanent spoils discharge. We anticipate that the proposed storm water pollution prevention plan and use of best management practices would provide reasonable assurance that SMUD's construction activities would not directly or indirectly adversely affect water quality and aquatic habitat.

The increased reservoir surface fluctuation and turbulence from the proposed intake/outlet could cause increased turbidity in Slab Creek reservoir. During the licensing process, SMUD used existing bathymetry to investigate the effects of operating Iowa Hill on the turbidity and sedimentation in Slab Creek reservoir, and updated the bathymetry and analysis in response to comments from the Water Board. The *Technical Report on Iowa Hill Pumped-Storage Development Turbidity Analysis* (Stillwater Sciences, 2008) concludes that the turbidity and shoreline erosion would not increase substantially because (1) the proposed intake/outlet structure would be located 90 feet above the channel bed in Slab Creek reservoir, so it would be very unlikely to mobilize sediment on the reservoir's bottom; (2) the more frequent reservoir surface fluctuation would not affect shoreline erosion, since the shoreline is mostly cobble, boulder, and bedrock; and (3) based on bathymetry data, sediment transport modeling, and projected reservoir levels, the existing sediment delta that exists at the upper end of the reservoir would not advance within 100 years to a location where it could be affected by the intake/outlet. These conclusions are consistent with our analysis of the data provided in the technical reports that the operation of the proposed Iowa Hill development would not increase turbidity in Slab Creek over the term of any new license.

Seismicity and Groundwater Effects

If active or potentially active faults were passing through or near the site of the Iowa Hill development, seismic activity could potentially cause failure of the structures associated with the development. However, no faults or fault systems are considered active or near enough to create any greater risk than that associated with the structures that already impound Project waters. In fact, construction of a reservoir with earthen berms and an impermeable layer is likely to withstand an earthquake better than the closest existing dam—on Slab Creek reservoir, the lower reservoir in the pumped-storage development—since there would be no possibility of the earthen berms overturning.

However, the underground penstock/tunnel would be susceptible to seismic activity, so best management practices should account for this in design and construction.

The proposed development could also affect groundwater by creating seepage paths along the proposed tunnel that could lead to instability, or adversely affect natural resources by altering or polluting the water table and surrounding soil. Under Proposed Article 1-43, *Groundwater*, SMUD would develop and implement a plan for managing the flow of groundwater during construction and for post-construction monitoring of groundwater to evaluate Project impacts on groundwater. The proposed plan would establish baseline measurements of the Project area and affected groundwater levels. During construction, SMUD would document all groundwater encountered and propose corrective measures if the levels encountered are different than what were expected. Ongoing monitoring and reporting would last for 5 years, and it would evaluate springs and creeks that could be affected by Project seepage or piping. An approved plan would also include mitigating measures in the case of any adverse effects to ensure that the proposed development would not create any significant impact.

Our Analysis

Although the UARP area predominantly has bedrock, boulder, and cobble substrate in its waterways, geological investigations concluded that material in the area of the proposed Iowa Hill development is not watertight enough to prevent seepage from the proposed upper reservoir. Residual soil and fractured deposits could result in storage losses during operation. However, the use of an impermeable liner in the upper reservoir would limit seepage losses and would also minimize sediment mobilization and transport to Slab Creek reservoir.

Implementation of a plan for monitoring groundwater during and after construction of the Iowa Hill development would provide information on the effects of the development on groundwater and allow SMUD and the Agencies to recommend mitigation to remedy any identified effects on groundwater.

UARP-only Alternative

The Iowa Hill development would not be constructed or operated under the UARP-only Alternative. All other proposed environmental measures would be implemented. Operations would otherwise be similar to those in the Proposed Action, without the effects of the Iowa Hill development.

The effects of the Iowa Hill development that would not occur under this alternative include changes in water-level fluctuations in Slab Creek reservoir; effects on turbidity within the reservoir; and clearing, cutting and filling, and soil erosion as a result of constructing the development. Impacts on geology in that area would not occur at Iowa Hill.

3.3.1.3 Unavoidable Adverse Effects

None.

3.3.2 Water Resources

3.3.2.1 Affected Environment

Water Quantity

The UARP and the Chili Bar Project use water of the SFAR and Rubicon River watersheds to generate electricity (figure 3-1). The river basins drain a portion of the western slope of the Sierra Nevada Mountains between Placerville and the Sierra crest, which reach over 9,000 feet, just west of Lake Tahoe. The total drainage area for the SFAR is 598 square miles as measured near Placerville (USGS gage no. 11444500) (figure 3-2) about 700 feet downstream of Chili Bar dam. The total drainage of the reservoirs within the Rubicon River (a major tributary to the Middle Fork of the American River) watershed used for diverting some of inflow to the reservoirs to the SFAR watershed is about 76 square miles.

The American River Basin has warm dry summers and cool and wet winters. Temperatures and precipitation vary considerably depending on elevation. Summer high temperatures are normally above 90 degrees in the lower elevations and low temperatures are normally substantially below freezing during the winter in the higher elevations. Average precipitation ranges from 40 to 70 inches with more than 90 percent of the precipitation occurring from October through April, mainly in the form of snow in the higher elevations. A snowpack of 5 to 10 feet is common in the higher elevations, with little or no snow in the lower elevations below 2,000 feet. Much of the snowpack below 5,000 feet melts by the end of April, but snowmelt from higher elevations continues into at least June in most years. Streamflow normally peaks during the late spring and/or early summer from snowmelt runoff. Low flows within this watershed typically occur during the late summer or early fall, after the snowmelt and before the runoff from the fall storms moving in from the Pacific Ocean. In the higher elevations above 6,000 feet, most precipitation during fall, winter, and spring falls as snow which results in low flows other than from occasional rain-on-snow events, until snowmelt begins, normally in April.

Rubicon Reservoir

The primary purpose of the Rubicon reservoir is diversion of high spring-time flow from the main stem of the Rubicon River to Buck Island reservoir via the Rubicon-Rockbound tunnel, which diverts into Rockbound Lake. Rubicon reservoir is not used for long-term storage; however, SMUD has water rights for storage of up to 450 acre-feet

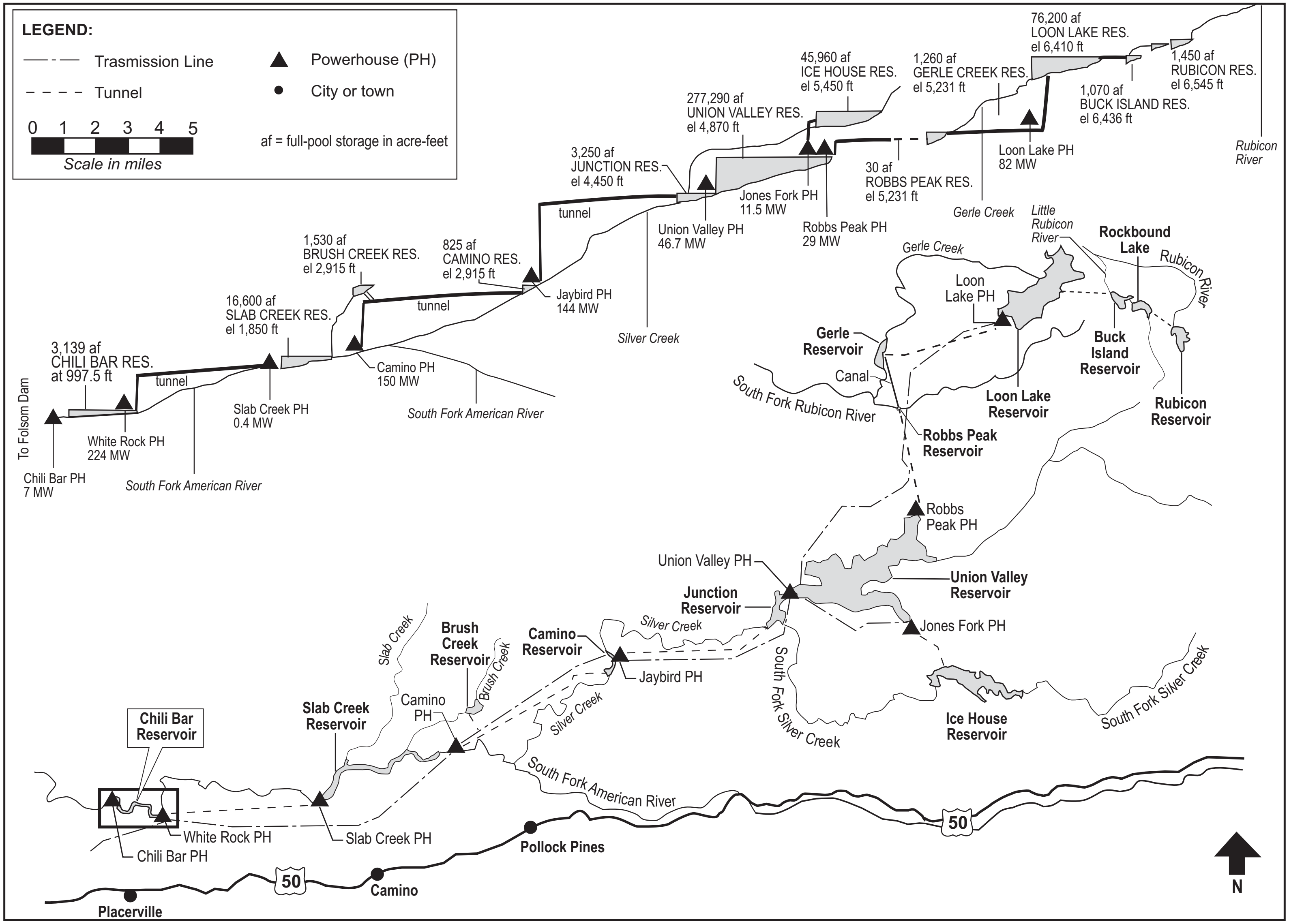

Figure 3-1. Profile of the Upper American River system, Rubicon Lake to the Chili Bar Project. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

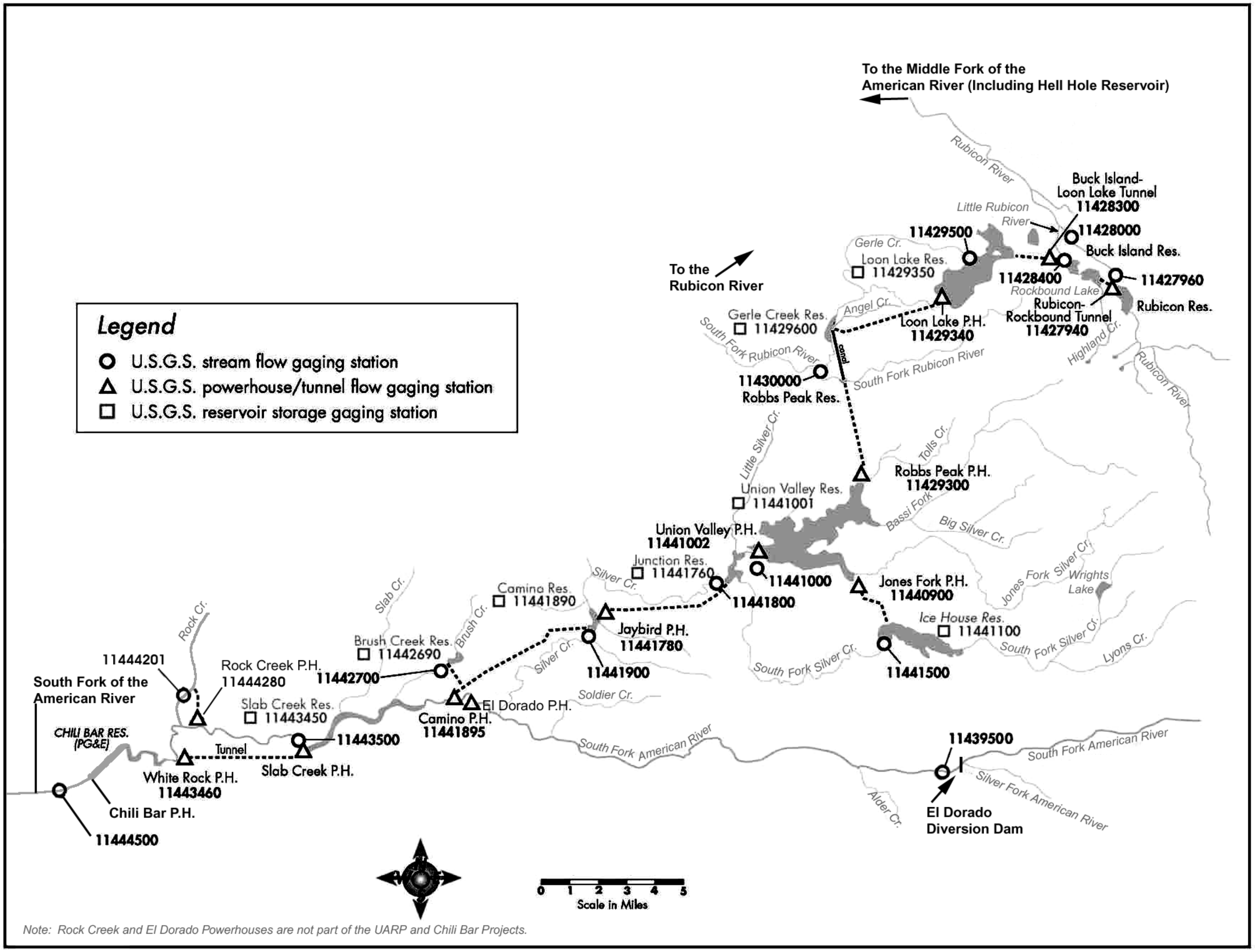

Figure 3-2. Existing USGS gages within the Upper American River system. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

in the reservoir, out of a total useable storage capacity of 1,010 acre-feet (table 3-2). Water is released downstream from Rubicon dam by either passing over the spillway or through one or both 10-inch-diameter globe valve controlled low-level outlets, which have a combined capacity of about 18 cfs at full reservoir pool.

Table 3-2. Reservoir summary for the Projects. (Source: SMUD, 2005; PG&E, 2005)

Reservoir	Drainage Area (square miles)	Normal Maximum Water Surface Elevation (feet msl)	Useable Storage (acre-feet)	Typical Daily Elevation Changes/Typical Annual Elevation Changes (feet)	Diversion Tunnel or Powerhouse
Rubicon	26.5	6,545	1,010	<0.5/11.8	Rubicon-Rockbound tunnel
Buck Island	6.0	6,436	648[a]	<0.5/11.5	Buck-Loon tunnel
Loon Lake	8.0	6,410	68,988	<0.5/36	Loon Lake powerhouse
Gerle Creek	28.7	5,231	483	1.5/9	Gerle Creek canal
Robbs Peak	15.2	5,231	30	<0.5/5	Robbs Peak powerhouse
Ice House	27.2	5,450	35,065[a]	<0.5/42	Jones Fork powerhouse
Union Valley	83.7	4,870	266,303[a]	<0.5/60	Union Valley powerhouse
Junction	147.0	4,450	2,140	20/32	Jaybird powerhouse
Camino	160.0	2,915	489	20/30	Camino powerhouse
Brush Creek	8.0	2,915	374	20[b]/<1	Camino powerhouse
Slab Creek	493	1,850	5,580	6/30	White Rock powerhouse
Chili Bar	598	997.5	1,088[c]	4.2/14.5	Chili Bar powerhouse

[a] Top of spillway or bulkhead gates, or stop logs in place.

[b] Brush Creek is rarely used in super peaking mode, but when it is, the typical daily change in elevation is about 20 feet.

[c] The as-constructed useable storage of Chili Bar reservoir is 1,339 acre-feet.

Because Rubicon reservoir is operated primarily as a diversion facility, the water level in the reservoir fluctuates with changing volumes of inflow, ranging between the minimum operating level of 6,533.2 feet and the maximum normal operating level of 6,545.0 feet. Water levels are also determined by the use of gates, which are normally installed in July and removed in October. During the summer recreational season of May 1 through September 10, the minimum operating pool level is increased by 6.0 feet to an elevation of 6,539.2 (figure 3-3). Although the daily water surface elevations are highly variable, the monthly median minimum water surface elevation is higher during the recreational season.

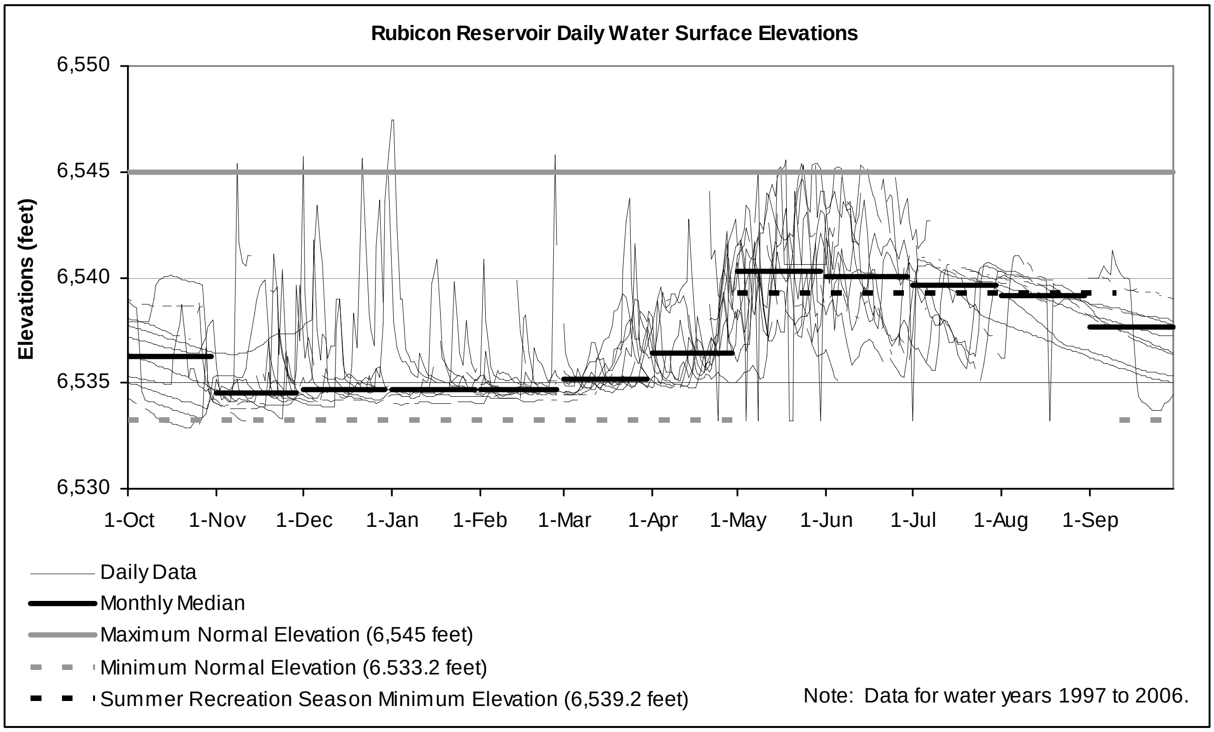

Figure 3-3. Rubicon reservoir daily water surface elevations.
(Source: CDEC, 2007)

Buck Island Reservoir

The primary purpose of the Buck Island reservoir, like Rubicon reservoir, is diversion of high spring-time flow from the Rubicon River via the Buck-Loon tunnel to Loon Lake reservoir. Buck Island reservoir is not used for long-term storage; however, SMUD has water rights for storage up to 440 acre-feet in this reservoir, out of a total useable storage volume of 648 acre-feet. Water is released downstream from Buck Island dam by either passing over the spillway or through one 12-inch diameter, globe valve, low-level outlet, which has a capacity of about 11 cfs at full reservoir pool. The water level in Buck Island reservoir fluctuates between the minimum operating pool level of 6,424.5 feet and the maximum normal elevation of 6,436.0 feet. During the summer recreational season of May 1 through September 10, SMUD increases the minimum operating level by 6.5 feet to 6,431.0 feet, effectively narrowing the median range of maximum water elevation fluctuation from 11.5 to normally 5.0 feet (figure 3-4). As with Rubicon reservoir, the daily elevation changes are highly variable.

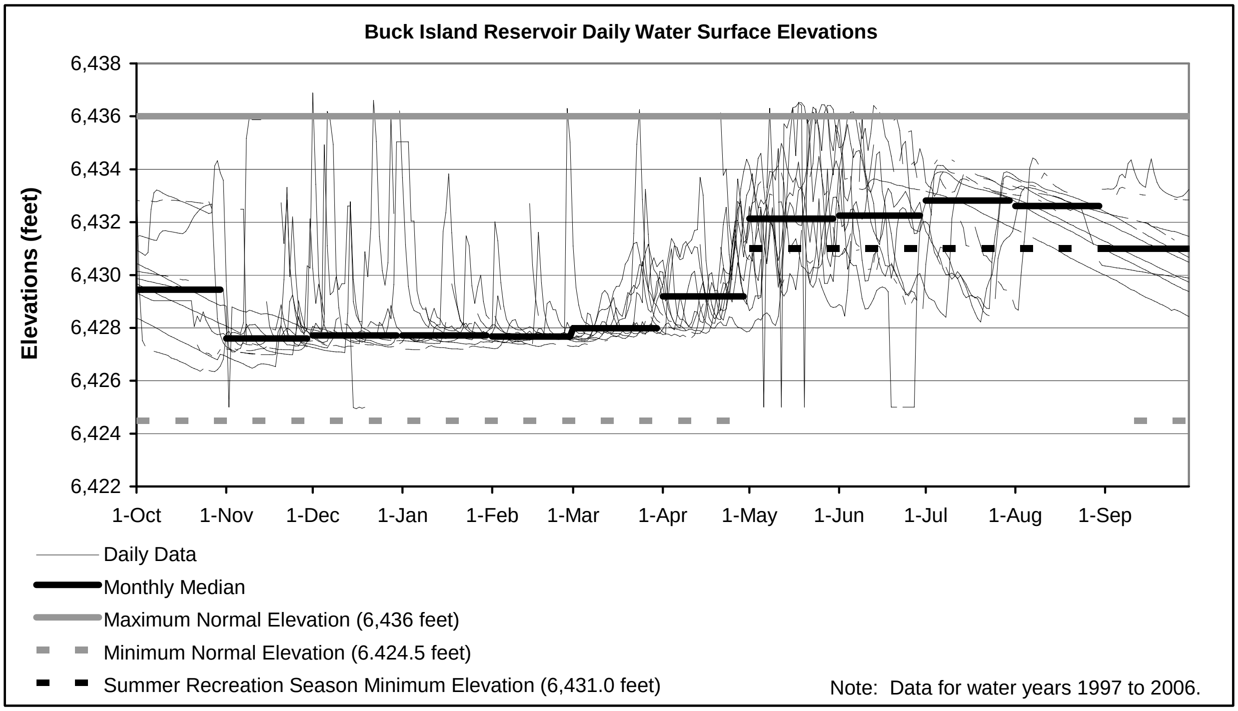

Figure 3-4. Buck Island reservoir daily water surface elevations. (Source: CDEC, 2007)

Loon Lake Reservoir

Loon Lake reservoir is the highest elevation storage reservoir in the UARP with a total useable storage volume of about 69,000 acre-feet. Water is released from the reservoir though the Loon Lake penstock to the Loon Lake powerhouse and then into Gerle Creek reservoir. Water is also released downstream from Loon Lake dam by either passing over the spillway or through one or more of two 10-inch-diameter, globe valves (maximum capacity of 41 cfs) or one 42-inch-diameter, Howell-Bunger valve (maximum capacity of 600 cfs). Variation in Loon Lake reservoir levels typically follows an annual cycle, with reservoir elevations reaching their highest levels during early summer months. The reservoir levels gradually lower throughout the summer months continuing into the fall and winter months. The water elevation slowly rises during the spring and early summer as the rain and snowmelt runoff refill the reservoir (figure 3-5).

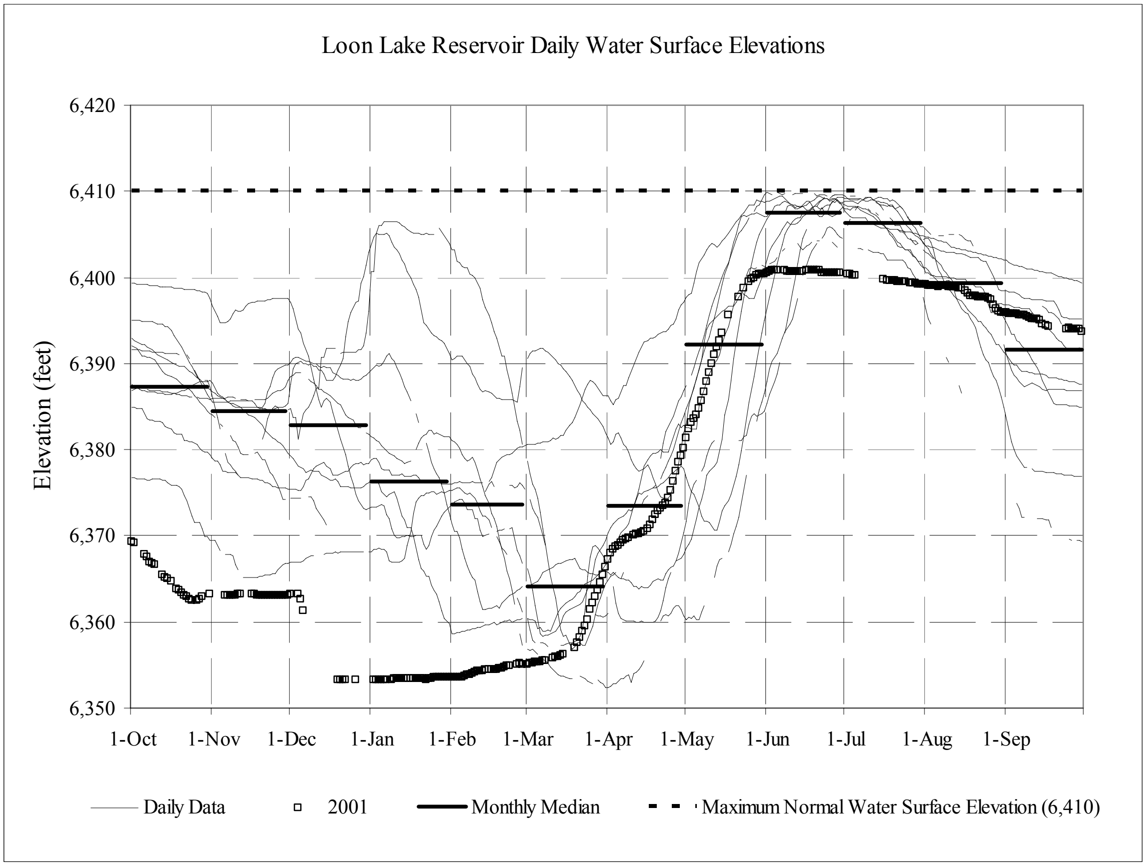

Figure 3-5. Loon Lake reservoir daily water surface elevations. (Source: CDEC, 2007)

Gerle Creek Reservoir

As with Rubicon and Buck Island, the primary purpose of the Gerle Creek reservoir is diversion of high spring-time flow and water re-diverted from upstream UARP facilities via the Gerle canal to Robbs Peak reservoir and then to Robbs Peak powerhouse on Union Valley reservoir. There are no storage rights at Gerle Creek reservoir, and the reservoir has a useable storage volume of 483 acre-feet. According to SMUD, daily average variation is about 1.5 feet and 9 feet annually (see table 3-2). Water is also released downstream from Gerle Creek dam by either passing over the spillway or through one 10-inch-diameter, globe valve, low-level outlet, which has a capacity of about 13 cfs at full pool.

Robbs Peak Reservoir

Robbs Peak reservoir, which has a useable storage volume of 30 acre-feet, primarily diverts water from the SFRR and the Gerle canal into the Robbs Peak tunnel and regulates inflow to the Robbs Peak powerhouse located on the northeast shore of Union Valley reservoir. Water is also released downstream from Robbs Peak dam by either passing over the spillway or through one 6-inch-diameter, diaphragm valve, low level outlet, which has a capacity of about 4 cfs at full pool. DWR requires that the Robbs Peak dam bulkhead gates be held in a full open position from October 1 through May 31, except that gate 2 may be closed for the full year. SMUD states that Robbs Peak reservoir has an average daily fluctuation of less than 0.5 foot and an annual fluctuation of about 5 feet (see table 3-2).

Ice House Reservoir

The primary purpose of Ice House reservoir is storage, and it has a useable storage volume of about 35,000 acre-feet. Water is released from the reservoir though the Jones Fork tunnel to the Jones Fork powerhouse located on the shoreline of the Union Valley reservoir. In addition, water can be released downstream from Ice House dam by either passing over the spillway or through one or both of two 10-inch-diameter globe valve low-level outlets and one 42-inch-diameter Howell-Bunger valve low-level outlet, which have a combined capacity of about 740 cfs at reservoir full pool. DWR requires that the spillway gates be held in the full open position from November 1 through April 1. Between April 1 and April 15, water may be impounded to the top of the spillway gates (elevation 5,445.0 feet). After April 15, water level may be increased to elevation 5,447.0 feet (figure 3-6). During October, the water level must be lowered gradually to elevation 5,436.5 feet, the spillway crest.

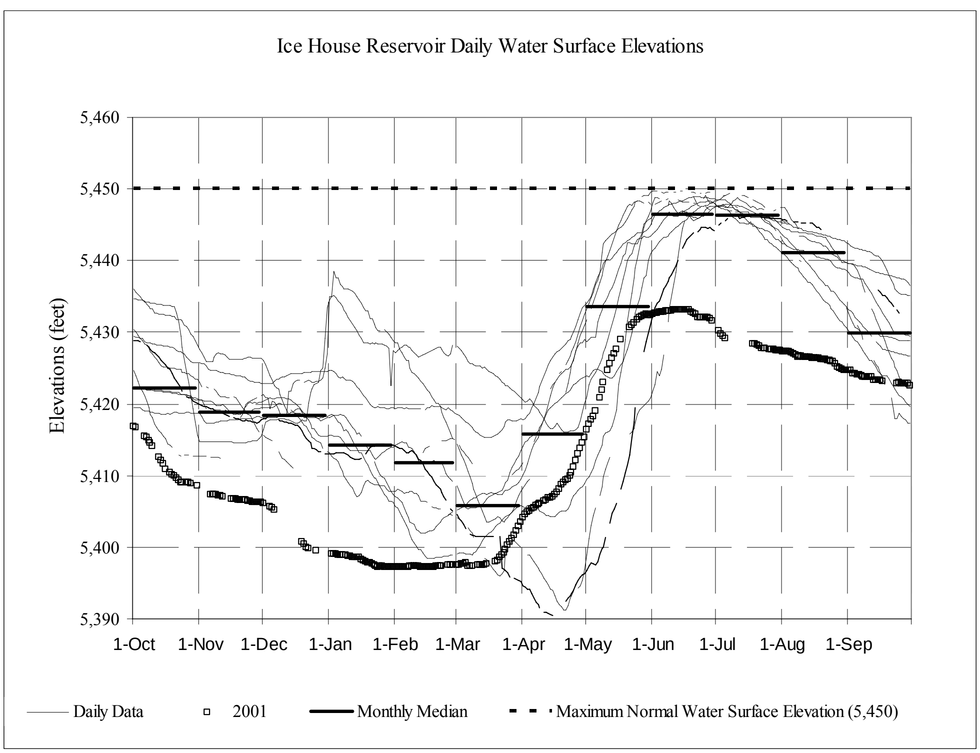

Figure 3-6. Ice House reservoir daily water surface elevations. (Source: CDEC, 2007)

Union Valley Reservoir

The primary purpose of Union Valley reservoir is storage, and it is the largest reservoir in the UARP and Chili Bar Project area, with a useable storage volume of about 266,000 acre-feet. Water is released from the reservoir though the Union Valley tunnel to the Union Valley powerhouse located on Junction reservoir, which serves as an afterbay for Union Valley powerhouse. Union Valley dam does not have a low level outlet. DWR requires that the spillway gates be held in the full open position from November 1 through April 1. Between April 1 and April 15, water may be impounded to elevation 4,865 feet. After April 15, water level may be increased to elevation 4,867.0 feet, near the maximum normal elevation of 4,870 feet (figure 3-7). During October, water level must be lowered gradually to elevation 4,855.0 feet, the spillway crest.

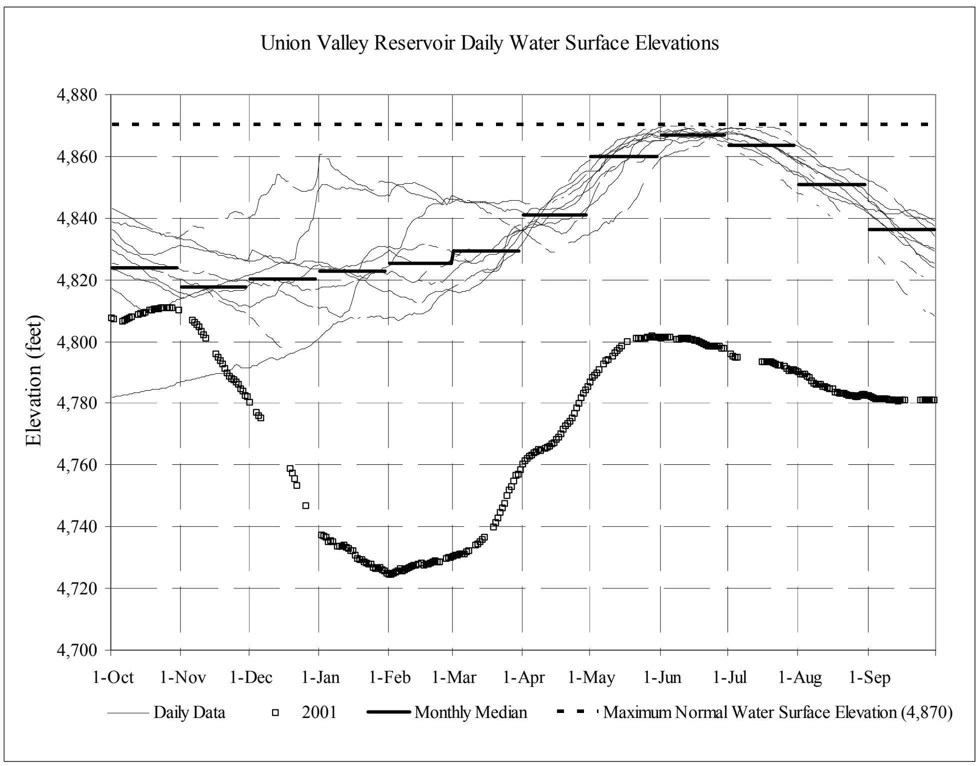

Figure 3-7. Union Valley reservoir daily water surface elevations. (Source: CDEC, 2007)

Junction Reservoir

The primary purpose of Junction reservoir is to act as a regulating afterbay for Union Valley powerhouse and a regulating forebay for the Jaybird tunnel, which leads to the Jaybird powerhouse. Water released from the Jaybird powerhouse flows directly into Camino reservoir. In addition, water is also released downstream from Junction dam by either passing over the spillway or through one 18-inch-diameter hollow cone valve low-level outlet, which has a maximum capacity of about 138 cfs at reservoir full pool (elevation 4,450 feet). Junction reservoir has a useable storage volume of 2,140 acre-feet, an average daily fluctuation of about 20 feet, and an annual fluctuation of about 32 feet (see table 3-2).

Camino Reservoir

Camino reservoir is a regulating afterbay for the Jaybird powerhouse and one of two regulating forebays for the Camino powerhouse. Brush Creek dam forms the other regulating forebay for the Camino powerhouse. Water is directed from Camino reservoir into the Camino tunnel, which joins the Brush Creek tunnel. Water is also released downstream from Camino dam by either passing over the spillway or through one 18-inch-diameter hollow cone valve low-level outlets, which has a capacity of about 112 cfs at full pool. Camino reservoir has a useable storage volume of 489 acre-feet, an average daily fluctuation of about 20 feet, and an annual fluctuation of about 30 feet (see table 3-2).

Brush Creek Reservoir

Unlike the Camino reservoir and other reservoirs within the UARP, Brush Creek reservoir is often operated to provide spinning reserves for reliability purposes. It is also used to generate maximum peak power during emergency and other short-term situations, such as when all available generating units are expected to operate at full load for short periods of time. Under this super-peaking operating mode, the daily water level may fluctuate up to 20 feet, ranging between the operating pool levels of 2,895.0 and 2,915.0 feet. During the appropriate nighttime periods of the next 2 to 3 days following this operating mode, SMUD typically shuts down the operation of the Camino powerhouse while operating the Jaybird powerhouse. Concurrently, the water exiting the Jaybird powerhouse is transported via the Camino and Brush Creek tunnels to refill Brush Creek reservoir. Water is released downstream from Brush Creek dam by either passing over the spillway or through a low-level outlet, which has a capacity of about 145 cfs at full pool. Brush Creek reservoir has a useable storage volume of 374 acre-feet and an average annual fluctuation of less than 1 foot (see table 3-2).

Slab Creek Reservoir

Slab Creek reservoir is a regulating afterbay for the Camino powerhouse and a regulating forebay for the White Rock powerhouse, which releases into PG&E's Chili Bar reservoir. Under the Proposed Action, Slab Creek reservoir also would function as the lower reservoir for the Iowa Hill development. Water is released from the reservoir through the White Rock tunnel. Water is also released downstream from Slab Creek dam by either passing over the spillway or through one 24-inch-diameter Howell-Bunger valve low-level outlet, which leads either to the Slab Creek powerhouse or a bypass facility if the powerhouse is not operating. The low-level outlet valve has a capacity of about 270 cfs at full pool. Slab Creek reservoir has a useable storage volume of 5,580 acre-feet, an average daily fluctuation of about 6 feet, and an annual fluctuation of about 30 feet (see table 3-2 and figure 3-8).

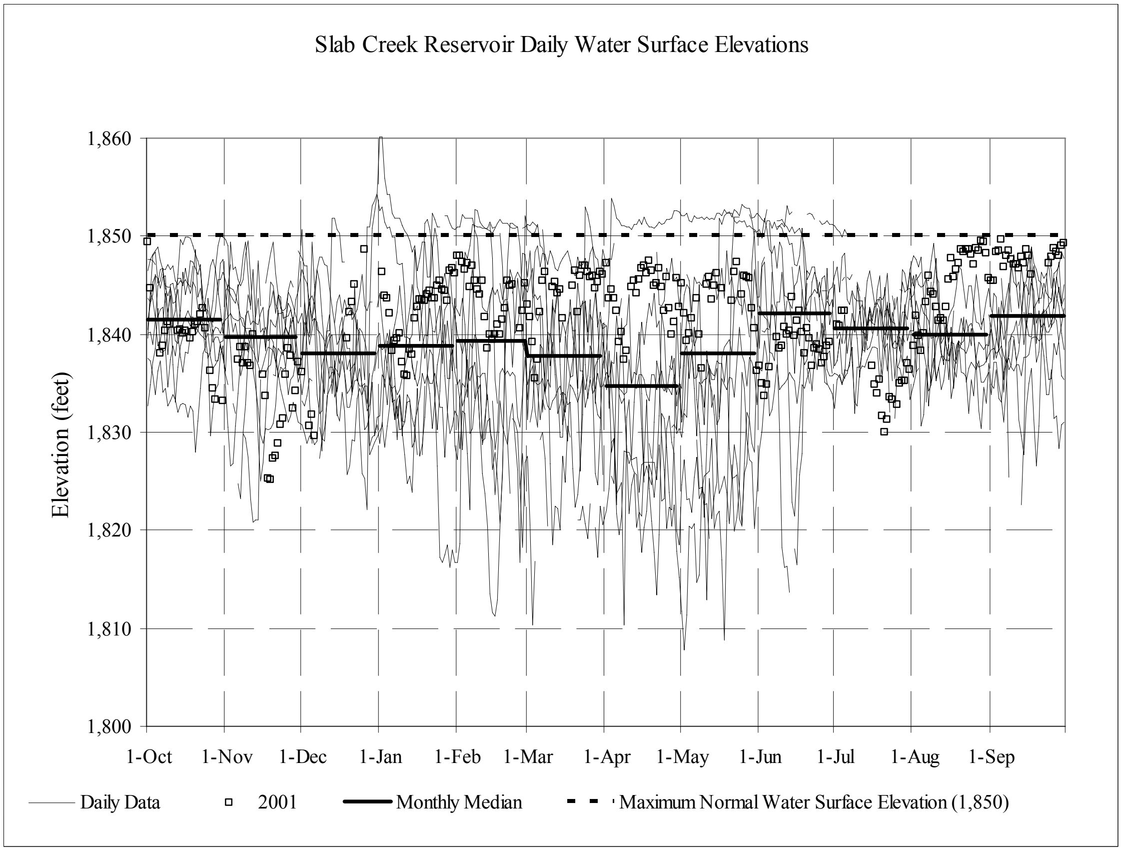

Figure 3-8. Slab Creek reservoir daily water surface elevations. (Source: CDEC, 2007)

Chili Bar Reservoir

PG&E's Chili Bar reservoir is a regulating afterbay for SMUD's White Rock powerhouse and a regulating forebay for PG&E's Chili Bar powerhouse. Water is released from the reservoir through the penstock leading to the powerhouse located near the base of the dam or though the spillway. PG&E describes the operation of Chili Bar as a reregulation facility from the upstream SMUD system to maintain the desired flow regime in the SFAR during peaking operations at White Rock powerhouse while providing minimum and recreational flow releases to downstream reaches. Chili Bar reservoir has a useable storage volume of 1,088 acre-feet, an average daily fluctuation of 4.2 feet and normally not exceeding 7 feet per day, and an annual variation of about 14.5 feet (see table 3-2).

Flow in Project Reaches

Twelve sections of river (about 81 river miles, excluding reservoirs) are affected by the UARP through either a bypass of water around the section of river via a Project tunnel or canal, or storage at and release of water from a UARP dam directly into the reach (see figure 3-1). These sections of river are called Project reaches, and are mostly named after the UARP facility from which the water is diverted or stored. The downstream end of each Project reach is established by a UARP facility (typically the normal high water line of the next downstream reservoir), a non-UARP reservoir, or the confluence with a major tributary.

The volume of water flowing in the different Project reaches is a function of three factors: (1) minimum releases at Project reservoirs; (2) accretion provided by various tributaries within the reaches; (3) and spill from the reservoirs. SMUD is currently required to release minimum water quantities for the protection of aquatic resources in downstream reaches. The minimum releases required by the current license generally vary by month and water year type. Four water year types are specified in the current license, with each defined by the total annual volume of water inflow to Folsom Lake, which is located downstream of the UARP on the main stem of the American River:

- Type 1—Inflow less than 1.0 million acre-feet
- Type 2—Inflow between 1.0 to 1.499 million acre-feet
- Type 3—Inflow between 1.5 to 1.999 million acre-feet
- Type 4—Inflow greater and equal to 2.0 million acre-feet.

Accretion is an important factor in determining flows in the Project reaches. A characteristic feature of the UARP area is the high level of seasonal variability in runoff, which dictates the distribution and volume of accretion that flows into the UARP reaches. The majority of the runoff in the different watersheds occurs during the snowmelt period, roughly between April and June, when melting snow runs off the dominant metamorphic and granitic rock surfaces. Little water is retained in the watersheds beyond the runoff period due to the shallow soil deposits overlaying the rock surfaces. Thus, the difference in volume of water flowing in Project reaches between spring and summer is substantial, ranging from many hundreds of cfs to less than 1 cfs, or in some cases no flow. The typical spring snowmelt runoff pattern of the upper reaches is replaced in the lower reaches by a winter runoff pattern. In the Junction, Camino, and Slab Creek reaches, for example, the accretion attains its highest point in February and March.

Spill from UARP reservoirs into the Project reaches occurs with varying levels of frequency and magnitude. In general, spills are less frequent at the three large storage reservoirs, Loon Lake, Union Valley, and Ice House. These reservoirs often have sufficient storage capacity to capture the snowmelt flows without spilling, except in wetter water years. The afterbay/forebay reservoirs (such as Junction, Camino, Gerle Creek, and Robbs Peak) spill more frequently due to their limited size compared to the volume of accretion flows that originate within their watersheds.

The existing flow regime in each Project reach is discussed below. Tables 3-3 through 3-11 (at the end of this discussion) summarize the reach data and terminology, current required minimum streamflows and streamflow data for the reaches with seasonally adjusted minimum streamflow requirements and USGS gages in the Project reaches.

Rubicon Dam Reach

The existing flow regime in the Rubicon dam reach is highly variable, due primarily to accretion flows associated with snowmelt runoff. The existing release schedule for Rubicon dam requires a year-round minimum release of 6 cfs as measured at USGS gage no. 11427960 (Rubicon River below Rubicon Lake) or natural inflow from the Rubicon River. During the late summer/early fall period, when inflow falls below 1 cfs or to zero SMUD usually releases 1 cfs from the dam. Generally, accretion in the Project reach is also zero during this low-flow period, which results in the 1 cfs release extending throughout the entire reach, even past Miller Creek, which typically dries up in summer. The sole augmentation of flow in this reach during this period occurs at the confluence with the Little Rubicon River, where the 1 cfs released by SMUD from Buck Island reservoir enters the Rubicon River.

During the snowmelt runoff, flows in the reach are substantially higher than the minimum release value of 6 cfs because of the substantial accretion runoff. Monthly median values for accretion throughout the reach during the snowmelt period climb to values of approximately 200 to 250 cfs. Winter base flows are generally low, however, due to the fact that much of the precipitation that falls on the Project reach watershed is in the form of snow that remains frozen during winter. Spill at Rubicon reservoir occurs during the spring snowmelt period, generally in wetter water years. Flow is diverted at Rubicon Lake by the Rubicon –Rockbound tunnel to Rockbound reservoir. Flow in the diversion tunnel typically peaks in May with a monthly mean and median of 300 cfs, and reaches its minimum in September with a monthly mean and median less than 15 cfs.

Rockbound Dam Reach

The Rockbound dam reach is a 0.3-mile ungaged segment of stream that lies between Rockbound Lake, a non-UARP facility, and Buck Island reservoir. Rockbound Lake is a natural lake with a small non-UARP masonry dam at its outlet. At Rockbound Lake, dam maintenance and operation are CDFG's responsibility. Because the dam outlet facilities are currently inoperable, flows out of Rockbound Lake are the result of water passing over the dam into the stream reach. The existing flow regime in the stream reach is a combination of water diverted from the Rubicon River at Rubicon reservoir (and passed through the Rubicon-Rockbound tunnel into Rockbound Lake) and natural flows in Highland Creek, which also enter Rockbound Lake. SMUD estimates that Highland Creek (the main natural tributary to Rockbound Lake) has peak flows of about 100 cfs during high snowmelt periods. During low-flow periods (such as during the summer and early fall), inflow to the lake from all sources often ceases. During these times, flows out of Rockbound Lake into the reach are at constant levels of less than 1 cfs from leakage at the outlet facilities of the masonry dam.

Buck Island Dam Reach

The existing flow regime in the Buck Island dam reach is very similar to that of the Rubicon dam reach. Once the snowmelt runoff has ceased, generally by July, flows in the entire watershed quickly fall to zero. This is true of Highland Creek, the feeder stream that provides the majority of natural inflow to Buck Island reservoir, and of the watershed downstream of the reservoir. There are no tributaries of significance along the 2.5-mile reach of the Little Rubicon River before its confluence with the Rubicon River, resulting in very minor accretion values during the dry months. The year-round minimum release schedule for Buck Island reservoir is 1 cfs, measured at USGS gage no. 11428400 (Little Rubicon River below Buck Island dam) for all months and water year types. This reservoir release is augmented by snowmelt accretion in April and May, although it is of a reduced volume compared to the Rubicon River. Spill at Buck Island dam, which is not presently measured by the downstream USGS gage, into the reach generally coincides with the spill events at Rubicon reservoir and occurs primarily in wet water years. Flow is diverted at Buck Island reservoir by the Buck Island-Loon Lake tunnel to Loon Lake reservoir. Flow in the diversion tunnel typically peaks in May and June with a monthly mean and median near 300 cfs, and reaches its minimum in August and September with a monthly mean and median less than 20 cfs.

Loon Lake Dam Reach

The existing flow regime in the Loon Lake dam reach is similar in nature to that of the other high elevation Project reaches. The existing license requires a year-round minimum release of 8 cfs from Loon Lake into Gerle Creek during all months and all water year types as measured at USGS gage no. 11429500 (Gerle Creek below Loon Lake). Unlike Rubicon and Buck Island reservoirs, which have limited storage capacity, releases at Loon Lake during the summer/fall period are not contingent upon the natural inflow from Ellis Creek, which typically dries up during summer. Instead, because there is greater storage capacity, releases from Loon Lake reservoir remain fixed at 8 cfs all summer and fall. Generally, during this low-flow period, accretion is insignificant, which results in about 8 cfs, throughout the course of the 8.5-mile-long reach to Greek Creek reservoir.

During the snowmelt runoff, flows in the reach are substantially higher than the minimum release value of 8 cfs. SMUD estimates the total-reach accretion amounts during the snowmelt period reach as about 100 to 150 cfs in AN and BN water years. The substantial storage capacity of Loon Lake reservoir and its location at the uppermost end of the watershed result in very infrequent spill, which is presently measured at the USGS gage below the dam. SMUD states that daily flows from reservoir releases and accretion through the reach during the winter and spring are quite variable, with short duration peaks in winter reaching highs near 1,000 cfs in some years. Flow is diverted at Loon Lake reservoir to the Loon Lake powerhouse (measured by USGS gage no. 11429340). SMUD states the Loon Lake powerhouse is typically operated as a daily peaking unit with high load settings and is turned off during non peaking periods. The average daily flow at the Loon Lake powerhouse peaks in June, with a mean and maximum in excess of 200 cfs. The powerhouse is not operated many days during many months other than during the spring. Water is discharged from the Loon Lake powerhouse to Gerle Creek reservoir via a 3.8-mile-long tunnel.

Robbs Peak Dam Reach

The existing flow regime in the Robbs Peak dam reach is a function of releases from Robbs Peak and Gerle Creek dams, spill events at both dams, and accretion along the 5.9-mile-long reach of the SFRR down to its confluence with the main stem Rubicon River. Major inflow sources to Gerle Creek dam include the discharge from the Loon Lake powerhouse and Gerle Creek. At the small Gerle Creek reservoir, water is diverted to Robbs Peak reservoir via a 1.9-mile-long canal (see figures 3-1 and 3-2). The release from Gerle Creek dam enters the Robbs Peak dam reach 1.1 miles downstream of Robbs Peak dam. The current license requires a combined release from the two dams ranging from 5 to 11 cfs measured at USGS gage no. 11430000 (SFRR below Gerle Creek) depending on month and water year type. These releases constitute the primary sources of flow at the confluence of the SFRR and Gerle Creek, as each segment of the reach extends about 1 mile, with little contribution from accretion. Downstream of the confluence of SFRR and Gerle Creek, the reach drops precipitously through a deeply incised canyon with no major tributaries. Accretion within the reach is low given the lack of tributaries. During the spring runoff period, the median monthly accretion throughout the reach is between 40 and 100 cfs in BN and AN water years. Similarly, accretion in summer/fall is about 5 to 10 cfs.

Flow from Robbs Peak reservoir is diverted by a 3.6 mile tunnel and penstock to the Robbs Peak powerhouse along the shoreline of Union Valley reservoir, within the Silver Creek portion of the SFAR watershed. Because Robbs Peak powerhouse relies largely on water from Loon Lake and lesser amounts from

Gerle Creek and Robbs Peak reservoirs, Robbs Peak powerhouse operates similarly to Loon Lake powerhouse as a daily peaking unit with high load settings and is turned off during non peaking periods.

Ice House Dam Reach

The existing flow regime in the Ice House dam reach is similar to that of the other high elevation Project reaches although the elevation of the reach is about 1,000 feet lower than the others. The existing release schedule at Ice House dam (as measured at USGS gage no. 11441500, SFSC below Ice House dam), ranges from winter lows of 3 cfs to summer highs of 15 cfs in wet years, but is less variable in other water year types. Despite the fact that inflow to Ice House reservoir from the SFSC typically falls to very low values in late summer and early fall, releases from Ice House dam during this low-flow period are between 5 and 15 cfs because of the reservoir's storage capacity. Generally, during this low-flow period, accretion in the reach below the dam is low with normal rates less than 10 cfs, which results in the 5 to 15 cfs releases accounting for a substantial amount of the stream flow throughout the course of the 11.5-mile-long reach.

During the snowmelt runoff, flows in the Ice House reach are substantially higher than the minimum release values because of the substantial accretion runoff from tributaries. Daily flows in the reach during winter and spring are quite variable, with short duration peaks in winter reaching highs of over 1,000 cfs. Like the other high elevation reaches, winter base flows are generally low because precipitation that falls on the watershed in the form of snow remains frozen during winter. Ice House reservoir does not spill regularly. Flow is diverted at Ice House reservoir to the Jones Fork powerhouse (measured by gage no. 11440900) on the shoreline of Union Valley reservoir. The Jones Fork powerhouse is typically operated as a daily peaking unit with high load settings and is turned off during non peaking periods. The amount of flow diverted to Jones Fork powerhouse typically peaks in June, with median monthly flows slightly above 70 cfs, and decreases to flows less than 10 cfs in October and November.

Junction Dam Reach

In contrast to the upstream Project reaches, the flow regime in the Junction dam reach is influenced by different timing of minimum releases, accretion, and spill events. The minimum release schedule from Junction dam ranges from a low of 5 cfs to a high of 20 cfs depending upon month and water year type. Flows up to 40 cfs are measured by USGS gage no. 11441800 (Silver Creek below Junction dam). Flows in the reach are augmented by accretion from small tributaries that enter Silver Creek over the 8.3-mile reach. However, because of the lower elevation of the Project reach watershed, the timing of accretion flow is shifted with respect to that of the higher elevation Project reaches. Most of the precipitation that falls into the reach watershed does so as rain during winter storms. Therefore the pattern of accretion runoff peaks in February and March, with median monthly flows of between 100 and 150 cfs in BN and AN water years. Another feature of the accretion pattern evident in the Junction dam reach is the higher volume of inflow entering Silver Creek in the summer/fall. In contrast to the upper reaches of the UARP, the watersheds in the lower reaches have deeper soil layers overlaying the bedrock, resulting in more moisture retention into the summer/fall, and thus, more accretion during the low-flow period. The resulting daily flows in Silver Creek downstream of Junction dam range from summer/fall lows of 20 to 40 cfs to winter highs of 100 to 200 cfs. The pattern of flow in the reach is more variable because the high flow events are dominated by winter rain events rather than by a sustained snowmelt.

Spill events occur in AN and Wet water years, typically during winter storms, due in part to the inflow from SFSC and Little Silver Creek, a direct tributary to Junction reservoir. February and March spill rates during normal and wet years range from about 500 to 2,000 cfs. Flow is diverted at Junction reservoir to the Jaybird powerhouse (measured by gage no. 11441780) located at Camino reservoir. SMUD states that the normal operation of Jaybird powerhouse is continuous baseload due to discharge problems with two generators, but preferred operation is full load daily peaking. The amount of flow diverted to Jaybird powerhouse typically peaks in May with median monthly flows near 900 cfs and decreases to median flows near 350 cfs in October and November.

Camino Dam Reach

The existing flow regime in the Camino dam reach is very similar to that of the Junction dam reach, and the timing of flows in the reach is driven by the similar influences. The minimum release schedule of Camino dam is the same as Junction dam, ranging from 5 to 20 cfs, depending upon month and water year type. Flow is measured at USGS gage no. 11441900 (Silver Creek below Camino dam), which also measures spillage from the dam. The volume and timing of accretion entering the Camino dam reach differs from the Junction dam reach due to its lower elevation and lack of substantial tributaries in its 6.2 mile distance. Due to the lower elevation of the reach, most of the winter precipitation falls as rain, resulting in highest flows occurring in the winter. The accretion pattern in summer and fall in the Camino dam reach is similar to that described in the Junction dam reach, but the volume is lower. The median monthly accretion levels in the Camino dam reach are generally less than 10 cfs, and the resulting daily flows in the Camino dam reach range from summer lows of approximately 10 to 20 cfs to winter highs of between 50 and 100 cfs.

SMUD states that spills into the Camino dam reach occur in Wet and AN years, mostly in the winter months of February and March, and normal spill rates are about 500 to 2,000 cfs. Flow is diverted at Camino reservoir to the Camino powerhouse (measured by gage no. 11441895), located upstream of Slab Creek reservoir. According to SMUD, normal unit operation is near full load during peak periods of the day, when water is available. The amount of flow diverted to Camino powerhouse typically peaks in July through September with median monthly flows over 700 cfs and decreases to median flows near 350 cfs in October and November.

The confluence of Silver Creek with the SFAR occurs about 2.8 miles upstream of the Camino powerhouse. The El Dorado Project (FERC Project No. 184) is located on the SFAR and consists of four lakes in the upper portion of the watershed and operated by EID to supplement flows in the SFAR. EID operates these lakes to retain spring and early summer snowmelt for releases later in the year. This allows EID to meet the consumptive needs of its downstream water users during the drier July through the early winter period. EID diverts water from the SFAR at a diversion dam about 22 river miles upstream of the Camino powerhouse as well as from small tributaries along the south side of the SFAR above the confluence with Silver Creek. EID withdraws a total of 15,080 acre-feet per year at rates up to 40 cfs in April through October and 10 to 20 cfs the reminder of the year (FERC, 2003). The water diverted into the canal, which has an annual mean flow of 100 cfs (FERC, 2003), in excess of that needed for downstream consumptive users is directed to the El Dorado powerhouse located along the SFAR just upstream of the Camino powerhouse. According to the USGS (USGS, 2007), flows in the SFAR downstream of the El Dorado diversion dam, as measured at USGS gage 11439500 (SFAR near Kyburz), peak in May with a monthly median flow near 1,000 cfs and quickly decrease to monthly median flows near 50 cfs during the July through November.

Brush Creek Dam Reach

The existing flow regime at Brush Creek dam is primarily the result of releases from Brush Creek dam and accretion over the 2.2-mile Project reach. Minimum releases from the dam range between 2 and 6 cfs, depending on month and water year type, as shown in table 3-9. These flows are measured at USGS gage no. 11442700 (Brush Creek below Brush Creek reservoir). No major tributaries enter Brush Creek along its short and steep descent to Slab Creek reservoir, therefore the only flow augmentations to the dam releases are the accretion flows that accumulate within the immediate watershed of the stream segment. SMUD states that the median monthly accretion during the winter runoff period range between 10 to 20 cfs and drops to 1 to 2 cfs in summer and fall.

Slab Creek Dam Reach

The existing minimum release schedule at Slab Creek dam ranges from 10 to 36 cfs, depending on month and water year type, and flows are measured at USGS gage no. 11443450 (SFAR near Camino), which also measures spillage from Slab Creek dam. Reach flows are augmented by several tributaries that flow into the SFAR along the 8.0-mile reach, including Iowa Canyon, Mosquito, and Rock Creek. Rock Creek, which is located about 5 miles downstream of Slab Creek dam, is the largest of the tributaries, draining a watershed of 74.5 square miles. On Rock Creek, there are diversion weirs that divert water to the Rock Creek powerhouse (FERC Project P-3189 operated by Enel North America Inc.), which is operated in a run-of river-mode and only when inflow is greater than the minimum flow requirements (FERC, 2003). Combined inflow to the SFAR from the powerhouse and bypassed reach[28] of Rock Creek peak in March and April, with flows near 50 cfs, and low flows occur in August through October, with flows slightly under 10 cfs. SMUD estimates that during February and March, these tributaries contribute median monthly accretion of about 200 to 300 cfs in BN and AN water years and 15 to 30 cfs during the summer/fall low flow period.

Spill at Slab Creek dam occurs primarily during winter and spring. Winter storms, such as rain-on-snow events in the upper SFAR Basin, can result in large, short-duration flows entering Slab Creek reservoir and spill events at the dam. Also, in Wet and AN water years, the SFAR spring snowmelt often leads to flows that exceed the capacity of Slab Creek reservoir and the White Rock tunnel, resulting in spillage at the dam. The AN and Wet year spring spill events are generally longer in duration (lasting for weeks and months) and lower in magnitude, generally augmenting flow in the reach by less than 10,000 cfs.

Flow is diverted by a 4.9 mile tunnel from Slab Creek reservoir to the White Rock powerhouse (measured by gage no. 11443460) on Chili Bar reservoir. Normal unit operation is near full load during peak periods of the day, when water is available, and the powerhouse is commonly shutdown during off peak periods. The amount of flow diverted to White Rock powerhouse typically peaks in May, with median monthly flows near 2,100 cfs, and decreases to median flows near 450 cfs in October and November. The Slab Creek powerhouse is located at the base of Slab Creek dam and has a maximum hydraulic capacity of 36 cfs. The powerhouse uses the minimum flow releases for power generation.

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[28] Median flows for USGS gage no. 11444280, Rock Creek powerhouse near Placerville, and USGS gage no. 11444201, Rock Creek near Placerville.

Chili Bar Dam Reach

The existing minimum release at Chili Bar dam is 100 cfs, but according to PG&E, due to Project operations, the minimum flow released is typically 200 cfs. This flow is measured at USGS gage no. 11444500 (SFAR near Placerville) and also measures powerhouse flow and dam spillage. Flows in the reach are augmented by several tributaries such as Greenwood and Weber creeks in the 19.1-mile reach downstream of Chili Bar dam before the tailwater associated with the large Folsom reservoir. As is the case with the Slab Creek dam reach, accretion from these low elevation tributaries can be substantial during runoff from winter rain events, but accretion is low during the June through October period.

PG&E operates the Chili Bar powerhouse near the base of the dam as a daily peaking plant during the mid June through October period or when water is not available to operate the plant at full capacity. This operation normally results in the flow changing from about 200 to about 2,000 cfs during most days, but in drier years the flows typically peak between 1,100 and 1,500 cfs. On other days or periods when more flow is available, outflow from White Rock powerhouse and spillage over Chili Bar dam can cause daily flows to reach over 3,600 cfs. Median daily flows as measured at USGS gage no. 11444500, peak at 2,300 cfs in May and are below 600 cfs in October and November. Short-duration spillage at Chili Bar dam occurs on a relatively regular basis, similar to Slab Creek dam, from winter storm events. Longer duration spillage flows are common during normal and wet years during peak snowmelt periods from the upper watershed.

Tables 3-4 through 3-10 summarize the current minimum streamflow requirements for the stream reaches which vary by water year type and or month. The current minimum streamflow requirement for the SFAR below Chili Bar dam is 100 cfs regardless of the water year type.

Table 3-3. Data for Project reaches. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

Section	Reach Name	Upstream and Downstream Termini	Length (miles)	Elevation Range (feet, from base of dam)	Average Gradient (percent)
Main Stem	Rubicon dam	Rubicon dam–Miller Creek	4.2	6,509–6,046	1.9
Little Rubicon	Rockbound dam	Rockbound dam–Buck Island reservoir	0.3	6,529–6,436	7.2
	Buck Island dam	Buck Island dam–Rubicon River	2.5	6,413–5,945	2.9
Gerle Creek	Loon Lake dam	Loon Lake dam–Gerle reservoir	8.5	6,320–5,231	2.3
Gerle Creek (cont.)	Gerle Creek dam	Gerle Creek dam–SFRR	1.2	5,170–4,980	3.5
SFRR	Robbs Peak dam	Robbs Peak dam–Rubicon River	5.9	5,817–3,540	5.5
Silver Creek	SFSC	Ice House dam–Junction reservoir	11.5	5,300–4,450	1.4
	Main Stem	Junction dam–Camino reservoir	8.3	4,290–2,915	3.2
		Camino dam–SFAR	6.2	2,810–2,055	2.3
SFAR	Brush Creek	Brush Creek dam–Slab Creek reservoir	2.2	2,710–1,850	9
	Main Stem	Silver Creek–Slab Creek reservoir	2.8	2,055–1,850	1.2
	Main Stem	Slab Creek dam–Chili Bar reservoir	8	1,650–995	1.5
	Main Stem	Chili Bar dam–Folsom reservoir	19.1	930–430	0.5

Table 3-4. Current minimum streamflow requirements (cfs) for SFRR below Robbs Peak dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	1	1	3	3
November	1	1	1	1
December	1	1	1	1
January	1	1	1	1
February	1	1	1	1
March	1	1	1	1
April	1	1	1	1
May	1	1	3	3
June	1	1	3	3
July	1	1	3	3
August	1	1	3	3
September	1	1	3	3

Table 3-5. Current minimum streamflow requirements (cfs) for Gerle Creek below Gerle Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	4	4	7	7
November	4	4	4	4
December	4	4	4	4
January	4	4	4	4
February	4	4	4	4
March	4	4	4	4
April	4	4	4	4
May	4	4	7	7
June	4	4	7	7
July	4	4	7	7
August	4	4	7	7
September	4	4	7	7

Table 3-6. Current minimum streamflow requirements (cfs) for SFSC below Ice House dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	5 or NF	5 or NF	12 or NF	12 or NF
November	5 or NF	5 or NF	10/4 or NF	10/4 or NF
December	5 or NF	5 or NF	4 or NF	4 or NF
January	5 or NF	5 or NF	3 or NF	3 or NF
February	5 or NF	5 or NF	3 or NF	3 or NF
March	5 or NF	5 or NF	3 or NF	3 or NF
April	5 or NF	5 or NF	3 or NF	3 or NF
May	5 or NF	5 or NF	8 or NF	8 or NF
June	5 or NF	5 or NF	8 or NF	8 or NF
July	5 or NF	5 or NF	15 or NF	15 or NF
August	5 or NF	5 or NF	15 or NF	15 or NF
September	5 or NF	5 or NF	15 or NF	15 or NF

Note: NF – natural flow

Table 3-7. Current minimum streamflow requirements (cfs) for Silver Creek below Junction dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	5	10	15	20
November	5	6	8	10
December	5	6	8	10
January	5	6	8	10
February	5	6	8	10
March	5	6	8	10
April	5	6	8	10
May	5	10	15	20
June	5	10	15	20
July	5	10	15	20
August	5	10	15	20
September	5	10	15	20

Table 3-8. Current minimum streamflow requirements (cfs) for Silver Creek below Camino dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	5	10	15	20
November	5	6	8	10
December	5	6	8	10
January	5	6	8	10
February	5	6	8	10
March	5	6	8	10
April	5	6	8	10
May	5	10	15	20
June	5	10	15	20
July	5	10	15	20
August	5	10	15	20
September	5	10	15	20

Table 3-9. Current minimum streamflow requirements (cfs) for Brush Creek below Brush Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	2	2	3	3
November	4	4	6	6
December	4	4	6	6
January	4	4	6	6
February	4	4	6	6
March	4	4	6	6
April	4	4	6	6
May	4	4	6	6
June	2	2	3	3
July	2	2	3	3
August	2	2	3	3
September	2	2	3	3

Table 3-10. Current minimum streamflow requirements (cfs) for SFAR below Slab Creek dam. (Source: SMUD, 2005, as modified by staff)

Month	Type 1	Type 2	Type 3	Type 4
October	36	36	36	36
November	36/10	36/10	36	36
December	10	10	36	36
January	10	10	36	36
February	10	10	36	36
March	10	10	36	36
April	10	10	36	36
May	10	10	36	36
June	36	36	36	36
July	36	36	36	36
August	36	36	36	36
September	36	36	36	36

Table 3-11. Monthly discharge (cfs) statistics for gages in the Project area. (Source: USGS, 2007)

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Rubicon Development	**USGS Gage No. 11427940 Rubicon-Rockbound Tunnel (water years 1992–2005)**							**USGS Gage No. 11427960 Rubicon River below Rubicon Lake (water years 1992–2005)**						
Mean	58.0	365.4	313.5	115.9	16.1	2.8	101.8	5.9	7.5	7.2	6.6	4.9	3.0	5.9
Median	35.4	331.5	266.5	37.0	0.1	0.0	25.0	5.8	7.4	7.1	6.6	6.2	1.6	6.6
Max.	875	973	896	858	248	105	1,180	8.8	9.3	9.2	8.6	8.0	7.9	9.4
Min.	4.2	0.0	0.0	0.0	0.0	0.0	0.0	3.7	6.0	5.7	0.8	0.3	0.1	0.1
10% Exceed.	113.7	705.1	671.1	344.5	52.7	7.5	329.0	7.2	8.6	8.2	7.8	7.6	7.0	7.7
90% Exceed.	10.8	118.6	16.0	0.0	0.0	0.0	0.0	4.8	6.6	6.3	5.9	1.1	0.8	1.3
Buck Island Development	**USGS Gage No. 11428300 Buck-Loon Tunnel (water years 1992–2005)**							**USGS Gage No. 11428400 Little Rubicon River below Buck Island Dam (water years 1992–2005)**						
Mean	76.4	462.8	392.6	138.1	18.4	2.5	129.3	1.3	1.4	1.4	1.3	1.2	1.2	1.3
Median	48.0	429.5	335.5	35.0	0.6	0.1	31.0	1.2	1.3	1.3	1.2	1.2	1.2	1.3
Max.	940	1,160	1,070	1,040	313	80	1,160	1.8	2.0	1.8	1.6	1.7	1.5	2.0
Min.	5.7	16.0	0.5	0.0	0.0	0.0	0.0	0.7	1.0	1.0	1.0	1.0	1.0	0.0
10% Exceed.	157.8	899.0	854.2	441.5	54.4	1.3	427.0	1.4	1.6	1.6	1.4	1.4	1.4	1.5
90% Exceed.	14.4	152.2	19.9	0.2	0.0	0.0	0.0	1.1	1.2	1.2	1.1	1.1	1.1	1.1
Loon Lake Development	**USGS Gage No. 11429340 Loon Lake Powerhouse (water years 1992–2005)**							**USGS Gage No. 11429500 Gerle Creek below Loon Lake (water years 1992–2005)**						
Mean	117.4	188.1	273.4	233.3	185.4	101.0	150.1	10.4	13.7	10.3	10.6	9.7	9.8	10.6

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Median	40.5	143.5	222.0	199.5	152.5	12.0	52.0	10.1	10.0	9.9	9.5	9.5	9.5	9.9
Max.	796	1,030	990	935	869	773	1,030	27.0	403	16	50	13	13	403
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2	8.2	8.0	8.9	8.3	8.3	8.0
10% Exceed.	352.7	436.1	664.7	507.0	461.7	368.5	434.0	12.0	14.0	12.0	12.0	12.0	12.0	12.0
90% Exceed.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	9.1	8.9	9.2	8.9	8.7	8.9
Robbs Peak Development	**USGS Gage No. 11429300 Robbs Peak Powerhouse (water years 1992–2005)**							**USGS Gage No. 11430000 SF Rubicon River below Gerle Creek (water years 1992–2005)**						
Mean	252.4	500.6	404.8	252.0	184.4	101.7	267.6	20.5	40.3	14.1	10.5	10.5	10.7	19.2
Median	197.6	494.5	312.5	216.5	152.5	3.0	184.0	8.8	11.0	11.0	11.0	11.0	11.0	11.0
Max.	1,042	1,190	1,180	1,150	874	758	1,220	2,018	3,200	203	20	14	26	8,050
Min.	6.6	0.5	0.0	0.0	0.0	0.0	0.0	5.2	5.3	5.1	5.2	5.1	5.1	5.1
10% Exceed.	533.7	932.4	943.1	529.3	469.7	378.2	681.1	13.0	15.0	13.0	12.0	13.0	13.0	13.0
90% Exceed.	45.2	73.0	1.0	0.5	0.5	0.0	0.5	6.1	6.1	6.6	6.6	6.0	6.1	6.0
Ice House Development	**USGS Gage No. 11440900 Jones Fork Powerhouse (water years 1988–2005)**							**USGS Gage No. 11441500 South Fork of Silver Creek (water years 1988–2005)**						
Mean	56.8	77.7	93.4	61.4	62.0	67.9	63.3	8.0	13.4	26.5	16.5	13.4	13.5	11.6
Median	27.4	31.5	65.5	31.5	43.0	26.5	34.0	6.7	9.7	9.4	16.0	16.0	16.0	6.2
Max.	270	287	285	285	254	264	287	418	1,250	457	250	20	25	2,840
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	5.1	5.1	5.2	5.1	5.1	3.0
10% Exceed.	158.3	256.3	262.0	172.5	162.2	194.2	180.0	8.7	11.0	13.0	19.0	19.0	20.0	17.0

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
90% Exceed.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	5.8	5.6	5.7	5.6	5.5	4.8
Junction Development	**USGS Gage No. 11441780 Jaybird Powerhouse (water years 1992–2005)**							**USGS Gage No. 11441800 Silver Creek below Junction Dam (water years 1992–2005)**						
Mean	512.6	735.3	737.0	678.0	757.1	688.4	598.7	11.2	18.2	17.9	18.3	18.5	18.5	14.2
Median	440.6	777.0	654.0	647.5	758.0	723.5	492.0	12.4	21.0	21.0	21.0	21.0	21.0	11.0
Max.	1,331	1,400	1,400	1,490	1,390	1,370	1,490	26.9	30.0	23.0	27.0	30.0	28.0	37.0
Min.	0.0	0.0	0.0	0.0	0.5	0.0	0.0	5.7	5.6	5.6	5.7	5.7	5.6	5.4
10% Exceed.	1,032.5	1,390	1,390	1,237	1,280	1,200	1,287	13.9	22.0	22.0	22.0	23.0	22.0	22.0
90% Exceed.	74.7	74.7	181.8	280.3	337.8	194.7	106.0	6.8	11.0	11.0	11.0	11.0	11.0	6.9
Camino Development	**USGS Gage No. 11441895 Camino Powerhouse (water years 1988–2005)**							**USGS Gage No. 11441900 Silver Creek below Camino Dam (water years 1988-2005)**						
Mean	514.4	661.2	667.9	673.1	749.5	680.1	585.8	73.7	95.3	117.8	120.5	86.6	78.5	80.7
Median	402.9	378.0	520.5	636.5	761.0	705.0	453.0	15.1	15.3	16.9	18.4	19.6	20.5	20.1
Max.	1,407	1,560	1,510	1,530	1,440	1,470	1,560	5,904	6,868	7,177	6,941	2,247	2,017	6,504
Min.	1.2	0.0	0.0	0.0	4.0	0.0	0.0	5.7	5.6	5.6	5.6	5.6	5.5	5.3
10% Exceed.	1,057.7	1,440	1,450	1,160	1,260	1,162	1,310	62.5	101.0	214.5	215.5	210.4	195.3	184.7
90% Exceed.	107.1	85.0	131.3	279.4	338.0	245.9	116.0	7.5	7.3	7.2	7.0	7.0	6.9	6.5
Slab Creek Development	**USGS Gage No. 11443460 Whiterock Powerhouse (water years 1988–2005)**							**USGS Gage No. 11443500 SFAR near Camino, CA (water years 1988–2005)**						
Mean	974.4	1,884.3	1,482.6	971.8	841.9	759.1	1,062.7	130.5	282.5	287.4	93.1	36.9	37.3	122.0

	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly	Avg. (Oct–Apr)	May	Jun	Jul	Aug	Sept	Yearly
Median	810.2	1,680	1,055	795.5	768.0	723.0	755.0	36.4	37.0	38.0	37.0	37.0	37.0	37.0
Max.	3,304	3,940	3,910	3,860	2,710	2,740	3,950	10,249	12,400	4,260	2,800	43	42	48,900
Min.	0.0	226.0	1.0	0.0	0.0	0.0	0.0	13.3	10.0	28.0	36.0	29.0	29.0	10.0
10% Exceed.	1,903	3,530	3,271	1,876	1,520	1,360	2,600	68.2	248.6	905.1	40.0	40.0	40.0	40.0
90% Exceed.	272.2	541.6	324.9	314.4	308.7	233.9	229.0	13.7	10.0	36.0	36.0	36.0	36.0	10.0
	Brush Creek Development USGS Gage No. 11442700 Brush Creek below Brush Creek Dam (water years 1988–2005)							**Chili Bar Development USGS Gage No. 11444500 SFAR near Placerville (water years 1988–2005)**						
Mean	6.1	6.1	3.5	3.2	3.2	3.2	5.1	1,238.1	2,377.6	1,883.1	1,114.8	925.6	838.3	1,316.1
Median	6.3	6.6	3.4	3.4	3.4	3.4	4.4	960.9	1,835	1,195	903.0	836.5	766.5	854.0
Max.	97.6	9.3	8.8	6.9	4.1	7.6	620	15,064	16,900	7,000	5,770	2,760	2,890	57,100
Min.	3.8	4.2	2.2	2.1	2.1	2.1	2.1	142.0	210.0	125.0	114.0	130.0	113.0	98.0
10% Exceed.	6.7	7.1	4.4	4.0	3.8	3.9	7.0	2,335.8	4,360	4,789	2,016	1,600	1,480	3,020
90% Exceed.	4.1	4.4	2.4	2.4	2.3	2.4	2.6	337.0	583.4	400.8	388.0	390.4	342.0	313.4

Note: All data for 1988 to 2005 water years.

Water Use

As table 3-12 shows, SMUD currently holds five licenses and one permit issued by the Water Board for water rights related to the UARP. These water rights authorize SMUD to directly divert and store water to generate hydroelectric power, provide recreation, and protect wildlife at its UARP facilities. PG&E is also listed as a water user for hydroelectric power use at its Chili Bar Project facilities. The current water rights licenses and permits incorporate the minimum instream flow releases mandated in the current Commission license. To improve water quality and benefit aquatic resources, the Proposed Action would increase the instream flow releases mandated in the FERC license.

Table 3-12. Summary of water rights in the UARP and Chili Bar Projects. (Source: Water Board, 2005)

License/ Permit/ Priority (date)	Source(s)	Quantity		Quantity Cap	Diversion Season	Beneficial Use
		Direct Diversion	Storage			
License 11073 Application 12323 2/13/1948	SFSC Silver Creek	400 cfs at Ice House, Union Valley, Junction, and Camino dams	49,700 acre-feet annually in Ice House reservoir 195,000 acre-feet annually in Union Valley reservoir	459,300[a] acre-feet annually (max. total storage 238,900 acre-feet annually)	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Recreation; Power at Jones Fork, Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses
License 11074 Application 12624 7/29/1948	Rubicon River Little Rubicon River (aka Rockbound Creek) Gerle Creek SFRR	500 cfs at Rubicon dam 200 cfs at Buck Island dam 325 cfs at Loon Lake and Gerle dam 175 cfs at Robbs Peak dam	450 acre-feet annually in Rubicon reservoir, 440 acre-feet annually in Buck Island reservoir, 92,000 acre-feet annually in Loon Lake reservoir, 141,500 acre-feet annually in Union Valley reservoir	281,100[b] acre-feet annually (max. total storage 226,900 acre-feet annually)	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Recreation; Wildlife Protection and Enhancement; Power at Loon Lake, Robbs Peak, Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses

License/ Permit/ Priority (date)	Source(s)	Quantity: Direct Diversion	Quantity: Storage	Quantity Cap	Diversion Season	Beneficial Use
License 10495 Application 14963 8/12/1952	Silver Creek	400 cfs at Union Valley, Junction, and Camino dams	NA	NA	Direct diversion: 1/1–12/31	Power at Union Valley, Jaybird, Camino, White Rock, Slab Creek, and Chili Bar powerhouses
	SFAR	800 cfs at Slab Creek and Chili Bar dams	NA	NA		
License 10496 Application 20522 12/12/62	SFAR Brush Creek	1,900 cfs at Brush Creek, Slab Creek and Chili Bar dams	NA	NA	Direct diversion: 1/1–12/31	Power at White Rock, Camino, Slab Creek and Chili Bar powerhouses
License 10513 Application 22110 4/23/1965	SFAR	800 cfs[c] at Slab Creek and Chili Bar dams	NA	NA	Direct diversion: 1/1–12/31	Power at White Rock, Chili Bar and Slab Creek powerhouses
Permit 19025 Application 26768 3/30/81	SFSC	270 cfs at Ice House dam	60,000 acre-feet annually in Ice House and Union Valley reservoirs	NA	Direct diversion: 1/1–12/31 Storage: 10/1–7/31	Power at Union Valley and Jones Fork powerhouses

[a] The total amount of water to be taken from the sources (direct diversion plus collection to storage) shall not exceed 459,300 acre-feet annually. The total amount of water to be placed to beneficial use (flow through Jaybird powerhouse) under license 11073 and license 10495 shall not exceed 528,400 acre-feet annually.

[b] The quantity of water to be put to beneficial use at Robbs Peak powerhouse shall not exceed 250,000 acre-feet annually.

[c] The maximum average amount diverted in any 30-day period through the White Rock powerhouse from Slab Creek dam under Licenses 10513, 10495, and 10496 shall not exceed 3,500 cfs.

On May 24, 2005, SMUD filed two water rights applications with the Water Board: (1) application no. 31595 for sources from the Rubicon River and (2) application no. 31596 for diversions from Silver Creek and SFAR sources. The applications involve the use of SMUD's existing facilities, including increases in individual storage rights in reservoirs above the volumes authorized by SMUD's existing water right licenses and permit. Water proposed to be stored under these applications would not exceed the total quantity that SMUD is currently licensed to store under licenses 11073 and 11074. In its water rights application, SMUD states that its application does not propose a change to the historical operations of the UARP.

Application 31595 requests a permit to directly divert water from Rubicon River sources to maximize use of its existing conveyance and power generation facilities. Because the water would be moved from the Middle Fork American River watershed to the SFAR watershed, it would flow into Folsom Lake by an alternate channel system. SMUD seeks to store the water in Rubicon, Buck Island, Gerle Creek, and Robbs Peak reservoirs for later release to provide for downstream recreational uses, releases for fish enhancement, and enhanced power generation.

Application 31596 requests a permit to divert water to storage from the Rubicon River, Silver Creek, and SFAR systems into the Camino Junction, Brush Creek, and Slab Creek reservoirs. SMUD seeks the additional storage to maintain consistent reservoir levels to maximize efficiency of power generation and to provide higher lake levels for recreation. The stored water would consist of a mix of new diversions and of re-diversions of water discharged from existing UARP facilities upstream.

According to the Water Board, Silver Creek, the American River, and their tributaries are listed as fully appropriated under Water Right Order 98-08, the Declaration of Fully Appropriated Stream Systems. Water right applications for diversions from stream systems that have fully appropriated status under Water Right Order 98-08 are subject to special conditions for acceptance, including limitations on seasons of diversion. However, the Water Board allows acceptance of water right applications that propose non-consumptive use of water, including hydropower generation, from fully appropriated sources. Water directly diverted under these applications would flow to Folsom Lake via the SFAR instead of the Middle Fork of the American River. SMUD made a case to the Water Board for its applications to fall within the definition of non-consumptive use. However, according to the Water Board, the notice of acceptance of these applications does not constitute a definitive finding by the Water Board that (1) the proposed use does not substantially diminish the quantity or quality of water in the source; or (2) the proposed use does not regulate the flow in the source in such a manner as to impair any other existing reasonable and beneficial use, including instream use.

Placer County Water Agency uses water of the Middle Fork of the American River for its Middle Fork American River Project (FERC No. 2079), which lies downstream of SMUD's UARP facilities in the Rubicon River watershed. Placer County Water Agency filed a protest letter (letter from F.E. Francis and W.S. Huang, Attorneys for Placer County Water Agency, Auburn, CA, dated January 23, 2007) with the Water Board against SMUD's 2005 application for new water rights licenses. The protest is based on the Water Agency's analysis that shows that SMUD has diverted water in excess of amounts permitted by the current licenses, which has resulted in a reduction of energy production at the Middle Fork American River Project. The Water Board will make a final determination regarding the water rights application following its normal procedures, which might include a hearing, if necessary.

Within the UARP or Chili Bar Project areas, there are no consumptive diversions such as those on the SFAR upstream of the confluence with Silver Creek at the El Dorado Project.

Water Quality

The existing and potential beneficial uses of waterbodies in the study area for the UARP and the Chili Bar Project, as determined by the Central Valley Water Board's Basin Plan, 4th Edition (Central Valley Water Board, 2004) are presented in table 3-13. Although SMUD provided information on the beneficial uses for Desolation Valley Lakes, the Water Board considers it to apply only to lakes within Desolation Valley and therefore not applicable to waters affected by either of the Projects being evaluated in this EIS. Table 3-14 presents state standards and objectives for temperature, DO, pH, coliform bacteria, selected metals, and other physical parameters. The values presented include criteria set in the Basin Plan, drinking water standards, and California Toxics Rule. The highest level of a contaminant that is allowed in drinking water, maximum contaminant level (MCL), is included for several parameters. Primary MCLs are set to protect human health, whereas secondary MCLs are set to protect the odor, taste, and appearance of drinking water. There are no numerical or narrative criteria for nutrients.

General Water Quality

General water quality is largely dependent on the geologic and hydrologic characteristics of a basin. Project area waters are soft, with hardness ranging from less than 1 mg to about 20 mg $CaCO_3$/L. Most total alkalinity measurements are below 10 mg $CaCO_3$/L, indicating a low capacity to buffer changes in pH. Concentrations of total suspended and dissolved solids are low, with values generally less than 10 mg/L. Water in the reservoirs is relatively clear, with Secchi depths ranging from about 10 to 30 feet. The trophic status of the reservoirs range from mesotrophic to oligotrophic, based on Secchi depth and total nitrogen and phosphorus concentrations. The maximum nitrate concentration in each reservoir and stream reach is generally well below the concentration of 1.0 mg/L, which SMUD used to characterize source waters that can stimulate growth of algae. However, large algal mats have been observed in the lower portion of the Junction dam reach, and excessive algal growth has been reported to occur in the Chili Bar dam reach (DTA and Stillwater Sciences, 2005a,b). Large amounts of algae also have been reported to occur in portions of the Ice House, Loon Lake, and Slab Creek dam reaches (DTA and Stillwater Sciences, 2005b). Organic compounds (including oil and grease, methyl-t-butyl ether, and total petroleum hydrocarbons) are below detection limits.

Table 3-13. Designated beneficial uses of surface waters in the study area. (Source: Central Valley Water Board, 2004)

Beneficial Use	Middle Fork[a]	SFAR, Upstream of Placerville[b]	SFAR, Placerville to Folsom Lake[c]
MUN: Municipal and domestic supply	Existing	Existing	Existing
AGR: Agriculture (irrigation and/or stock watering)	Existing	--	Existing
POW: Hydropower	Existing	Existing	Existing
REC-1: Water contact recreation	Existing	Existing	Existing
REC-2: Non-contact water recreation	Existing	Existing	Existing
WARM: Warm freshwater habitat	Potential	Potential	Existing
COLD: Cold freshwater habitat	Existing	Existing	Existing
SPWN: Cold freshwater habitat spawning	Existing	Existing	--
WILD: Wildlife habitat	Existing	Existing	Existing

Note: -- – not designated

[a] Applicable to surface waters of the Rubicon River and its tributaries including the Rubicon, Buck Island, Loon Lake, Gerle Creek, and Robbs Peak reaches.

[b] Applicable to surface waters associated with the Ice House, Union Valley, Junction, Camino, Brush Creek, and Slab Creek reaches.

[c] Applicable to surface waters associated with the Chili Bar Project.

Table 3-14. Water quality objectives to support designated beneficial uses in the study area. (Sources: Central Valley Water Board, 2004; CDHS, 2002; 40 CFR § 131.8)

Parameter	Objective/Standard
Temperature	Natural water temperatures of basin waters shall not be altered unless it can be demonstrated to the satisfaction of the Central Valley Water Board that such alteration does not affect beneficial uses. At no time or place, should water temperature be increased by more than 5°F (2.8°C) above natural receiving water temperature.
Dissolved oxygen	Monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. DO concentrations shall not be reduced below 7.0 mg/L.
pH	From 6.5 to 8.5 units, and changes of no more than 0.5 unit.
Fecal coliform bacteria	Based on a minimum of not less than five samples for any 30-day period, shall not exceed a geometric mean of 200 MPN per 100 mL, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400 MPN/100 mL.
Settleable solids	Shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
Turbidity	Shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: 1 NTU for natural turbidity of 0 to 5 NTU, 20 percent for 5 to 50 NTU, 10 NTU for 50 to 100 NTU, and 10 percent for natural turbidity greater than 100 NTU.
Chemical constituents	Water designated for use as domestic or MUN shall not contain concentrations of chemical constituents in excess of the MCLs specified in the various provisions of Title 22 of the California Code of Regulations.
Aluminum	Primary MCL 1,000 μg/L, Secondary MCL 200 μg/L
Iron (California Toxics Rule)	Secondary MCL 300 μg/L
Lead[a]	Primary MCL: At a minimum, water designated for use as domestic or MUN shall not contain lead in excess of 15 μg/L.
	CCC of 0.13 μg/L, CMC of 3.44 μg/L
Mercury (California Toxics Rule)	Primary MCL 2.0 μg/L
Cadmium[a]	Primary MCL of 5 μg/L, CCC of 0.37 μg/L, CMC of 0.32 μg/L
Copper[a]	Secondary MCL 1,000 μg/L, CCC of 1.25 μg/L, CMC of 1.54 μg/L
Nickel[a]	Primary MCL of 100 μg/L, CCC of 7.41 μg/L, CMC of 66.75 μg/L
Silver[a]	Secondary MCL 100 μg/L, instantaneous maximum of 0.07 μg/L
Zinc[a]	Secondary MCL 5,000 μg/L, CCC of 16.79 μg/L, CMC of 16.66 μg/L

Note: mg/L – milligrams per liter

μg/L – micrograms per liter

CCC – criterion continuous concentrations

CMC – criterion maximum concentrations

MCL – maximum contaminant level

mL – milliliter

MPN – most probable number

MUN – municipal supply

NTU – nephelometric turbidity units

[a] The Basin Plan's toxicity water quality objective is to maintain waters free of toxic substance concentrations that produce detrimental physiological responses in human, plant, animal, and aquatic life. Therefore, we use criteria set in the California Toxics Rule (40 CFR § 131.8) to assess the support of these beneficial uses. These criteria are for dissolved metals, rather than total metals, are dependent on hardness, and include levels of CCC and CMC. Listed criteria were calculated based on a typical hardness of 10 mg/L as $CaCO_3$.

None of the Project reservoirs or stream reaches was included on the 2002 section 303(d) list of water quality limited waterbodies for any water quality parameters (Central Valley Water Board, 2003).

Temperature—Table 3-15 presents a summary of thermal characteristics of each of the reservoirs along with other factors that have the potential to affect water temperature within and/or downstream of the reservoir. Five of the reservoirs (i.e., Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino) do not typically thermally stratify. Each of these reservoirs has relatively small storage capacity and an average retention time of less than 5 days. Rockbound and Loon Lake, which are located at upper elevations, are dimictic[29], with turnover occurring prior to icing over and again in the spring after the ice cover melts. In contrast, several of the lower elevation reservoirs (i.e., Ice House, Union Valley, Junction, Brush Creek, and Slab Creek) do not ice over and are monomictic, with turnover occurring once in the late fall and remaining well mixed until spring. SMUD's water temperature profiling of Slab Creek reservoir indicates that the reservoir develops only weak and unstable summer stratification conditions. This lack of a strong stratification is in contrast to the upstream storage reservoirs (Loon, Union Valley, and Ice House) or even Rockbound Lake, which all strongly stratify during the summer.

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[29]Lakes and reservoirs that freeze over and normally go through two stratifications and two mixing cycles a year.

Table 3-15. Summary of selected reservoir characteristics that affect water temperatures along with vertical profiles of water temperature collected by applicants, 2000 to 2004. (Source: DTA, 2005a, as modified by staff)

Reservoir	Normal Maximum Storage Capacity and Water Surface Elevation	Max. Depth (feet)	Average Retention Time (days)	Low-Level Outlet	Water Temperature (°C)[a]	Thermal Stratification Characteristics
Rubicon	1,450 acre-feet at 6,545 feet	9[b]	4.6	Centerline 6,523 feet, capacity 18 cfs	6.1 to 15.7 (1.2 on May 12, 2004)	Does not thermally stratify
Rockbound	1,010 acre-feet at 6,529 feet	82[b]	--	None	5.1 to 16.9 (9.1 on September 17, 2003)	Dimictic, develops strong thermal stratification with a 40-foot-deep epilimnion
Buck Island	1,070 acre-feet at 6,436 feet	33[b]	2.5	Centerline 6,420 feet, capacity 11.6 cfs	5.8 to 16.8 (2.2 on June 26, 2003)	Does not thermally stratify
Loon Lake	76,200 acre-feet at 6,410 feet	165	142.5	Centerline 6,327 feet, capacity 640 cfs	4.9 to 17.0 (7.7 on September 16, 2003)	Dimictic, weak thermal stratification
Gerle Creek	1,260 acre-feet at 5,231 feet	51	--	Centerline 5,186 feet, capacity 13.6 cfs	5.2 to 17.2 (2.3 on May 6, 2004)	Does not thermally stratify
Robbs Peak	30 acre-feet at 5,231 feet	--	--	Centerline 5,196 feet, capacity 4.3 cfs	No profile data	Does not thermally stratify
Ice House	45,960 acre-feet at 5,450 feet	138	162.3	Centerline 5327.5 feet, capacity 46.8 cfs	5.1 to 19.0 (12.9 on June 12, 2003)	Monomictic, develops strong thermal stratification with a 40-foot-deep epilimnion
Union Valley	277,290 acre-feet at 4,870 feet	360	261.6	None	5.1 to 20.3 (12.2 on October 1, 2002)	Monomictic, develops strong thermal stratification with a 60-foot-deep epilimnion

Reservoir	Normal Maximum Storage Capacity and Water Surface Elevation	Max. Depth (feet)	Average Retention Time (days)	Low-Level Outlet	Water Temperature (°C)[a]	Thermal Stratification Characteristics
Junction	3,250 acre-feet at 4,450 feet	141	1.5	Centerline 4,335 feet, capacity 138 cfs	5.7 to 14.3 (7.9 on May 5, 2004)	Monomictic, develops a thin (<10-foot-deep) epilimnion
Camino	825 acre-feet at 2,915 feet	76	0.3	Centerline 2,840 feet, capacity 112 cfs	9.4 to 10.1 0.0	Does not thermally stratify
Brush Creek	1,530 acre-feet at 2,915 feet	140	--	Centerline 2,775 feet, capacity 145 cfs	5.7 to 20.1 (11.2 on September 16, 2003)	Monomictic, develops strong thermal stratification with a 50-foot deep epilimnion
Slab Creek	16,600 acre-feet at 1,850 feet	186	2.2	Centerline 1,680 feet, capacity 263 cfs	5.7 to 19.1 (10.1 on May 4, 2004)	Monomictic, develops a thin (<10-foot-deep) epilimnion
Chili Bar	3,139 acre-feet at 997.5 feet	61[b]	1.3	Centerline 924 feet, capacity 1,100 cfs	8.2 to 17.5 (4.1 on September 15, 2003)	Little thermal stratification

Note: -- – not available

[a] Overall range of water temperatures measured in reservoir along with the maximum difference in water temperatures in any profiles and the corresponding date.

[b] Based on vertical profiles of water quality.

Table 3-16 summarizes the hourly water temperature data recorded with thermographs in the stream reaches during the relicensing studies conducted in 2000 through 2004. Hourly temperature data were collected during different periods at the sites. The table summarizes the hourly measurements by providing the absolute range of temperatures recorded, the maximum of the mean daily temperatures for each day (maximum mean temperature), and the months that had at least one day with a mean daily temperature that exceeded 20.0°C[30] for each of the monitoring sites. The summary indicates that temperatures remain relatively cool:

- throughout Loon Lake reach (8.5 miles);
- throughout Gerle Creek reach (1.2 miles);
- in the lower portion of the Robbs Peak reach (about 4 miles);
- in the upper portion of Ice House reach (about 7 miles);
- throughout Junction reach (8.3 miles);
- in the upper end of Camino reach (about 3 miles)
- throughout Brush Creek reach (2.2 miles);
- in the Upper portion of Slab Creek reach (about 4 miles) and
- in the upper portion of Chili Bar dam reach (about 7 miles).

Seasonally warm temperatures occur:

- throughout Rubicon reach (4.2 miles);
- throughout Buck Island reach (2.5 miles);
- in the upper end of Robbs Peak reach (about 2 miles);
- in the lower end of Ice House reach (about 4 miles);
- throughout SFAR reach (2.8 miles);
- in the lower portion of Slab Creek reach (about 4 miles); and
- in the lower portion of Chili Bar dam reach (about 12 miles).

[30]We used daily average temperatures of greater than 20.0°C as an indicator of thermal conditions that may limit cold freshwater habitat. This is consistent with the Water Control Board's approach for several other locations in the Sacramento River Basin.

Table 3-16. Summary of hourly water temperature (°C) data collected by applicants for selected sites, 2000 to 2004.[a] (Source: DTA, 2005a, as modified by staff)

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean[b]	Months with Mean >20.0°C[c]
Rubicon Reservoir Tributary[d]					
	Rubicon River upstream of Rubicon reservoir (RR4)[d]	–1.9	26.8	21.3	July to August
Rubicon Dam Reach (4.2 miles)					
	Rubicon River at Rubicon dam (RR3)	–0.2	22.7	22.2	July to August
	Rubicon River upstream of Rubicon Springs (RR2)	0.0	24.1	21.9	July to August
	Rubicon River downstream of Little Rubicon River (RR1)	–0.1	23.7	22.9	June to August
Buck Island Dam Reach (2.5 miles)					
	Little Rubicon at Buck Island dam (LRR2)	–0.4	23.6	22.9	June to September
	Little Rubicon River upstream of Rubicon River (LRR1)	0.0	26.4	23.7	July to August
Loon Lake Dam Reach (8.5 miles)					
	Gerle Creek at Loon Lake dam (GC6)	0.7	17.1	16.9	None
	Gerle Creek upstream of Jerrett Creek (GC5)	–0.2	19.1	15.8	None
	Gerle Creek downstream of Barts Creek (GC4)	0.0	20.1	18.2	None
	Gerle Creek upstream of Gerle Creek reservoir (GC3)	–0.3	24.3	19.8	None
Gerle Creek Dam Reach (1.2 miles)					
	Gerle Creek at Gerle Creek dam (GC2)	–0.2	18.6	18.4	None
	Gerle Creek upstream of S.F. Rubicon River (GC1)	0.0	19.3	17.0	None
Robbs Peak Dam Reach (5.9 miles)					
	S.F. Rubicon River upstream of Robbs Peak forebay (SFRR4)[d]	–0.6	24.5	21.3	July
	S.F. Rubicon River at Robbs Peak forebay dam (SFRR3)	–0.3	23.1	22.5	July to August

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean [b]	Months with Mean >20.0°C[c]
	SF Rubicon River upstream of Gerle Creek (SFRR2)	0.0	20.2	18.4	None
	S.F. Rubicon River downstream of Gerle Creek (SFRR1)	–0.2	20.4	18.8	None
	S.F. Rubicon River 2 miles downstream of Gerle Creek (SFRR.5) [e]	3.0	19.7	18.1	None
Ice House Reservoir Tributary					
	S.F. Silver Creek upstream of Ice House reservoir (SFSC6)[d]	0.0	21.7	19.7	None
Ice House Dam Reach (11.5 miles)					
	S.F. Silver Creek at Ice House dam (SFSC5)	2.8	8.6	8.0	None
	S.F. Silver Creek upstream of Ice House dam road (SFSC4)	–0.2	13.9	8.6	None
	S.F. Silver Creek downstream of Ice House dam road (SFSC3)	0.1	15.9	10.8	None
	S.F. Silver Creek midway between burn area (SFSC2)	–0.1	26.0	20.7	July to August
	S.F. Silver Creek upstream of Junction reservoir (SFSC1)	–0.2	26.0	21.3	July to August
Junction Dam Reach (8.3 miles)					
	Silver Creek at Junction dam (SC4)	–0.2	13.4	11.2	None
	Silver Creek upstream of Jaybird powerhouse (SC3)	–0.1	22.0	20.2	July
Camino Dam Reach (6.2 miles)					
	Silver Creek at Camino dam (SC2)	0.0	15.3	12.7	None
	Silver Creek upstream of SFAR (SC1)	0.5	25.5	23.2	May to August
SFAR Reach (2.8 miles)					
	SFAR upstream of Silver Creek (SFAR12) [d]	–0.1	26.7	24.3	June to September
	SFAR downstream of Silver Creek (SFAR11)	0.0	25.9	23.7	June to September

Reach	Site	Absolute Min.	Absolute Max.	Max. Mean [b]	Months with Mean >20.0°C[c]
	SFAR downstream of Camino powerhouse (SFAR10)	0.4	24.7	21.9	July to August
Brush Creek Dam Reach (2.2 miles)					
	Brush Creek upstream of Brush Creek dam (BC3) [d]	5.8	18.6	16.9	None
	Brush Creek at Brush Creek dam (BC2)	1.9	19.0	18.7	None
	Brush Creek upstream of Slab Creek reservoir (BC1)	3.7	20.5	19.9	None
Slab Creek Dam Reach (8.0 mile)					
	SFAR at Slab Creek dam (SFAR9)	2.7	16.7	16.3	None
	SFAR downstream of walking bridge (SFAR8)	2.1	19.0	16.8	None
	SFAR at Mosquito Bridge (SFAR7)	1.2	24.0	21.6	May to July
	Rock Creek upstream of SFAR (RC1) [d]	2.6	24.4	23.2	July to September
	SFAR upstream of White Rock powerhouse (SFAR6)	2.8	26.7	24.4	June to September
	SFAR downstream of White Rock powerhouse (SFAR5)	1.8	30.4	19.4	None
Reach Downstream of Chili Bar (19.1 miles)					
	SFAR at Chili Bar dam (SFAR4)	4.5	17.9	17.2	None
	SFAR upstream of Dutch Creek (SFAR3)	3.6	21.3	18.7	None
	SFAR downstream of Greenwood Creek (SFAR2)	4.2	22.6	21.3	July
	SFAR upstream of Weber Creek (SFAR1)	4.2	23.6	21.7	June to July

[a] Not all sites were monitored in all years.

[b] Max. Mean indicates the maximum of all of the average temperatures for each of the days monitored.

[c] Months with Mean >20.0°C indicates the month(s) with at least one day having a mean temperature of greater than 20.0°C.

[d] Not affected by the Projects.

[e] Less than two full seasons of data collected.

In addition, the summary provides information on several stream reaches that are not affected by the Projects. Relatively cool streams include the SFSC inflow to Ice House reservoir and Tells Creek inflow to Union Valley reservoir. Seasonally warm temperatures occur in the Rubicon River inflow to Rubicon reservoir, Big Silver Creek and Jones Fork Silver Creek inflow to Union Valley reservoir, SFAR upstream of the Silver Creek confluence, and Rock Creek inflow to SFAR.

Dissolved Oxygen and pH—DO concentrations usually remain above the 7.0-mg/L criterion in the upper portions of the reservoirs. However, DO concentrations of less than 7.0 mg/L were measured in nine of the twelve reservoirs during late summer and early fall (table 3-17). Based on average DO concentrations for 0.5-meter increments, the majority of these low DO concentrations ranged from 5.0 to 6.9 mg/L, although average DO concentrations of less than 5.0 mg/L occurred:

- Near the middle of Rockbound Lake in the bottom 10 feet during early October 2002.
- In deep water at various locations in the Union Valley reservoir during fall and in the Jones Fork arm of the reservoir in the late summer. Hypoxic (DO <2.0 mg/L) conditions were measured in the bottom 6.5 to 26 feet of the reservoir during mid-October to early November of 2002.
- In Ice House reservoir in the bottom 13 to 41 feet during late September to mid-November.
- Throughout the entire water column of Junction reservoir in mid-September 2004.
- Near the middle of Brush Creek reservoir in the bottom 6.5 to 36 feet during mid-September to early November. Hypoxic conditions in bottom 8.5 feet in mid-September 2003.

Results of the seasonal pH monitoring of vertical profiles in the reservoirs ranged from 5.8 to 8.5 standard units. Generally, pH levels decreased with depth in the reservoirs and were lowest near the bottom of the reservoirs. Seven of the 12 reservoirs had pH values below the lower allowable limit of 6.5 units, but none of them exceeded the upper limit of 8.5 units (table 3-17).

Results of the 2002 to 2004 periodic monitoring program of stream reaches indicate that DO levels generally satisfy the applicable water quality criteria, although low DO concentrations were measured at a few stream sites during the late summer and early fall. These included DO concentrations of less than 7.0 mg/L at two UARP affected stream sites (5.5 mg/L in the outflow from Loon Lake on October 8, 2002, and 4.7 mg/L in the SFAR outflow from Slab Creek reservoir on September 13, 2004), one Chili Bar Project affected stream site (6.1 mg/L in the SFAR downstream of Greenwood Creek on September 13, 2004), and one stream site not affected by either Project (3.7 mg/L in Rocky Basin Creek on September 17, 2003).

Table 3-17. Summary of the range of water quality data in reservoirs for all vertical profiles and the maximum fluctuation within any of the profiles, 2002 through 2004. (Source: DTA, 2005a, as modified by staff)

Location	Number of Vertical Profiles	Range of DO Concentrations (mg/L)	Range of DO Percent of Saturation	Range of pH
Rubicon reservoir	4	8.3 to 12.0 (0.4 on 10/7/02)	77 to 102 (4 on 10/7/02)	6.7 to 7.8 (0.5 on 10/7/02)
Rockbound lake	5	4.1 to 12.9 (5.0 on 10/7/02)	42 to 110 (62 on 10/7/02)	6.1 to 7.7 (0.9 on 10/7/02)
Buck Island reservoir	6	5.4 to 11.8 (1.9 on 9/21/04)	53 to 99 (18 on 9/21/04)	6.5 to 7.9 (0.5 on 9/21/04)
Loon Lake reservoir	21	5.6 to 12.7 (5.2 on 9/16/03)	57 to 104 (41 on 9/16/03)	5.8 to 7.7 (0.9 on 9/16/03)
Gerle Creek reservoir	7	7.6 to 12.1 (1.5 on 9/15/04)	72 to 125 (19 on 9/15/04)	6.1 to 7.4 (1.0 on 9/15/04)
Union Valley reservoir	32	0.8 to 11.8 (7.9 on 11/06/02)	6 to 116 (90 on 11/06/02)	5.8 to 7.9 (1.1 on 10/16/02, 10/31/02, and 9/14/04)
Ice House reservoir	28	2.3 to 13.2 (6.8 on 11/14/02)	20 to 117 (79 on 10/24/02)	6.0 to 8.5 (1.4 on 11/06/02)
Junction reservoir	5	3.4 to 12.6 (2.3 on 9/16/03)	29 to 110 (23 on 9/16/03))	6.2 to 7.8 (0.7 on 5/13/03)
Camino reservoir [a]	2	9.4 to 9.5 (0.1 on 11/13/02)	82 to 102 (2 on 11/13/02)	6.8 to 7.3 (0.1 on 11/13/02 and 9/12/04)
Brush Creek reservoir	6	1.6 to 10.4 (7.7 on 9/16/03)	14 to 103 (89 on 9/16/03)	6.1 to 7.7 (0.9 on 9/16/03)
Slab Creek reservoir	17	4.8 to 14.0 (2.4 on 9/15/03)	46 to 116 (17 on 9/13/04)	6.5 to 7.8 (0.5 on 6/25/03)
Chili Bar reservoir	13	4.9 to 14.3 (3.4 on 9/13/04)	51 to 123 (36 on 9/13/04)	6.7 to 7.8 (0.7 on 11/13/02)

Note: The values within the "( )"s are the maximum fluctuations within vertical profile and the date(s) that this was measured.

Monitoring results for pH in the stream reaches ranged from 4.9 to 8.7, indicating that pH is occasionally outside the allowable range of 6.5 to 8.5. Of the 221 riverine pH measurements, 24 (11 percent) were below 6.5 and 1 (<1 percent) was greater than 8.5. Most of the sites monitored in the headwaters of the Rubicon River had at least one low pH value; whereas only four of the SFAR Basin sites had low pH values. Two of these four sites are upstream of the Projects' effects. The other two sites are a short distance downstream of Ice House and Camino reservoirs. The only pH value above 8.5 was measured in the SFAR at the most downstream site monitored, just upstream of the Weber Creek confluence.

Metals and Polychlorinated Biphenyls—The applicants sampled reservoir and stream reaches for metals, total hardness and total cyanide during seven sampling events in 2002 to 2004 to monitor conditions during fall turnover, the first major rain, spring runoff, and summer low flow. Hardness in the UARP and Chili Bar Project reservoirs ranged from 1 to 9 mg/L as $CaCO_3$. Hardness in UARP-affected reaches and non-project reaches ranged from approximately 1 to 20 mg/L, while hardness in the reach downstream of Chili Bar dam ranged from about 7 to 12 mg/L. All of these results show that surface waters in the area are soft.

Analyses for metals consisted of total metals in 2002 and 2003 and were expanded to also include the dissolved fraction of metals in 2004. Comparison of the results of this sampling effort to the Primary and Secondary MCLs indicates that the concentrations of metals generally satisfy the Primary and Secondary MCLs in reservoirs and stream reaches of the Projects. Although 10.8 percent of the 406 total lead samples and 3.7 percent of the 215 total mercury samples exceeded the corresponding Primary MCLs, QA/QC test results indicate that these high concentrations were likely a result of contamination from sampling devices used in 2003 and 2004. Sample results for total iron and total aluminum exceeded the corresponding secondary MCL in 4.2 and 0.7 percent of the samples, respectively.

Table 3-18 displays the percent of the dissolved fraction samples for cadmium, copper, lead, nickel, silver, and zinc that exceed the corresponding criterion continuous concentrations (CCC) and criterion maximum concentrations (CMC). This analysis indicates that most samples had concentrations that were below the CCC and CMC for most of these metals. In streams, more than 10 percent of the samples exceeded the CCC and/or the CMC for copper and lead. Both the UARP and Chili Bar Project-affected stream reaches tended to exceed the CCC and CMC for copper more than the reaches not affected by the Projects. Due to contamination of the samples collected in 2004 from the sampling device, it is not possible to determine how frequently the lead CCC or CMC was exceeded in the reservoirs. However, it appears that the frequency of exceedance of the CCC and CMC in the Project reservoirs is about the same as in Project-affected stream reaches, based on comparison of the total recoverable lead levels for both stream and reservoir sites in samples collected in 2002 and 2003. Dissolved copper concentrations exceeded the CCC and CMC in half of the samples from Chili Bar reservoir and 21.7 percent of the samples from the UARP reservoirs. More than 10 percent of the samples from Chili Bar reservoir exceeded the CCC and CMC for cadmium and zinc.

The applicants analyzed bioaccumulation of trace metals using samples of four piscivorous fish species collected from five UARP reservoirs and Chili Bar reservoir. Sampling these piscivorous fish is expected to document near maximum effects of biomagnifications on body burdens. The applicants analyzed one composite fish fillet

Table 3-18. Frequency of dissolved cadmium, copper, lead, nickel, silver, and zinc water samples that exceed the corresponding CCC and CMC criteria, 2004. (Source: DTA, 2005b)

	CCC/CMC Criteria Exceedance[a]				
Metal	**Non-Project Affected Reaches**	**UARP Affected Reaches**	**Chili Bar Project Affected Reaches**	**UARP Reservoirs**	**Chili Bar Reservoir**
Cadmium	0/0	1.5/4.5	0/0	2.9/2.9	12.5/12.5
Copper	3.3/3.3	16.6/16.6	33.3/33.3	21.7/21.7	50/50
Lead	33.3/0	33.3/0	11.1/0	[b]	[b]
Nickel	0/0	0/0	0/0	0/0	0/0
Silver	NA/6.6	NA/1.5	NA/0	NA/2.9	NA/0
Zinc	0/0	4.5/4.5	0/0	0/0	16.2/16.2

Note: NA – indicates not applicable.

[a] Values are reported as the percent of samples that exceed the CCC followed by "/" and the percent of samples that exceed the CMC.

[b] Reservoir samples were contaminated with lead from the Kemmerer sampler and thus lead results are not valid.

sample and one composite fish liver sample collected from each reservoir. Table 3-19 provides descriptions of the composite fish tissue samples and the concentration of trace metals in them, along with screening values intended to protect humans from consumption of contaminated fish. As expected, the fish liver samples generally had higher concentrations of all of the metals analyzed.

Arsenic concentrations in some fish fillets exceeded the screening values set to protect recreational and subsistence anglers. The recreational screening value of 0.026 milligram per kilogram (mg/kg) was exceeded in samples from three of the reservoirs (Ice House, Union Valley, and Gerle Creek). Since the detection level for arsenic was higher than the screening value for subsistence anglers, it is not possible to determine whether fish from the other three sampled reservoirs also exceed the subsistence screening value. The applicants analyzed the fish samples for total mercury, not methylmercury. However, EPA (2000) recommends the use of total mercury as a conservative surrogate for methylmercury in fish tissue since most of the mercury accumulated in fish is generally in the form of methylmercury and methylmercury analysis is relatively expensive. Comparison of the total mercury concentrations to the concentrations of screening values set for methylmercury suggests that contamination of piscivorous fish in Slab Creek and Union Valley reservoirs may be at harmful levels for recreational anglers. This conservative approach also suggests that mercury

Table 3-19. Trace metal concentrations (mg/kg) in composite fish fillet and fish liver samples (shown in parentheses) from selected UARP and Chili Bar Project reservoirs, samples collected on December 16, 2003.[a] (Source: DTA, 2005b; EPA, 2000)

Metal	Screening Values[a]	Loon Lake	Gerle Creek	Union Valley	Ice House	Slab Creek	Chili Bar
Composite sample description		6 brown trout with fork lengths of 13.5 to 14.8 inches	1 brown trout with fork length of 20.1 inches	4 smallmouth bass with fork lengths of 11.8 to 15.7 inches	7 rainbow trout with fork lengths of 8.4 to 13.4 inches	1 brown trout with fork length of 19.1 inches	8 Sacramento pikeminnow with fork lengths of 9.4 to 12.8 inches
Silver	--	<0.002 (1.74)	<0.002 (1.86)	<0.002 (0.013)	<0.002 (0.22)	<0.002 (0.17)	<0.002 (<0.002)
Aluminum	--	0.37 (<0.02)	<0.02 (6.55)	<0.02 (21.2)	<0.02 (<0.02)	<0.02 (<0.02)	<0.02 (<0.02)
Arsenic	Rec 0.026, Subs 0.00327	<0.02 (0.38)	0.028[b] (1.19)	0.06 (0.12)	0.16 (0.099)	<0.02 (0.038)	<0.02 (0.051)
Cadmium	Rec 4.0, Subs 0.491	0.0080 (0.62)	0.0008[b] (0.83)	<0.0004 (0.64)	<0.0004 (0.025)	<0.0004 (0.029)	0.0013 (0.019)
Chromium	--	0.094 (0.139)	0.093 (0.121)	0.086 (0.161)	0.080 (0.156)	0.089 (0.09)	0.066 (0.118)
Copper	--	0.48 (87.8)	0.52 (126)	0.47 (4.11)	0.46 (35.3)	0.44 (9.74)	0.39 (2.12)
Manganese	--	0.037 (1.11)	0.0009[b] (0.43)	0.13 (0.97)	0.12 (1.47)	0.012 (1.17)	<0.0006 (0.41)
Nickel	--	<0.001 (0.015)	<0.001 (0.034)	0.009 (<0.001)	<0.001 (<0.001)	<0.001 (0.007)	<0.001 (0.006)
Lead	--	<0.0004 (<0.0024)	<0.0004 (0.012)	<0.0004 (0.015)	<0.0004 (0.0018)	<0.0004 (<0.0004)	0.0043 (<0.0004)
Selenium	Rec 20, Subs 2.457	0.32 (9.14)	0.39 (30.6)	0.21 (0.99)	0.19 (0.91)	0.086 (1.31)	0.14 (0.72)
Zinc	--	4.92 (25.0)	3.53 (52.6)	4.19 (17.8)	4.32 (22.9)	3.60 (27.8)	8.05 (12.0)

Metal	Screening Values[a]	Loon Lake	Gerle Creek	Union Valley	Ice House	Slab Creek	Chili Bar
Mercury	Rec 0.4, Subs 0.049[c]	0.137 (--)	0.321 (--)	0.419 (--)	0.036 (--)	0.595 (--)	0.075 (--)

Note: -- – indicates no guideline criteria from selected literature sources or data available, as appropriate.

[a] Screening values are directly comparable to concentrations in fish tissues typically eaten by humans (i.e., fillets), but not liver samples. “Rec” screening values set to protect recreational anglers, based on fish consumption rate of 17.5 grams (g)/day, 70 kg body weight and, for carcinogens, 10^{-5} risk level and 70-year lifetime. “Subs” screening values set to protect subsistence anglers, based on fish consumption rate of 142.4 g/day, 70 kg body weight and, for carcinogens, 10^{-5} risk level and 70-year lifetime.

[b] Value is below reporting limit, but above the method detection limit.

[c] As methylmercury, although it is recommended that total mercury be analyzed and the conservative assumption be made that all mercury is present as methylmercury since most mercury in fish and shellfish tissue is present primarily as methylmercury (NAS, 1991, as cited by EPA, 2000; Tollefson, 1989, as cited by EPA, 2000; Tollefson, 1989) and because of the relatively high cost of analyzing for methylmercury. This approach is deemed to be most protective of human health and most cost-effective (EPA, 2000).

contamination of piscivorous fish in three of the other reservoirs (Gerle Creek, Loon Lake, and Chili Bar) may be harmful to subsistence anglers. All of the cadmium and selenium concentrations measured in fish fillets were less than the corresponding screening values set for recreational and subsistence anglers.

Coliform Bacteria—During the summer of 2003, SMUD and PG&E sampled 21 different locations for fecal coliform in a manner consistent with the applicable water quality standard (i.e., 5 samples in a 30-day period). All of these 30-day periods include the holiday weekend of either Independence Day or Labor Day, and are therefore representative of the high recreational season. Table 3-20 summarizes the results of this sampling effort.

Table 3-20. Summary of fecal coliform sampling results for UARP reservoirs and reaches and the reach downstream of Chili Bar, based on five samples collected during a 30-day period in summer 2003 [a] showing location with exceedances of criteria. (Source: DTA, 2005b)

Site	Range (MPN/100 mL)	Geometric Mean (MPN/100 mL)	Samples in Excess of 400/100 mL criterion (MPN/100 mL on date)
Union Valley reservoir at Camino Cove	<1–3,180	38	**3,180** on 6/23 **1,200** on 7/01
Union Valley reservoir at Fashoda Beach	<1–600	10	**600** on 6/23
Union Valley reservoir at Jones Fork Campground	<1–2,900	17	**550** on 6/23 **2,900** on 7/01
Jones Fork Silver Creek at Ice House Road	165–1,500	**468**	**730** on 6/23 **1,500** on 7/22
Big Silver Creek at bike bridge	37–1,160	133	**1,160** on 7/22
SFAR downstream of Miner's Cabin	<1–6,100	159	**6,100** on 7/01 **438** on 7/08
SFAR downstream of Greenwood Creek	<1–728	31	**578** on 7/01 **728** on 7/08
SFAR upstream of Hastings Creek	28–3,900	**322**	**3,900** on 7/01 **462** on 7/08
SFAR downstream of Weber Creek	<1–9,300	**327**	**660** on 6/25 **9,300** on 7/01 **1,350** on 7/08

Notes: MPN/100 mL is most probable number/100 milliliter.

Bold values exceed applicable criterion.

[a] Each sampling period included either Independence Day or Labor Day weekend.

Fecal coliform concentrations generally satisfied the applicable criteria in the sampled reservoirs. However, the 400 most probable number (MPN)/100 mL criterion that is not to be exceeded in more than 10 percent of the samples was exceeded in 20 to 40 percent of the samples from all three of the Union Valley reservoir sample sites. The 400 MPN/100 mL criterion also was exceeded at two sites in tributaries to Union Valley reservoir that are not affected by the Projects, and four sites in the Chili Bar bypassed reach. Although the highest values and most frequent exceedances occurred at the most downstream site, which is located downstream of Weber Creek and about 1 mile upstream of Folsom Lake, SMUD reported that fecal coliform concentrations did not increase in an upstream to downstream direction on each day sampled. The geometric mean remained below the 200 MPN/100 mL criterion for 18 of the 21 sample sites. This criterion was exceeded at the two most downstream sites in the Chili Bar bypassed reach and at a site in Jones Fork Silver Creek that is upstream of the Project's influence.

3.3.2.2 Environmental Effects

Water Quantity

The Settlement Agreement's proposed minimum streamflow schedules and water level regimes for Project-influenced reaches and reservoirs include a variety of alternative measures for each Project development. Because measures related to streamflow primarily pertain to protecting and enhancing aquatic and riparian habitat and recreational opportunities, we discuss the specific aspects of these measures in sections 3.3.2.2, *Water Quality;* 3.3.3.2, *Aquatic Resources*; 3.3.4.2, *Terrestrial Resources*; and 3.3.6.2, *Recreational Resources*. In this section we discuss the effects of the proposed water level regimes on reservoirs affected by the UARP and Chili Bar Project operations as well as the means to ensure compliance with the proposed minimum streamflow schedules and water levels.

Reservoir Levels

Under Proposed Article 1-23, *Reservoir Levels*, SMUD would within 6 months of license issuance meet or exceed the end-of-the-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs (table 3-21) and would manage reservoir levels at Rubicon, Buck Island, Gerle, Junction, Brush, and Slab Creek reservoirs to meet seasonal targets as described below. This measure and other reservoir level related measures also pertain to protecting and enhancing aquatic and riparian habitat, recreational opportunities, and aesthetics; therefore, we also discuss additional aspects of these measures in sections 3.3.3.2, *Aquatic Resources*; 3.3.4.2, *Terrestrial Resources*; 3.3.6.2, *Recreational Resources;* and 3.3.8.2, *Aesthetic Resources.*

Table 3-21. Loon Lake, Union Valley, and Ice House reservoir levels by water year. (Source: SMUD and PG&E, 2007)

Reservoir/Month	End-of-Month Reservoir Elevation CD	Dry	BN	AN	Wet
Loon Lake					
July	6,388	6,395	6,399	6,400	6,400
August	6,382	6,389	6,394	6,393	6,393
September	6,379	6,385	6,390	6,390	6,390
Union Valley					
July	4,816	4,836	4,856	4,856	4,856
August	4,803	4,827	4,835	4,841	4,842
September	4,796	4,818	4,830	4,830	4,830
Ice House					
July	5,435	5,437	5,440	5,441	5,441
August	5,430	5,433	5,434	5,435	5,434
September	5,420	5,429	5,430	5,431	5,430

Rubicon and Buck Island Reservoirs—SMUD would attempt to maintain the water surface in Rubicon and Buck Island reservoirs at as high an elevation as practicable, and with a minimum of fluctuation, from May 1 to September 10 of each year in order to secure the maximum recreational benefits. Both of these high elevation reservoirs are remote and due to access issues, the gates are manually installed in June or July and are removed in mid- to late September or October. As described in Proposed Article 1-1, *Minimum Streamflows*, SMUD would maintain an overwintering minimum pool of 6,527 feet in elevation in Rubicon reservoir for the protection of aquatic species.

Gerle Reservoir—SMUD would attempt to maintain the water surface in Gerle reservoir at as high an elevation as practicable, and with a minimum of fluctuation, from May 1 to September 10 of each year. If SMUD anticipates the reservoir will be drawn down below 5,225 feet during this time period, SMUD would consult with the Forest Service, Water Board, FWS, and CDFG.

Junction and Brush Creek Reservoirs—SMUD would maintain the seasonal reservoir levels at Junction and Brush Creek reservoirs within the range of levels measured between 1975 through 2000 based on the databases maintained by DWR and SMUD.

Slab Creek Reservoir—SMUD would attempt to maintain the reservoir level above 1,830 feet in elevation during daylight hours between 10:00 a.m. and 8:00 p.m. during the period from July 1 through September 30. SMUD would also attempt to limit daily fluctuations to less than 7 feet per day during daylight hours between 10:00 a.m. and 8:00 p.m. from July 1 through September 30. The minimum reservoir elevation and maximum daily fluctuation would be reassessed and modified if necessary to accommodate (1) the operation of the proposed Iowa Hill development, should it be constructed; (2) the recreational use at Slab Creek reservoir; and (3) other applicable factors.

Water Levels during a Super Dry Water Year—A super dry (SD) year is defined as any critically dry (CD) year that is immediately preceded by a dry or CD water year or any dry water year type that is immediately preceded by any combination of two dry or CD water year types. In the event of a SD year, SMUD would, by March 10, notify the Forest Service, CDFG, and the Water Board about their concerns related to reservoir levels. By June 1 of a SD year, SMUD would confer with the Forest Service, CDFG, Water Board, and the Consultation Group to discuss reservoir operations plans and reservoir levels during the SD water year. Upon approval by the Forest Service, the Commission, Water Board, and CDFG. SMUD would implement the revised operations while balancing, as discussed in the Settlement Agreement, a wide range of aquatic, recreation, water supply, and power generation issues for a SD year.

Our Analysis

End of Month Water Levels

The proposed end-of-month water levels at Loon Lake, Ice House, and Union Valley are somewhat similar to historical operation of all three reservoirs. However, the Settlement Agreement includes a wide range of proposed measures including increased minimum flows, pulse flows, ramping rates, recreational releases and others that would affect reservoir water levels while providing enhancement to water quality and aquatic, terrestrial, recreational, and other resources.

As part of the Settlement process, CDFG modeled the operations of the UARP and Chili Bar Project using the HEC-ResSim[31] model to help evaluate the effects of various streamflow and reservoir elevation targets. In addition to reservoir and streamflow requirements, the model also included energy generation based on the Settlement Agreement and several other factors. The model included

[31]HEC-ResSim is a computer reservoir system simulation program developed by the U.S. Army Corps of Engineers for performing reservoir operation modeling under a variety of operational goals and constraints.

simulation of Project operations under current measures and operation practices, designated as the "Base Case." Simulation of the Proposed Action, including the proposed minimum flows, pulse flows, reservoir elevation, maintenance, and other measures using the historical inflow data, is designated in the following figures as the "Settlement Agreement." Output from the model included streamflow data, power generation, reservoir elevation data, and other information at both 30-minute and 1-day intervals for the 1975 to 2000 water years.

Table 3-22 shows the water year types for water years 1992 through 1999. Figures 3-9 through 3-11 are representative of the reservoir levels in Loon Lake, Ice House reservoir, and Union Valley reservoir for water years 1992 through 1999 (a grouping of years that include a reasonable representation of water year types) from the output of the HEC-ResSim model under the Proposed Action. These figures show that in almost all cases, SMUD could achieve the end-of-month target elevations while meeting the proposed minimum streamflow schedules included in the Settlement Agreement. However, as shown in the figures, the end-of-month water levels would not have been met at the reservoirs in 1992, which under the Settlement Agreement would have been classified as an SD year as, discussed later in this section.

Table 3-22. Water year types for 1992–1999. (Source: SMUD, 2005)

Year	Water Year Type
1992	Dry
1993	Above Normal
1994	Critically Dry
1995	Wet
1996	Above Normal
1997	Wet
1998	Wet
1998	Above Normal

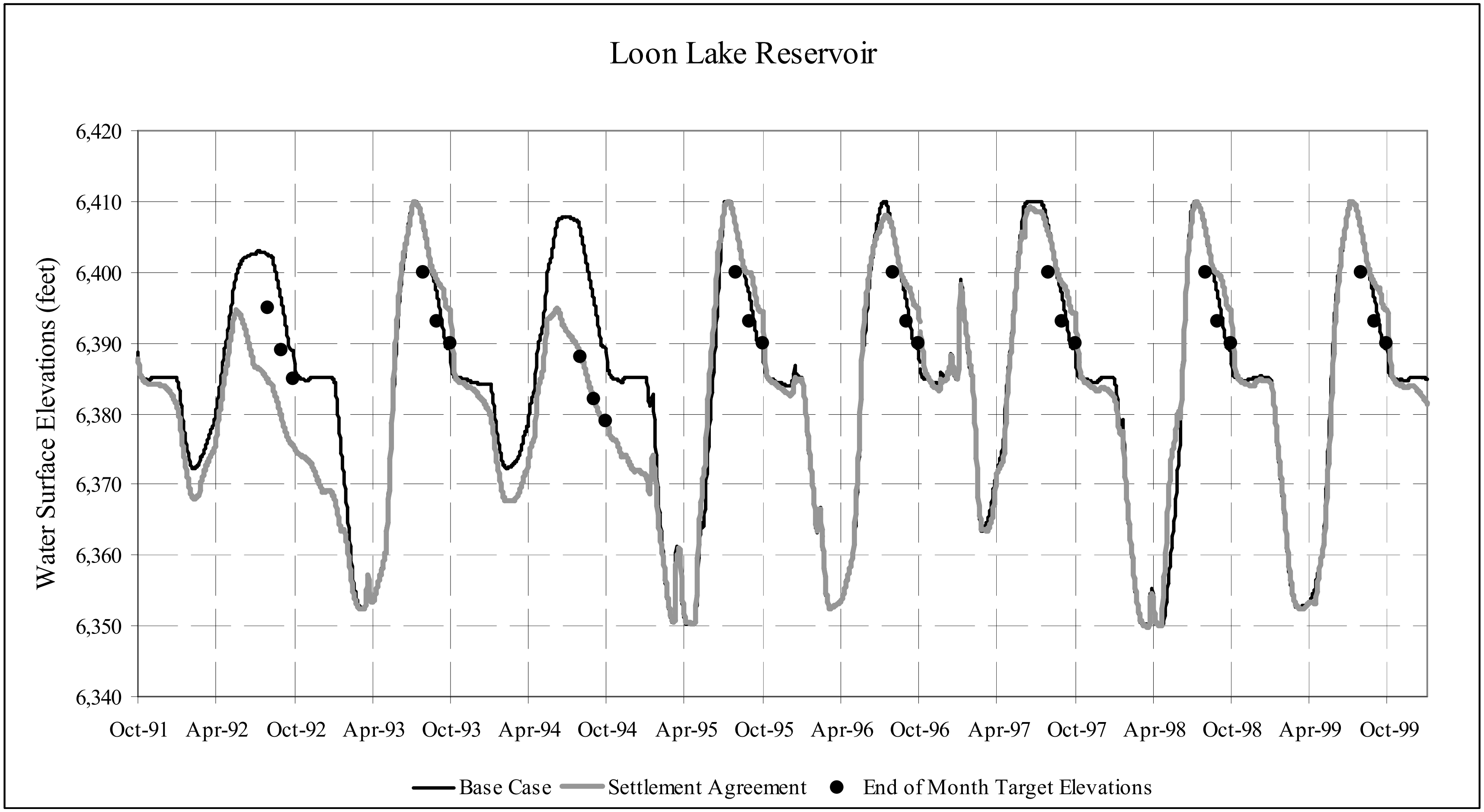

Figure 3-9. Loon Lake reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

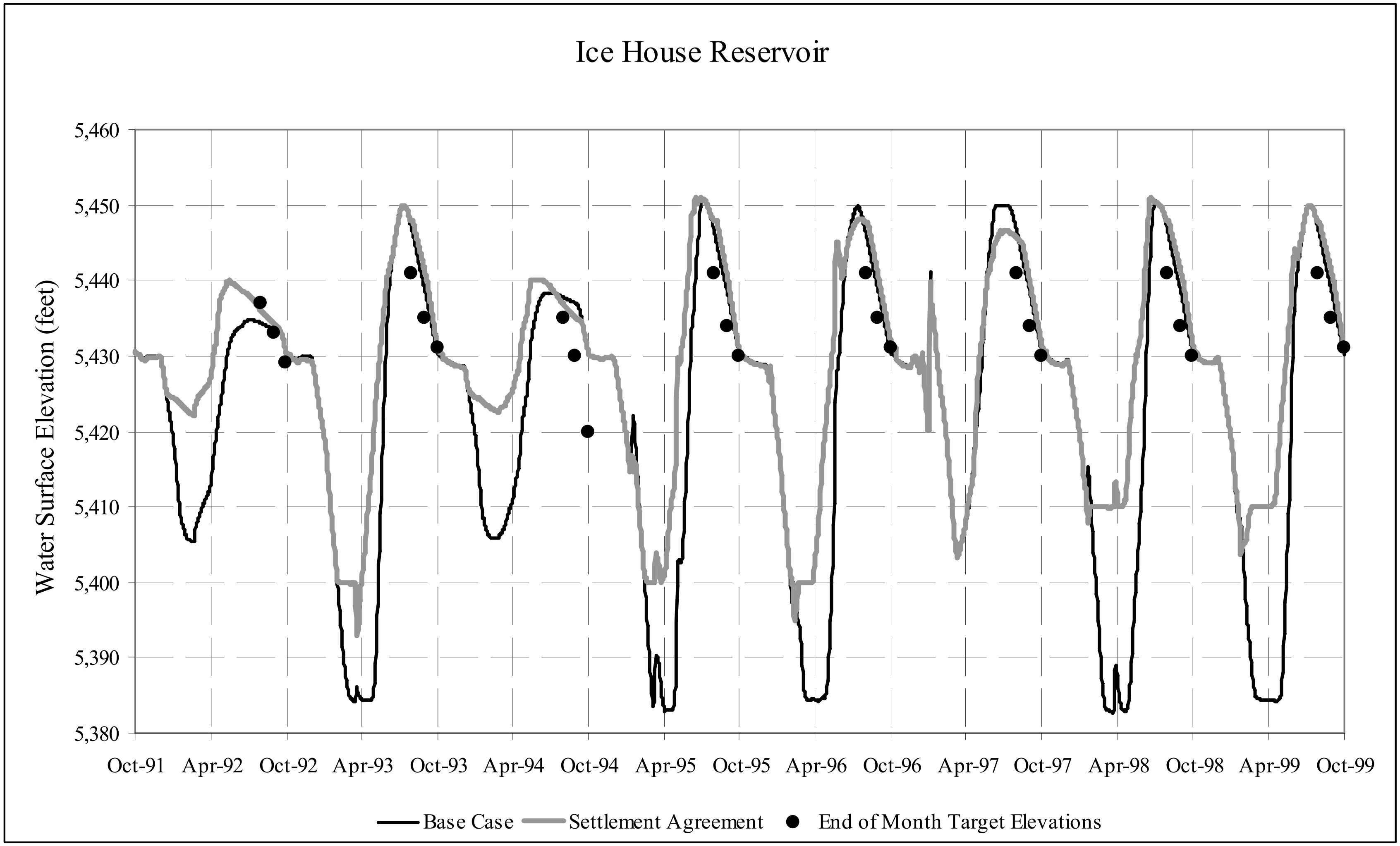

Figure 3-10. Ice House reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

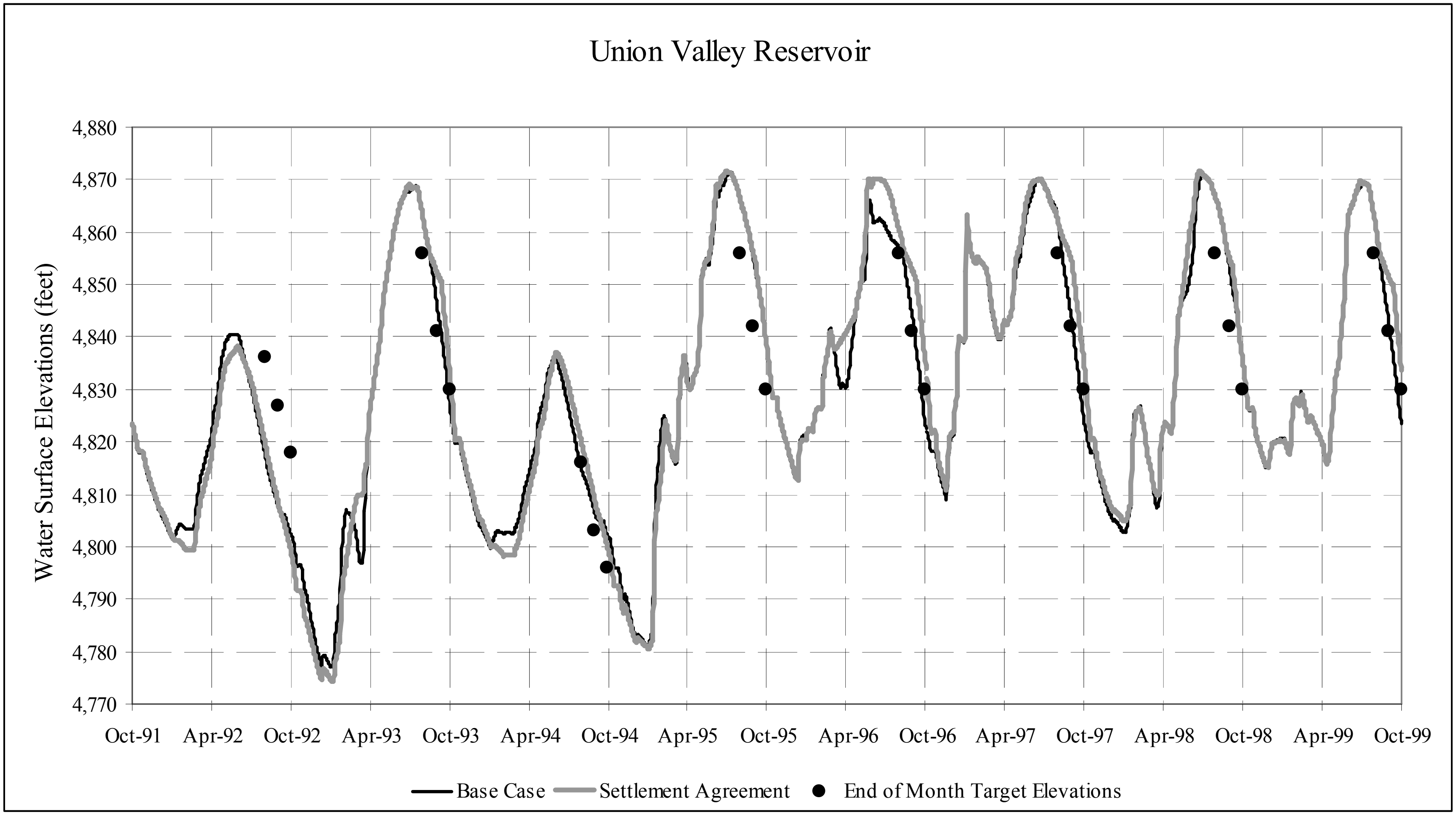

Figure 3-11. Union Valley reservoir modeled elevations for 1992 to 1999 water years. (Source: CDFG, 2007, as modified by staff).

Water Levels during a Super Dry Water Year

Review of the water year type records indicate the SD water year types have occurred three times between 1975 and 2005 (1977, 1988, and 1992). HEC-ResSim modeling indicates that water levels in the three main storage reservoirs could fail to meet the CD end-of-month targets during these years. Figure 3-12 shows the Base and the Proposed Action water levels during these SD years at Union Valley reservoir, the largest storage reservoir. This figure is representative of several important aspects, including the variation in severity of SD years. Another key feature of this figure is the additional drawdown that would have occurred in 1977, when measures included in the Settlement Agreement would have resulted in additional drawdown during the summer.

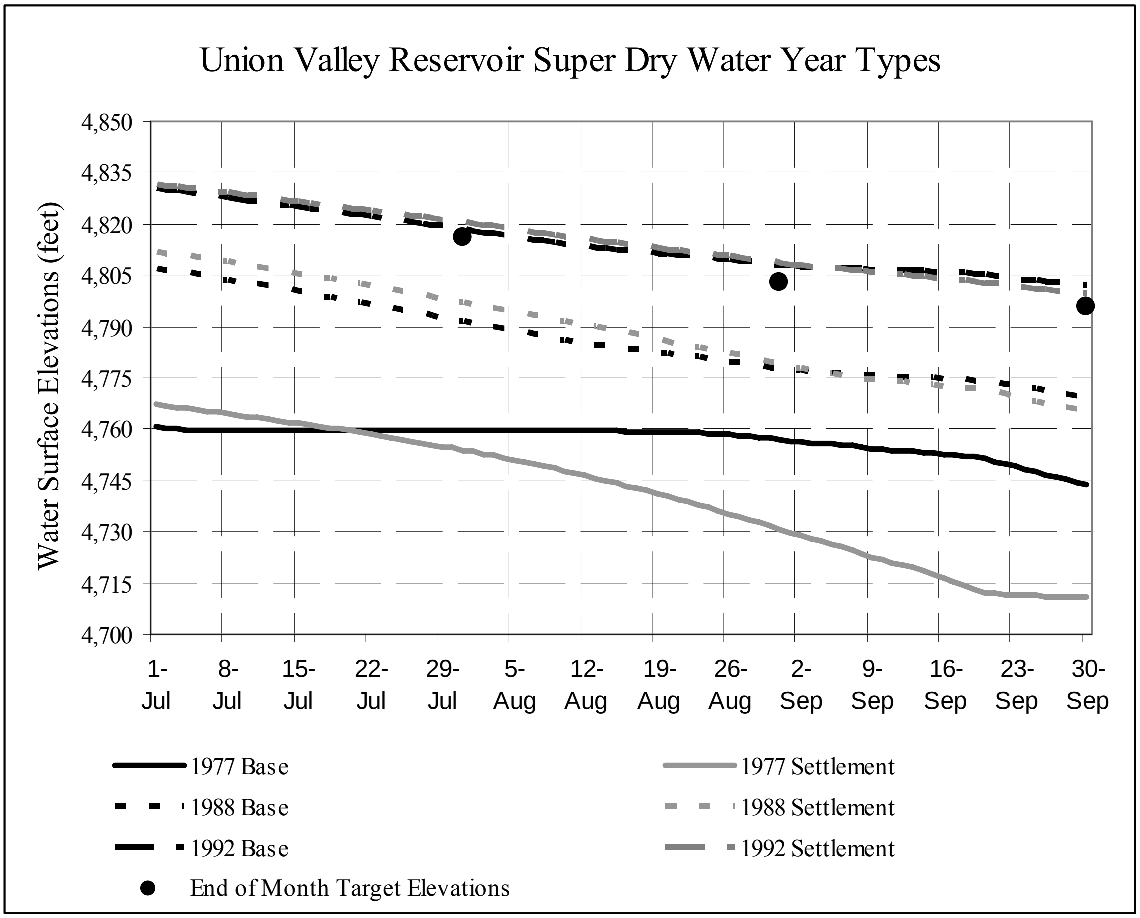

Figure 3-12. Union Valley reservoir modeled base and Proposed Action water surface elevations from July to September 30 for 1977, 1988, and 1992. (Source: CDFG, 2007, as modified by staff)

Rubicon and Buck Island Reservoirs

HEC-ResSim modeling of the effects of the Proposed Action on the reservoir levels at Rubicon and Buck Island reservoirs showed that fluctuations of the water levels of these two reservoirs would still occur and be somewhat similar to existing conditions. Existing conditions for the past 8 years at these reservoirs are shown in figures 3-13 and 3-14. Many of these fluctuations, especially early in the May through September 10 period as shown in figures 3-13 and 3-14, are due to rapidly varying inflow to the reservoirs. These high elevation reservoirs have limited storage capacity and are affected by changes in the inflow to the reservoirs, normally driven by snowmelt. However, these graphs do show a relatively stable water surface elevation during low inflow conditions, which normally start during July and extending through the recreational season. In addition, the manual installation of the gates at these reservoirs normally occurs in early June or July and they are removed in mid- to late September or October. Not provided in the graphs are overwintering reservoir elevations at Rubicon reservoir. Modeled elevations during the winter period are similar to existing operations and did not fall below elevation 6,532 feet, 5 feet above the proposed minimum pool elevation.

Gerle Reservoir

HEC-ResSim modeling of the measures in the Proposed Action analyzed its effects on the reservoir levels at Gerle reservoir and showed that fluctuations of the water levels of this reservoir would still occur. This is partly because Gerle reservoir operates as an afterbay for Loon Lake powerhouse and as a forebay for the canal leading to Robbs Peak reservoir and powerhouse. Many of the variations in the early part of the May 1 to September 10 period (see figure 3-15) are the result of limited storage capacity and rapid variations in inflow similar to the Rubicon and Buck Island reservoirs. These graphs also show that SMUD would not be able to maintain the reservoir at an elevation of 5,225 feet, the trigger elevation for consulting with the Agencies.[32]

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[32]For simplicity purposes, the transition between Gerle Creek reservoir and the Gerle Creek canal was modeled as an uncontrolled outlet. However, in actuality, there are gates at the headworks to the Gerle Creek canal, and it is expected that SMUD would use these gates to help maintain the elevation of Gerle Creek reservoir at or above 5,225 feet during the summer recreation season. Under current conditions, fish passage from Gerle Creek reservoir to Gerle Creek seems to be more of a function of streambed geometry above the maximum level of the reservoir than of reservoir level, and reservoir levels do not substantially affect fish passage to Gerle Creek.

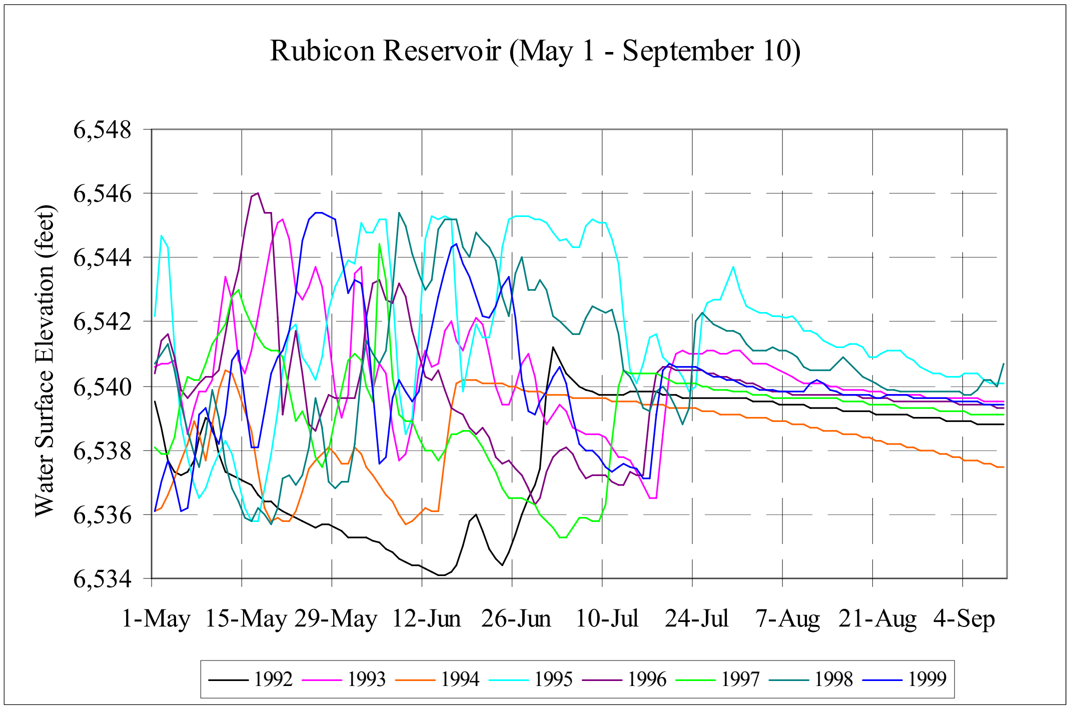

Figure 3-13. Rubicon reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007, as modified by staff)

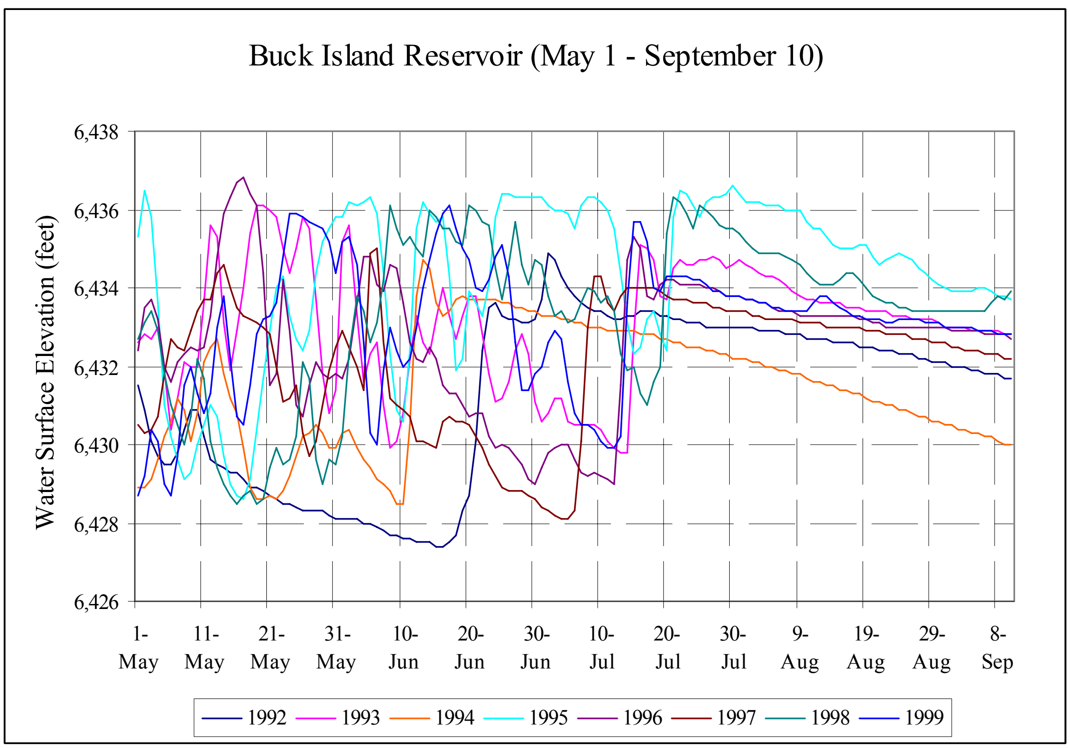

Figure 3-14. Buck Island reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007, as modified by staff)

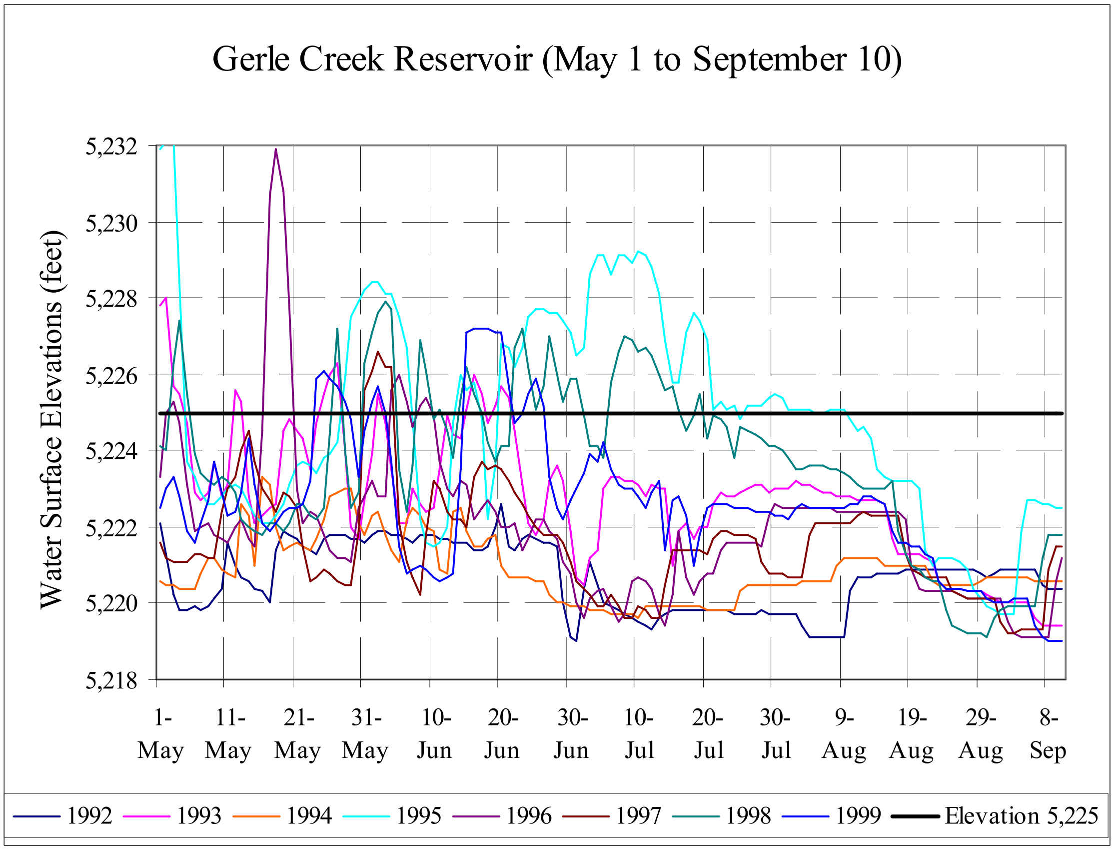

Figure 3-15. Gerle Creek reservoir modeled elevations between May 1 and September 10 for 1992 to 1999. (Source: CDFG, 2007 as modified by staff)

Junction and Brush Creek Reservoirs

Both of these reservoirs serve as afterbays and forebays for downstream and upstream powerhouses. In the past, SMUD has operated them with water variations of approximately 20 feet per day during peaking operations. HEC-ResSim modeling of the Proposed Action indicates that this type of variation would continue to occur, largely the result of continued daily peaking operations and the limited storage capacity of the reservoirs.

Slab Creek Reservoir

HEC-ResSim modeling of the effects of the Proposed Action's measures on reservoir levels at Slab Creek reservoir shows that daily fluctuation at this reservoir would occur, but would be likely to be less than under existing conditions. Existing daily fluctuations at this reservoir are normally about 6 feet, with only a few days per year over 7 feet. Figure 3-16 provides representative short-interval data of historical and modeled water surfaces in Slab Creek reservoir for July 1 through September 30, 1999. This figure shows a substantial decrease in the daily fluctuation of Slab Creek reservoir and indicates that water levels remain above elevation 1,830.[33]

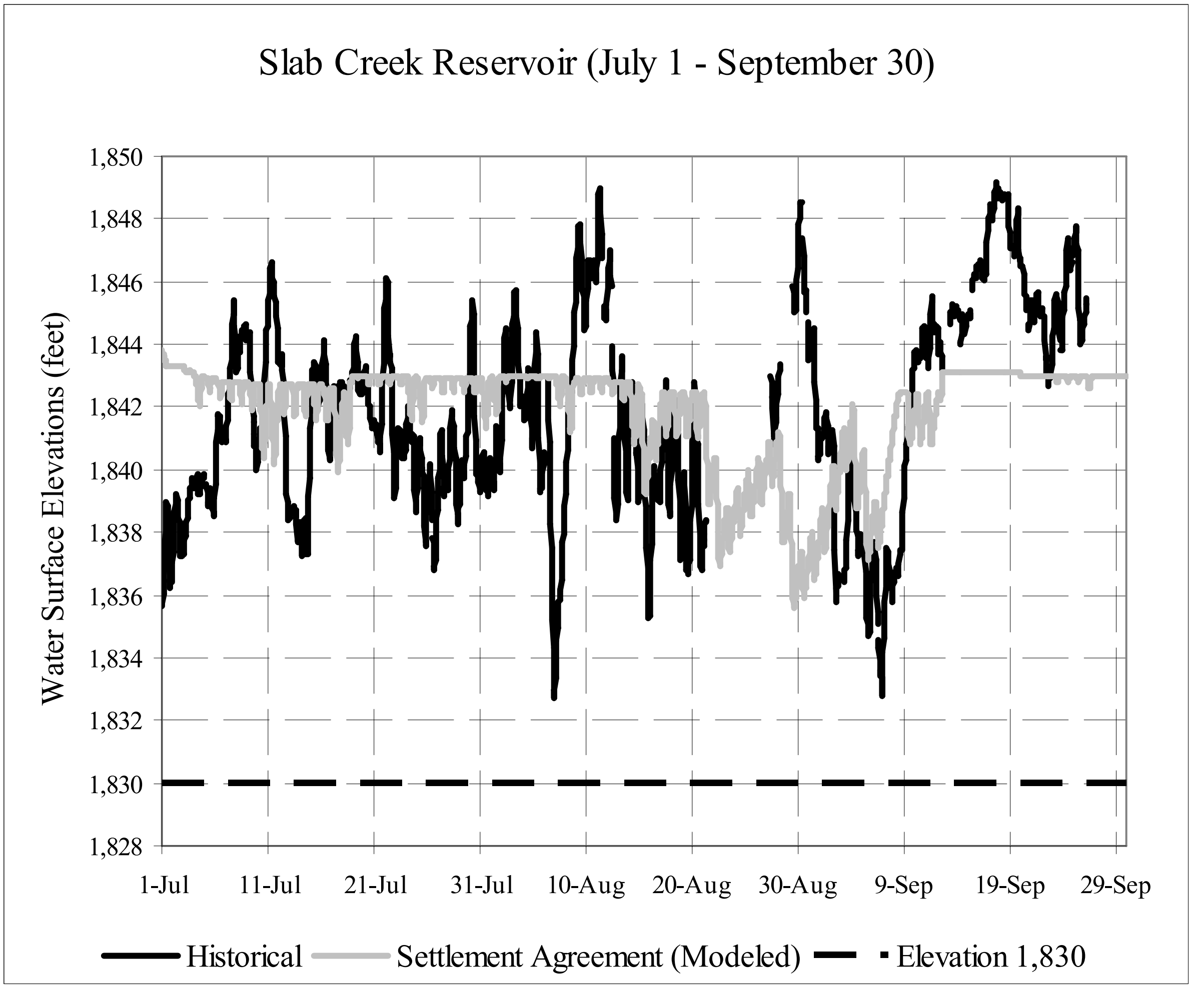

Figure 3-16. Slab Creek reservoir historical one hour and modeled half hour elevations between May 1 and September 10 1999. (Source: CDFG, 2007; CDEC, 2007, as modified by staff)

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[33]For model simplicity purposes, coordinated operations between Slab Creek reservoir and Chili Bar reservoir was simulated using the implicit storage balance option within HEC-ResSim. In addition, the target elevation for Slab Creek reservoir was set at a constant elevation of 1,843 feet. The reservoir fluctuation depicted in the model output is primarily a result of these modeling simplifications. It is expected that the daily fluctuation in Slab Creek reservoir water surface elevations (absent effects from the Iowa Hill development) will be similar to historical operations.

Flow and Water Level Monitoring—Flow and water level gages are in place on many Project-affected reaches and reservoirs (tables 3-23 and 3-24).

Table 3-23. Existing streamflow gages in the UARP area. (Source: SMUD, 2005, USGS, 2007)

Existing USGS Gage No.	Gage name
11427960	Rubicon River below Rubicon dam, near Meeks Bay[a]
11428400	Little Rubicon River below Buck Island dam[b]
11429500	Gerle Creek below Loon Lake dam
11430000	SFRR below Gerle Creek
11441500	SFSC near Ice House
11441800	Silver Creek below Junction dam near Pollock Pines[c]
11441900	Silver Creek below Camino dam
11442700	Brush Creek below Brush Creek dam near Pollock Pines
11443500	South Fork of the American River near Camino

[a] measures flows below 10 cfs, does not measure dam spillage.
[b] measures flows below 2 cfs, does not measure dam spillage.
[c] measures flows up to 40 cfs, does not measure dam spillage.

Table 3-24. Existing reservoir gages in UARP area. (Source: SMUD, 2005, CDEC, 2007)

Existing USGS No.	Existing DWR Abbreviation	Reservoir Name
NA	RBL	Rubicon
11429350	LON	Loon Lake
11429600	GLL	Gerle Creek
11441100	ICH	Ice House
11441001	UNV	Union Valley
11441760	JNC	Junction
11441890	CMI	Camino
11442690	BHC	Brush Creek
11443450	SLB	Slab Creek

Currently, SMUD maintains these gages and conducts monitoring and other procedures under the supervision of, and in conjunction with, USGS. Under Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, SMUD would maintain gages at almost all the current locations to monitor stream flows and reservoir levels, as well as conduct gage installation, rating, and measurements.

PG&E's existing and proposed compliance point for flows released from the Chili Bar Project is the existing USGS gage no. 11444500 (SFAR near Placerville). Under Proposed Article 2-8, *Streamflow and Reservoir Elevation Gaging*, PG&E also proposes to monitor the water level of Chili Bar reservoir to ensure compliance.

Our Analysis

We have reviewed the existing gaging and determined that SMUD would need to modify the current gaging in order to demonstrate compliance with the proposed minimum streamflow schedules in several of the downstream reaches.

Measuring flows below Rubicon dam. USGS gage no. 11427960 (Rubicon River below Rubicon dam) is a measuring device located in the outlet pipes of Rubicon dam and computes flow up to 10 cfs; it does not measure flow from the spillway. An auxiliary, but non-recording, gage is located about 1,300 feet downstream from the dam at a point where flow from the spillway has rejoined the channel. Currently, the recording gage is suitable for measurement of the existing 6 cfs or natural flow minimum flow requirement. However, the proposed minimum flows are above 10 cfs during the March through June period of most water year types, as shown in table 3-36. To demonstrate compliance with the proposed minimum streamflow schedule, SMUD would need to establish a means to measure outflow in excess of 10 cfs. This might be possible by converting the existing downstream non-recording gage to a fully operational and recording gage station or by other methods. In addition, according to SMUD, the current maximum low level outlet capacity is 18 cfs, so SMUD would need to modify the outlet pipe and/or structure to allow compliance with streamflows of 20 cfs (April) or 35 cfs (May) during BN, AN, or wet water year types. To monitor compliance with the proposed pulse events, SMUD could install a gage downstream of the confluence of the channel from spillways on the main and auxiliary dams and the low level outlet to monitor the recommended pulse flow event of at least 600 cfs for 3 consecutive days. Alternatively, if deemed feasible by USGS, the Forest Service, and other parties, SMUD could use the existing Rubicon reservoir water surface recorder and develop a rating curve to measure the amount of flow over the Rubicon reservoir spillway. However, it might be technically challenging to measure the flows accurately due to the length of the spillway crest. Because the Rubicon dam and reservoir are in the Desolation Wilderness Area, SMUD would need Forest Service approval of any physical modification to Project facilities necessary to monitor compliance with the proposed pulse events.

Measuring flows below Buck Island dam. USGS gage no. 11428400 (Little Rubicon River below Buck Island dam, near Meeks Bay) is a water stage recording V-notch sharp-crested weir near the low level outlet of the dam. This gage currently measures up to 2 cfs and does not measure flow from the spillway; it is suitable for measuring the current minimum flow requirement of 1 cfs. Because the proposed minimum flows are above 2 cfs during the March through June period of most water year types, as shown in table 3-37, SMUD would need to establish a means to measure outflow in excess of 2 cfs and up to 8 cfs, such as modifying the existing weir measurement structure.

Measuring flows below Gerle Creek and Robbs Peak dams. USGS gage no. 11430000 (SFRR below Gerle Creek, near Georgetown) is a water stage recorder located about 600 feet downstream of the confluence with Gerle Creek and about 1.2 miles downstream from Gerle Creek dam. Currently this gage measures both minimum flows and spillage over the dam. This gage is also used to also measure minimum flows from Robbs Peak dam, which is located about 1.1 miles upstream on the SFRR. SMUD states that manual staff gaging downstream of each dam is currently used in conjunction with the SFRR gage data. A rectangular weir staff gage is located at the base of Robbs Peak dam that provides gage data to correctly adjust releases from both Robbs Peak and Gerle Creek reservoirs. The gaging data is currently used to measure flows released from each dam during low flow periods. Accretions in the reaches below these two dams during the summer months are not substantial between the dams and the existing gage. It would be difficult to install new flow gaging stations in the areas below these two dams because of the general stairstep boulder/bedrock nature of the stream channels. Installation of gages at these locations would have both short-term and long-term environmental consequences (e.g., potential erosion and sedimentation, destabilization of existing slopes, disturbance of aquatic and riparian habitat, potential degradation of the local visual quality, and potential disturbance of cultural sites). Plans for the gaging stations could provide site-specific details regarding how these effects would be addressed. Consultation with USGS for the development of these gage sites, if part of a new license, would help ensure future compliance with USGS standards for flow measurement.

Measuring flows below Junction dam. USGS gage no. 11441800 (SFSC below Junction dam, near Pollock Pines) is located in the outlet pipe from Junction dam. Currently this gage does not measure flow above 40 cfs and does not have the ability to measure flow over the spillway. SMUD states that the low level outlet pipe from Junction dam has a maximum capacity of 138 cfs. Minimum flows in excess of 40 cfs, as shown in table 3-44, are proposed for the months of April, May, and June in some water years. In order to demonstrate compliance with the proposed minimum streamflow schedule, SMUD would need to establish a means to measure flow in excess of the current 40 cfs, such as modifying the existing measurement structure.

Measuring flows below Loon Lake dam, Ice House dam, Camino dam, Brush Creek dam, and Slab Creek dam. USGS gage no. 11429500 (Gerle Creek below Loon Lake dam, near Meeks Bay) is a water-stage recorder and V-notch sharp-crested weir about 0.3 miles below the dam. USGS gage no. 11441500 (SFSC near Ice House) is a water stage recorder with concrete control, located about 0.4 mile downstream from the dam. USGS gage no. 11441900 (Silver Creek below Camino dam) is a water stage recorder located about 0.4 mile downstream from the dam and measures low flow and dam spillage. USGS gage no. 11442700 (Brush Creek below Brush Creek dam, near Pollock Pines) measures flow in the outlet pipe from Brush Creek dam. According to SMUD, the low level outlet pipe from Brush Creek dam has a maximum capacity of 145 cfs. USGS gage no. 11443500 (SFAR near Camino) measures flow with an acoustic velocity meter approximately 1000 feet below the dam. Currently these gages measure both minimum flows and spillage over the dams and would be sufficient to measure the proposed minimum streamflow schedules, including the proposed pulse flows and/or recreational streamflows.

Operation of reservoir water level elevation gages. Currently, SMUD operates and maintains all of the water level gages listed in table 3-24, and SMUD reports the water levels on an hourly basis to the DWR.[34] This type of monitoring is needed as part of Project operations to coordinate multiple reservoirs, powerhouses, tunnels, and other structures within the Project area, and would be expected to continue. The effects of the Iowa Hill development would include changes in the water-level fluctuations in Slab Creek reservoir, with a general withdrawal of water during the night and increased inflow during the day during generation.

Measuring flows below Chili Bar dam. USGS gage no. 11444500 (SFAR near Placerville) measures flow with a water-stage recorder approximately 700 feet downstream of the dam. Currently this gage measures both minimum flows and spillage over the dam and would be sufficient to measure any reasonable flow regime, including possible recreational streamflows.

Streamflow and Reservoir Elevation Gaging Plan

Under Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, SMUD would, within 1 year after license issuance, develop and submit to the Commission for approval a streamflow and reservoir elevation gaging plan that meets USGS standards and includes a minimum of 10 streamflow gage locations (see table 3-23) and nine reservoir elevation compliance gaging locations (see table 3-24). This plan would be approved by the Water Board prior to filing with the Commission. SMUD would detail in the plan the maintenance and operation of all of the above mentioned streamflow and reservoir elevation gages, with the exception of USGS gage no.

[34] The data are available online at http://cdec.water.ca.gov/reservoir.html.

11430000 (SFRR below Gerle Creek). This gage would be replaced by new gages, one below Gerle Creek reservoir and one below Robbs Peak reservoir.

As part of the Settlement Agreement, SMUD also proposes to: (1) install and maintain simple staff gages at the put-ins for the Slab Creek and Ice House recreational boating runs and perform an investigation to determine whether telemetry equipment can be installed at Rubicon River below Rubicon dam and Little Rubicon River below Buck Island dam to monitor conditions and/or control operations, both within 2 years of licensing; and (2) provide real time information at 15-minute intervals for all streamflow and reservoir elevation gages.

Under Proposed Article 2-8, *Streamflow and Reservoir Elevation Gaging*, PG&E would, within one year after license issuance, develop and file for approval from the Commission a stream flow and reservoir elevation gaging plan, which would meet USGS standards. This plan, which would be approved by the Water Board prior to filing with the Commission, would address compliance streamflow gaging below Chili Bar dam at the existing USGS gage no. 11444500 (SFAR near Placerville) and water level compliance at Chili Bar reservoir.

The Placer County Water Agency recommends that SMUD implement a gaging system of SMUD's facilities that would verifiably and effectively monitor, report, and limit the rate of water diversion at SMUD's diversions facilities in the Rubicon River watershed. To effectively perform these functions, gaging would be required at the diversion gage locations shown in table 3-25 and real-time telemetry reporting capability would need to be installed, maintained, and made available to PCWA and other resource agencies.

Table 3-25. Existing diversion structure gages in Rubicon River watershed area of the UARP. (Source: SMUD, 2005)

Existing USGS Gage Number	Gage Name
11427940	Rubicon–Rockbound tunnel
11428300	Buck Island–Loon tunnel
11429340	Loon Lake powerhouse
11429300	Robbs Peak powerhouse

Our Analysis

SMUD and PG&E already monitor, or in some cases provide assistance to the USGS for monitoring and recording, many hydrological indicators, such as reservoir water level and stream flow in the Project area. Daily, and in many cases hourly or shorter interval, data recording allows SMUD and PG&E to manage their facilities for hydroelectric generation and document environmental compliance within the terms of their existing licenses. The configuration of future flow and water level monitoring gages would depend on the operating conditions that may be specified in new licenses.

Developing a coordinated gage installation plan, in consultation with resource and land management agencies, as well as USGS, would ensure that any new gages necessary to measure the flows and water levels that may be specified in a new license would provide accurate data consistent with applicable USGS standards. It also would provide documentation of the justification for the type of new gage (i.e., a gage with real-time telemetry capabilities or a gage without such capabilities) that is installed at each site and any needed modifications to existing streamflow or reservoir elevation gages. Other specific details of the streamflow gaging and reservoir elevation plans are discussed below.

Currently, real-time reporting is not available on any diversion structure located within the Rubicon River watershed area of the UARP. Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, does not include gaging at the diversion structures listed in table 3-25. Although the installation of real-time telemetry and other equipment to monitor, report, and limit the diversion flow at these structures, as suggested by Placer County, would provide information on the quantity of water diverted from these structures, we see no nexus between the requested gaging and this relicensing proceeding. In fact, this would seem to be a matter that would fall under the jurisdiction of the Water Board.

Public Information Services

Under Proposed Articles 1-25 and 2-14, *Public Information Services*, SMUD and PG&E would provide real-time streamflow and reservoir level information to the public via staff gages in the reservoirs, web sites, and toll free telephone numbers.

Our Analysis

Staff gages for recreational boating at the put-ins for Slab Creek and Ice House boating runs. Staff gages at these sites would allow boaters to observe the actual water level before launching on these whitewater runs. These gages would be roughly calibrated to flow levels that are too low, too high, or suitable for recreational boating activities. This measure is discussed in more detail in section 3.3.6.2, *Recreational Resources*.

Telemetry equipment on gages on the Rubicon River below Rubicon dam and on the Little Rubicon River below Buck Island dam. As is the case with possible modification to the existing gage, or replacement of the gage below Rubicon dam, SMUD and the Forest Service would need to concur that telemetry equipment is economically and technologically feasible, and whether it could be installed consistent with law, regulations, and policies applicable to the Desolation Wilderness Area.

Provide real-time information at 15-minute intervals for all stream flow and reservoir elevation gages within the UARP area. Currently, real-time reporting is not available to the public on any streamflow gaging sites within the UARP area. Hourly real-time reservoir levels are available on the CDEC web site. Real-time information for all streamflow and reservoir elevation locations can normally be easily and inexpensively collected in either 1-hour or 15-minute intervals and made available to the public, which would allow the public, operators of downstream projects such as the Chili Bar Project and Middle Fork American River Project, and others to coordinate their activities and operations based on this information.

Chili Bar streamflow and reservoir gaging plan. Flow compliance monitoring for releases from Chili Bar reservoir would necessitate the continuing operation of gage no. 11444500 located below Chili Bar dam. Currently this is not a real-time USGS gage, but flows and gage heights at 1-hour intervals are available on the CDEC website for this streamflow gage. Reservoir level compliance would likely entail an upgrade of the current system that PG&E uses to monitor the water level within Chili Bar reservoir.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. Minimum flows, pulse flows, ramping rates, streamflow and reservoir elevation gaging, and public information services would be as described in the Proposed Action. As a result, the effects of the UARP-only Alternative would be the same as discussed under the Proposed Action with the exception that Slab Creek reservoir would not experience the daily and weekly fluctuations from operation of the pumped-storage facility.

Effects of Project Operations on Water Quality

Operation of the Projects has the potential to affect water temperatures, water quality, and algae. The available information that serves as the basis for our analysis regarding the effects of Project operations on water temperatures is not consistent between reaches. SMUD used water temperature observations and the SNTEMP model (Theurer et al., 1984) to simulate the effects of altered flow regimes on water temperatures in the Ice House, Camino, and Slab Creek dam reaches; and it used CE-QUAL-W2 (Wells, 2000) to simulate the effects of the proposed Iowa Hill development on water temperatures within Slab Creek reservoir. Water temperature was not modeled for the other UARP or Chili Bar Project-affected reaches and our analysis is by necessity based on observed temperatures.

The results of hourly temperature measurements made during 2000 to 2004 are used to represent existing conditions for all reaches. We compare the mean temperature for each day (i.e., 24-hour period), which we refer to below as “mean temperature”, to 20.0°C as an indicator of whether thermal conditions fully support cold water fishes. The lack of directly comparable information, as discussed above, resulted in our using two approaches to evaluate the effects of flows on water temperatures, depending on whether or not modeling had been done. For the reaches that were modeled, our analysis focuses on the applicants’ water temperature simulations for 2002, a BN water year type. To determine the potential effects of proposed operations on water temperature in Project reaches that were not modeled, we consider the changes in the proportion of total flow for BN water year types that would be supplied by the corresponding dam release (as opposed to the percentage provided by natural accretion). The existing minimum streamflow schedules referred to in our analysis are shown in tables 3-4 through 3-10 in section 3.3.2.2, *Water Quantity*. A summary of the temperatures in 2000–2004 referred to in our analysis are shown in table 3-16, and the elevations of the low water intakes and outlets are shown in table 3-15 in section 3.3.2.1, *Water Quality.* In addition, we evaluate the effects of proposed minimum flows and operation of the proposed Iowa Hill development below using the results of SMUD's CE-QUAL-W2 simulations. The results of our analyses of these issues are summarized in table 3-26, and are discussed below.

Table 3-26. Summary of general water temperature characteristics for the UARP and Chili Bar Project affected reaches under existing and proposed minimum instream flows and proposed Iowa Hill operations.[a] (Source: Staff)

Reach	Existing Operations [b]	Proposed Operations [c]
Rubicon	Warm late spring to summer releases. In comparison to dam release temperatures, major warming in May and June transitioning to minor to moderate cooling in July, which continues through September. Frequently >20°C in portions of the reach in July and August.	Temperatures slightly reduced compared to existing conditions in May and June, but negligible change in July–September.
Buck Island	Warm late spring to summer releases. Moderate to major warming within the reach during May–June, transitioning to minor cooling in July, which continues through September. Frequently >20°C throughout the reach in July and August.	Temperatures slightly reduced in May and June, but negligible effects in July–September.
Loon Lake	Cool releases through mid-September. Moderate warming in May, major warming in June–August, and minor cooling in late September. Remain <20°C throughout the bypassed reach.	Temperatures moderately reduced in June and July, and slightly reduced in May and August.
Gerle Creek	Moderate warming in May–July followed by minor warming in August and minor cooling in September. Remain <20°C throughout the bypassed reach.	Temperatures somewhat reduced during May through mid-August, and slightly increased in September.
Robbs Peak	Moderate warming in May–July, minor cooling in August, and moderate cooling in September. Remains <20°C in most years, but frequently >20°C in Dry years.	Temperatures somewhat reduced during May through mid-August, and slightly increased in September.

Reach	Existing Operations [b]	Proposed Operations [c]
Ice House	Cold May–September releases. Major warming May–September. Infrequently >20°C in July and August in the lower half of the reach.	Based on temperature simulations for a BN year, temperatures would be reduced 3 to 4°C in June and reduced about 2°C in July. The cooling effect would be smaller at both the upper and lower ends of the reach, although temperatures would likely remain <20°C throughout the entire reach.
Junction	Cool May–September releases. Major warming May–September. Rarely >20°C at lower end of reach in July.	Temperatures substantially reduced in May–July, maintaining <20°C. Temperatures slightly increased in August and September of AN and Wet water years due to lower minimum flow releases.
Camino	Moderate release temperatures. Major warming in May–September. At the lower end of the reach, >20°C frequently in July, occasionally in June and August, and rarely in May.	Based on temperature simulations for a BN year, temperatures at the lower end of the reach would be reduced substantially in May–July, and remain virtually the same in August and September. Temperatures would be >20°C less often than under the existing conditions.
SFAR	At the upper end of the reach warm inflows from both the SFAR and Camino dam reach resulting in >20°C frequently in July and August, occasionally in June, and rarely in September.	Minimal to no measurable effects on temperatures.
Brush Creek	Major warming in May–July and moderate warming in August–September. Remains <20°C throughout the bypassed reach.	Temperatures somewhat reduced throughout the reach.
Slab Creek	Moderate release temperatures. In the reach upstream of White Rock powerhouse, major warming in May–September. In the lower portion of this section, frequently >20°C in June–August.	Based on temperature simulations for a BN year, temperatures substantially reduced at the lower end of the reach, although temperatures of >20°C could continue to occur in June–August. Pumping/generation cycling of the proposed Iowa Hill development would result in slightly cooler conditions (<1 °C) within Slab Creek reservoir and the streamflow releases from Slab Creek dam.
Chili Bar	Major warming in June–September and moderate warming in May. The lower end of the reach is rarely >20°C.	Temperatures slightly reduced May–September, likely to levels that remain <20°C.

[a] General trends based on mean temperatures.
[b] For Existing Operations, effects are presented as a comparison to release temperatures from the respective dam.
[c] For Proposed Operations, effects are presented as a comparison to existing conditions.

Our Analysis

Rubicon Dam and Buck Island Dam Reaches

The thermal regime of releases from both Rubicon and Buck Island reservoirs, which do not thermally stratify, have the same general seasonal pattern as in the Rubicon River inflow to Rubicon reservoir. The mean daily temperatures at the upstream end of the Rubicon dam reach are about 3 to 6°C in early May, increase to about 12°C in mid- to late June, rapidly increase to over 20°C in mid-July, then gradually cool after mid-August. Warmer temperatures occur earlier in the season during Dry water years. The temperature of releases from Buck Island dam into the Little Rubicon River follow the same general pattern as the Rubicon dam releases, but they are about 1.5 to 3°C warmer in late spring to early summer, and slightly (<1°C) warmer in late summer.

The Rubicon dam and Buck Island dam reaches experience similar changes in water temperature. Based on mean daily temperatures, both reaches experience substantial warming (increases of about 1.5 to 3.5°C) in May and June, a transition from warming to cooling in July, and cooling in August and September. These characteristics are closely linked to the relationship between accretion and release flows. Typically, accretion flows account for more than 90 percent of the total flow during May and June, but less than 15 percent of the total flow in August and September. Downstream of the confluence of the two rivers, water temperatures tend to closely follow those of the Little Rubicon River.

Under the Settlement Agreement, the primary objectives for the Rubicon River downstream of Rubicon dam and the Buck Island dam reach are to provide cold freshwater habitat for healthy trout and mountain yellow-legged frog populations, and less conducive conditions for California roach, speckled dace, and golden shiners. The Settlement Agreement also attempts to reduce elevated aluminum concentrations that may adversely affect aquatic organisms.

Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from both dams during May and June, but would not change releases during July through September, with the exception of releasing 1 cfs when natural flows are less than 1 cfs (tables 3-36 and 3-37, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would slightly lower May and June water temperatures in both bypassed reaches, but not change water temperatures during July through September. Although the settlement parties indicated that the proposed flow regime is intended to address the elevated aluminum concentrations in Rubicon reservoir, there is no evidence that they would substantially reduce aluminum concentrations nor is there any evidence that the aluminum concentrations are Project related. In order to conclusively determine whether aluminum concentrations are reduced in the reservoir, aluminum concentrations would need to be monitored after the new flow regime is implemented.

Loon Lake Dam Reach

Mean daily temperatures typically remain below 20°C in the bypassed reach between Loon Lake dam and Gerle Creek reservoir. Loon Lake dam releases are made from the low-level outlet, which is at a depth of 83 feet below the reservoir's normal maximum level, resulting in mean daily release temperatures of about 4 to 6°C in early May, slowly and steadily increasing to about 12°C by late August to mid-September. During drawdown of Loon Lake in the late summer of some years, mean daily temperatures of reservoir releases increase to 15 to 17°C at a faster rate. Within this bypassed reach, mean daily temperatures increase about 1.5°C in May, about 5°C in June and August, about 7°C in July, and decrease in late September. Much of this warming of the cool deepwater releases from Loon Lake appears to result from ambient air temperatures and solar insolation within 2 miles of the dam. Thermal characteristics of the Loon Lake dam reach appear be highly influenced by the cool late spring and summer releases from the dam and accretion from tributaries and other sources. Typically, releases account for less than 10 percent of the total flow during May, about 30 percent of the total flow in June, about 70 percent of the total flow in July, and 90 percent of the flow in August and September.

Under the Settlement Agreement, the primary objectives for the Loon Lake dam reach are to provide cold freshwater habitat for healthy rainbow trout, brown trout, and mountain yellow-legged frog populations. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases during May through September of most years, with the largest increases occurring in May and June (table 3-38, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would slightly lower May and August water temperatures, and moderately lower water temperatures during June and July.

Gerle Creek Dam and Robbs Peak Dam Reaches

Streamflow releases from both Gerle Creek reservoir and Robbs Peak reservoir, which do not thermally stratify, have mean daily temperatures that do not exceed 20°C in most years, although releases from Robbs Peak dam frequently exceed 20°C in July and August of Dry water years. Mean daily temperatures of releases from Gerle Creek dam are about 5 to 7°C in early May, increase to about 12°C in mid- to late June, and increase to their peak of about 15 to 18°C in late August or early September. Warmer temperatures occur earlier in the season during Dry water years, reaching 12°C as early as late May. The temperature of releases from Robbs Peak dam into the SFRR were warmer and much more variable than Gerle Creek dam releases, which are highly influenced by deep-water releases from Loon Lake, reaching their peak mean daily temperatures of 18 to 22°C in late July to August. In 2001, a Dry water year, mean daily temperatures of Robbs Peak dam releases exceeded 20°C continuously from July 14 through August 16, indicating that coldwater fishes are not fully supported.

Based on differences in mean daily temperatures within the Gerle Creek and Robb Creek releases, the temperatures of streamflow releases from Gerle Creek dam and Robbs Peak dam increase about 1.5 to 2°C during May through July before reaching the Gerle Creek/SFRR confluence. In August, these reaches tend to transition from increasing to reducing temperatures as a result of ambient air temperatures becoming cooler. The cooler ambient air temperatures lower mean daily temperatures about 0.5 to 1.5°C in September. Inflow from the Gerle Creek dam reach had little effect on temperatures, with the largest effects being an increase of about 0.5°C in September. These thermal characteristics are closely linked to release temperatures from Gerle Creek dam, which are sometimes affected by drawdowns of Loon Lake and Robbs Peak dam.

Under the Settlement Agreement, the objectives include providing cold freshwater habitat for healthy mountain yellow-legged frog populations in the Gerle Creek dam reach, and providing cold freshwater habitat for healthy mountain yellow-legged frog and foothill yellow-legged frog populations in the SFFR downstream of Robbs Peak dam. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from both Gerle Creek dam and Robbs Peak dam during May through September, with the largest increases occurring in May and June (tables 3-39 and 3-40, see section 3.3.3, *Aquatic Resources*, below). Based on our analysis, we conclude that the proposed minimum streamflow releases would somewhat lower water temperatures during May through mid-August, and slightly increase water temperatures in September. We anticipate that the largest reduction in temperatures would occur in the SFRR because the proposed minimum streamflow releases are more than four times the current requirements in May and June.

Ice House Dam Reach

Mean daily temperatures generally remain below 20°C in most of the SFSC bypassed reach between Ice House dam and Gerle Creek reservoir. Releases from the Ice House dam low-level outlet, which is at a depth of approximately 122 feet below the reservoir's normal maximum level, are drafted from the hypolimnion of Ice House reservoir, resulting in mean daily release temperatures of about 5 to 7°C from May through September. About two thirds of this reach flows through a large area that was burned by the Cleveland Fire in 1992 and that is not fully revegetated. Water temperature increases are moderate upstream of the area that was burned, but they are substantial within the burned area. Between the dam and about 0.5 mile upstream of the burn, mean daily temperatures increased about 2 to 3.5°C in May through August and about 1°C in September, although temperatures remain below 12°C.

Between the dam and the lower end of the reach, mean daily temperatures increase about 11 to 12°C in June through August, and about 7°C in May and September. The monitoring results indicate that mean daily temperatures occasionally exceed 20°C in the area affected by the burn in July and August, and that they nearly reach 20°C in June of some years. Thermal characteristics in the Ice House dam reach are highly influenced by the cool spring through summer releases from the hypolimnion of Ice House reservoir, the open unshaded burn area, and accretion from tributaries and other sources. Based on required minimum flows for BN water years, dam releases account for about 15 to 20 percent of the total flow in May and June and about 50 percent of the total flow in July through September.

Under the Settlement Agreement, one of the primary objectives for the Ice House dam reach is to provide temperatures that allow for management of native coldwater fish species and improve habitat conditions for foothill yellow-legged frog populations. Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases during May through July of all years, and August and September of CD and Dry water years (table 3-42, see section 3.3.3, *Aquatic Resources*, below). These higher minimum streamflow releases would reduce water temperatures throughout much of the bypassed reach.

Comparison of simulated daily mean and daily maximum temperatures indicates that the existing hypolimnetic releases result in cooler than existing conditions throughout much of the reach. Simulated temperatures for existing conditions were as much as 15°C cooler (7°C for existing versus 22°C for natural) just downstream of the dam, about 3 to 4°C cooler than existing temperatures near the middle of the reach, and virtually the same at the lower end of the reach. Comparison of simulated temperatures for the existing and proposed operations suggests that proposed operations would result in mean temperatures in June that about 3 to 4°C lower than under existing operations and about 2°C lower in July. This cooling effect would be smaller at both the upper and lower ends of the reach. However, it appears that mean daily temperatures of 20°C or less would be maintained throughout the entire reach. Recovery of vegetation in the burn area is expected to slowly increase shading of this reach and thereby reduce input of solar energy and somewhat lower temperatures in the lower half of the reach through any new license term.

Junction Dam Reach

Mean daily temperatures rarely exceed 20°C in Silver Creek between Junction dam and Camino reservoir, the Junction dam reach. At Junction dam, releases to the bypassed reach are typically provided through the low-level outlet, which is at a depth of 115 feet below Junction reservoir's normal maximum level. Mean daily release temperatures are about 4 to 7°C in early May, increase to about 7 to 11°C by early June, and remain in that temperature range through September. Considerable warming occurs in the reach, as is evidenced by mean daily temperatures just upstream of Camino reservoir averaging about 5°C higher than at the release in May and September, and 7 to 8.5°C higher in June through August. Limited monitoring conducted during July through September of 2004 indicates that release temperatures increase by about 1°C within 0.5 miles of the dam.

It appears that the water temperature in this reach is primarily controlled by the quantity and temperature of releases from Junction dam, and accretion from tributaries and other sources in the reach. Based on accretion and required minimum streamflow releases for BN water years, releases account for about 25 to 30 percent of the total flow during May and June and about 55 to 60 percent of the total flow in July through September.

Under the Settlement Agreement, an objective for the Junction dam reach is to provide temperatures that allow for management of native coldwater fish species and improve habitat conditions for foothill yellow-legged frog breeding. Another objective is to reduce the presence of an unidentified algae species that has proliferated throughout the reach. Proposed Article 1-1, *Minimum Streamflows*, would increase minimum streamflow releases from Junction dam during May through July of all water year types, in August of Dry and CD water years, and September of CD water years (table 3-44, see section 3.3.3, *Aquatic Resources*, below).

In addition, this proposed article would somewhat reduce minimum streamflow releases from Junction dam in August and September of AN and Wet water years. We anticipate that the large increases in May through July minimum streamflow releases would substantially reduce temperatures in the reach. We anticipate that the proposed reduction of minimum streamflow releases for August and September of AN and Wet water years would increase temperatures in the reach, although this warming effect is expected to be minimal since the proposed reductions in streamflow are small. Mean daily temperatures under the proposed minimum streamflow releases are expected to remain below 20°C, although water temperatures have not been monitored recently during AN or Wet water years so there is a possibility that mean daily temperatures could exceed 20°C. We anticipate that warmer water temperatures would occur in edgewater habitat that has slower velocities and is not thoroughly mixed with the main flow of the river.

In order to maintain mean daily temperatures of no more than 20°C in the Junction dam reach, Proposed Article 1-1, *Minimum Streamflows*, also includes a clause that would require SMUD to release a block of water for temperature control in Wet water years. If water temperature measured in Silver Creek immediately upstream of Camino reservoir exceeds a mean daily temperature of 20ºC in July, August, or September of a Wet water year, SMUD would be required to release additional water into Silver Creek below Junction dam as directed by the Agencies. A block of water shall not exceed 1,044 acre-feet for July, 491 acre-feet for August, or 475 acre-feet for September. Within 1 year of license issuance, SMUD would, in consultation with the Agencies, develop a plan for the block of water that addresses, at a minimum: notification protocols for temperature exceedances, emergency temperature operation contingencies, and ecological monitoring needs associated with use of the block of water. Reserving the block of water, monitoring water temperatures at the lower end of the Junction dam reach, and developing a plan for notification protocols and ecological monitoring needs associated with the block of water would facilitate making informed decisions of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary.

During the settlement process, pulse flows were strongly considered for this reach to address the stagnant conditions that contribute to excessive algae growth and limit movement of spawning gravels. However, to conserve water for hydroelectric generation and recreational interests, minimum streamflows that follow the shape of the unimpaired hydrograph and are higher than the current minimum streamflows were included in the settlement instead, in hopes that they will address these undesirable ecological conditions. In their rationale for the Settlement Agreement, both the Forest Service and CDFG indicate that they expect the higher minimum streamflows to suppress unknown algae species in the reach. The Settlement Agreement includes an adaptive management approach to address this issue, which we discuss in section 3.3.2.2, *Algae Monitoring and Adaptive Management.*

Camino Dam and SFAR Reaches

Streamflow releases from Camino dam have the potential to affect water temperatures in Silver Creek from Camino dam to the SFAR confluence (Camino dam reach) and in the SFAR from this confluence to Slab Creek reservoir (SFAR reach). Monitoring results indicate that mean daily temperatures exceed 20°C in the lower end of the Camino dam reach and in the SFAR reach (see table 3-16). Mean daily temperatures of streamflow releases from Camino reservoir, which does not thermally stratify, are about 7-10°C in early May, increase to about 8 to 11°C throughout most of June through September, but generally remain below 12°C. Between Camino dam and the SFAR confluence, mean daily temperatures increase about 6°C in May and September and about 8.5 to 10°C in June through August. Evaluation of mean daily temperatures for the 2000 through 2004 monitoring period show that exceedances of 20°C occurred at the lower end of the Camino dam reach on nearly 70 percent of the days in July, about 20 percent of the days in June and August, and occasionally (<5 percent of the days) in May.

At the confluence of the lower end of the Camino dam reach and the SFAR, the SFAR contributes very warm water, as documented by mean daily temperatures exceeding 20°C on nearly 90 percent of days in July and 60 percent of days in August. The SFAR temperatures are increased by higher temperature inflow from the Camino dam reach in May and June, and slightly reduced by cooler conditions in the Camino dam reach in July and August. In September, Camino dam temperatures have negligible effects on SFAR temperatures. Overall, this results in mean daily temperatures immediately downstream of the confluence of Silver Creek with the SFAR that exceed 20°C frequently in July and August, occasionally in June, and rarely in September. A short distance upstream of Slab Creek reservoir, Camino powerhouse discharges much cooler water into the SFAR, resulting in mean daily temperatures that are generally 10 to 15°C during late spring through early fall, with rare exceedances of 20°C in July and August.

Under the Settlement Agreement, the objectives for the Camino dam reach include providing temperatures that allow for management of native fish and improve conditions for foothill yellow-legged frog breeding, and providing good water quality to improve bioassessment composite metric scores, particularly in the lower portion of the reach. SMUD and the parties involved in the settlement do not provide their objectives for the SFAR reach, which also is affected by Camino dam releases.

Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Camino dam during May through July of all water year types, in August of Dry and CD water years, and September of CD water years (table 3-46, see section 3.3.3, *Aquatic Resources*, below). In addition, this proposed article would somewhat reduce minimum streamflow releases from Camino dam in August and September of AN and Wet water years.

Simulated temperatures for the BN year of 2002 suggest that the proposed minimum flows would reduce mean daily temperatures in Silver Creek upstream of the confluence with the SFAR about 5°C in May and June, and about 3°C in July, but still remain above 12°C from mid-May through September. It appears that mean daily temperatures at the lower end of the Camino dam reach would seldom exceed 20°C in May though July of BN water years. Proposed operations would remain virtually the same for August and September of BN water years, and thus the thermal regime would remain the same. Mean daily temperatures would occasionally exceed 20°C in August. In 2001, a Dry water year, mean daily temperatures for the lower end of the Camino dam reach exceeded 22°C in June, July, and August. The proposed increased minimum streamflow releases would reduce these temperatures, although it is not evident whether these reductions would lower temperatures to less than 20°C, since water temperatures were not simulated for a Dry year. Temperature monitoring would need to be conducted at this site to determine if the new flow regime reduced mean daily temperatures to less than 20°C. If mean daily temperatures continue to exceed 20°C, the licensee could determine whether further increasing minimum flows could reduce temperatures to acceptable conditions. We discuss the effects of warmer temperatures on life stages of trout in section 3.3.3.2, *Environmental Effects*, in Aquatic Resources.

SMUD addressed the possibility that the proposed minimum flows would not reduce mean daily temperatures to acceptable levels by including a provision to use a block of water to further reduce Camino dam reach temperatures in Wet years. Proposed Article 1-1, *Minimum Streamflows*, includes a provision to adaptively use up to 1,044 acre-feet for July; 491 acre-feet for August; or 475 acre-feet for September. If water temperature measured in Silver Creek immediately upstream of the SFAR confluence (USGS gage no. 11442000, SMUD station SC-1) exceeds a mean daily temperature of 20ºC in July, August, or September of a Wet water year, SMUD would be required to release additional water into Silver Creek below Camino dam as directed by the Agencies. Within 1 year of license issuance, SMUD would, in consultation with the Agencies, develop a plan for the block of water that addresses, at a minimum:

notification protocols for temperature exceedances, emergency temperature operation contingencies, and ecological monitoring needs associated with use of the block of water.

Reserving the block of water, monitoring water temperatures at the lower end of the Camino dam reach, and developing a plan to address notification protocols and ecological monitoring needs associated with the block of water would facilitate making informed decisions of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary. However, we note that our analysis indicates that mean daily temperatures could potentially exceed 20°C at the lower end of the Camino dam reach under the proposed minimum streamflow release schedule in water year types other than just Wet water years, for which this adaptive process is reserved.

Although the proposed minimum streamflow releases would increase the quantity of water contributed by the Camino dam reach and reduce the temperature of those contributions, their effect on water temperatures in the SFAR reach would likely be negligible due to the much greater contributions of flow from the SFAR.

Brush Creek Dam Reach

Mean daily temperatures typically remain below 20°C in Brush Creek between the diversion dam and Slab Creek reservoir, the Brush Creek dam reach. Dam releases from the low-level outlet, which is at a depth of 140 feet below the reservoir's normal maximum level, result in mean daily release temperatures of about 7-10°C in early May, increasing to about 12 to 14°C by mid-June, and reaching their peak of about 13 to 15°C in August. Mean daily temperatures for the lower end of the bypassed reach were very similar to those measured in the creek just upstream of Brush Creek reservoir, suggesting that they were near their equilibrium with ambient conditions. This is likely due to the reach's steep gradient with frequent small waterfalls, along with minimal accretion during the summer. Annual maximums of mean daily temperatures for the lower end of the reach ranged from about 16 to 20°C.

The existing license requires June through September minimum streamflow releases from Brush Creek dam ranging from 2 to 3 cfs or the natural flow, whichever is less. Under Proposed Article 1-1, *Minimum Streamflows*, corresponding minimum streamflow releases would be increased to a range of 3 to 9 cfs or natural flow, or 1 cfs if natural inflow is less than 1 cfs (table 3-47, see section 3.3.3, *Aquatic Resources*, below). This flow regime was developed with an emphasis on managing for native aquatic species. The mean trout biomass present in Brush Creek is well below the recommended objective, so the objective of minimum streamflows is to increase biomass by increasing the available stream habitat via streamflow regime manipulation. Increasing the summer minimum streamflow releases would provide more cool water at the upper end of the bypassed reach, and is therefore expected to result in somewhat cooler temperatures throughout the reach. Providing minimum streamflow releases of

1 cfs when the natural flow is less than 1 cfs is expected to somewhat reduce temperatures, at least in the upper end of the bypassed reach.

Slab Creek Dam Reach

Mean daily temperatures frequently exceed 20°C in the lower portion of the SFAR between Slab Creek dam and Chili Bar reservoir (the Slab Creek dam reach). Slab Creek dam releases are made from the low-level outlet, which is at a depth of 170 feet below Slab Creek reservoir's normal maximum level. This results in mean daily release temperatures of about 7 to 11°C in early May, increasing to about 12°C by late May to early June. Temperatures reach their peak of 14 to 16°C in June, and generally remain at 10 to 15°C through September. Mean daily temperatures at Mosquito Bridge, located near the middle of the reach length, average about 3.5 to 4.5°C higher than at the release point in May through August and are about 2°C higher in September. In the lower end of the reach, Rock Creek contributes its flow, which is typically warmer than Mosquito Bridge site flows. Just upstream of the White Rock powerhouse (located at the lower end of the Slab Creek dam reach) mean daily temperatures are generally 18 to 24°C in June through August. Mean daily temperatures exceeding 20°C are common at this site in June, July, and August.

Under the Settlement Agreement, the objectives for the Slab Creek dam reach include providing temperatures that allow for management of native fish and improve habitat conditions for foothill yellow-legged frogs and hardhead, and providing good water quality to improve bioassessment composite metric scores, particularly in the lower portion of the reach. Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Slab Creek dam during May through September of all water year types (tables 3-48 and 3-49, see section 3.3.3, *Aquatic Resources*, below).

Simulated mean daily temperatures suggest that the proposed minimum streamflows would substantially reduce temperatures at the lower end of the Slab Creek dam reach. SMUD also provided longitudinal plots of the range of mean daily temperatures simulated for flow releases of 30 to 270 cfs. These plots suggest that mean daily temperatures at the lower end of the reach would generally be about 10 to 15°C in May, 14 to 21°C in June, 19 to 22°C in July, 17 to 21°C in August, and 13 to 19°C in September. These simulations suggest that mean daily temperatures could exceed 20°C, which we use as an indicator of providing the designated coldwater habitat, in the lowermost one-third of the reach in June and July and the lowermost mile in August. Because water temperature modeling was only done for a BN water year type, it is not possible to use model simulations to assess conditions for other water year types. However, the proposed minimum streamflow releases are substantially higher than the existing required minimum flow releases, so we anticipate that a substantial reduction in warming would also occur in other water year types.

Iowa Hill Development

SMUD's Proposed Action includes construction and operation of the Iowa Hill development, which would use the existing Slab Creek reservoir as a lower reservoir and a new 6,400 acre-foot upper reservoir on top of Iowa Hill (section 2.4.1, *Proposed Project Facilities*). Operation of the proposed Iowa Hill development has the potential to affect the thermal regime of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam. In order to evaluate this potential effect, SMUD used version 3.2 of CE-QUAL-W2, a 2-dimensional (vertical and longitudinal) hydrodynamic water quality model developed by the U.S. Army Corps of Engineers, Waterway Experiment Station and Scott Wells (Cole and Buchak, 1995; Wells, 2000), to simulate water temperatures for the period of April 1 through October 1 of 2003, a BN water year.

A pumping/generation cycle was developed for a heavy use scenario using output from the CHEOPS UARP operations model. Under this scenario, the general pattern of operation is to pump water up to Iowa Hill reservoir at night (approximately midnight to 5 am), and release generation flows from Iowa Hill reservoir during the daytime (approximately 7 am to 8 pm). The temperature analysis repeated this daily pattern of pumping and generation from April 2 through September 29. Simulated mean water column temperatures for Slab Creek reservoir near the dam were a little cooler (as much as 0.87°C cooler and averaged 0.39°C cooler) for the heavy use scenario than the without Iowa Hill development scenario. The range of these differences was very close to the absolute mean errors computed for the calibrated vertical profiles from the nearest site to the Slab Creek dam (0.28 to 0.55°C). The combination of these factors suggests that pumping/generation cycling of the proposed Iowa Hill development would result in cooler water being discharged from the proposed Iowa Hill reservoir during the daytime that would cause minimal cooling within Slab Creek reservoir and the streamflow releases from Slab Creek dam.

Operation of the Iowa Hill development has the potential to affect mercury bioaccumulation by enhancing the mobilization of inorganic or methylmercury from riparian sources or from reservoir sediments. Like many area streams affected by historic gold mining operations, some fish tissue samples collected from Slab Creek reservoir show elevated mercury levels (table 19). Based on these tissue samples, it is likely that some mercury exists in sediments that settle in Slab Creek reservoir and in the delta at the head of the reservoir. According to SMUD's modeling studies, remobilization of the sediment on the bottom of Slab Creek reservoir would be unlikely because the proposed Iowa Hill intake/outlet structure at Slab Creek reservoir would be located 90 feet above the reservoir bottom. Furthermore, geomorphic studies conducted by SMUD indicate that the alluvium delta at the upstream area of Slab Creek reservoir will not advance to a position that could be disturbed by the proposed Iowa Hill intake/outlet for at least 100 years. As a result, we conclude that the effects of operating the proposed Iowa Hill development on methylation and bioaccumulation of mercury likely would be negligible.

Chili Bar Dam Reach

Mean daily temperatures occasionally exceed 20°C in the lower portion of the SFAR reach between Chili Bar dam and Folsom Lake, the Chili Bar dam reach. Chili Bar reservoir water is released to the powerhouse from the penstock intake which is at a depth of about 46 feet below Chili Bar reservoir's normal maximum level. This results in mean daily release temperatures of about 8 to 12°C in early May, increasing to their peak of about 16 to 17°C in late June to early July, and generally remaining above 12°C through September. Water temperatures increase at a similar rate throughout the reach's length. Between the Chili Bar dam and the lower end of the reach mean daily temperatures increase about 2 to 2.5°C in May, June, and September and about 3 to 3.5°C in July and August. It appears that the thermal characteristics in this reach are primarily controlled by the quantity and temperature of releases from Chili Bar dam and ambient conditions.

Under the Settlement Agreement, the primary objectives for the Chili Bar dam reach include providing habitat for healthy foothill yellow-legged frog populations, and reducing or eliminating water quality conditions that encourage algae growth in the Chili Bar dam reach. Proposed Article 2-1, *Minimum Streamflows,* would substantially increase the current minimum streamflow releases of 100 cfs from Chili Bar dam during May through September of all water year types (table 3-51, see section 3.3.3, *Aquatic Resources*, below). We base our analysis of the effects of the proposed minimum streamflow schedule on the assumption that the heat load downstream of the dam would remain virtually the same as it is under existing conditions. This leads us to conclude that the proposed minimum streamflow releases would slightly lower May through September water temperatures, probably to mean temperatures of less than 20°C.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Project operations at all reaches and reservoirs, with the exception of Slab Creek reservoir, would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on water temperature and algae would be the same as those described under the Proposed Action, without the effects discussed for the Iowa Hill development.

Effects of Project Construction and Maintenance on Water Quality

Construction of Project facilities and maintenance of existing facilities have the potential to adversely affect water quality.

Under Proposed Article 1-11, *Canal and Penstock Emergency and Maintenance Release Points*, SMUD would, within 1 year after license issuance, file with the Commission a plan approved by the Forest Service and the Water Board, to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality effects when the release points are used. SMUD also would consult with CDFG and FWS in the development of the plan. Upon Commission approval of the plan, SMUD would implement the recommendations contained in it.

Iowa Hill Development

Under Proposed Article 1-42, *Water Quality and Water Pollution*, SMUD would consult with the Agencies, Central Valley Water Board, U.S. Army Corps of Engineers, and other resource agencies with authority over public trust resources within the area of potential effects (APE) from construction and operation of the proposed Iowa Hill development. Prior to initiating any construction activities, SMUD would provide detailed design plans and a proposed timeline for construction to appropriate state and federal regulatory agencies, and obtain all necessary permits. These permits would include but not be limited to a National Pollutant Discharge Elimination System Permit, Waste Discharge Requirements, a section 404 Permit, a section 401 Certification, a Streambed Alteration Permit, and/or other authorizations or certifications as determined necessary under state or federal law.

Prior to undertaking activities on National Forest System lands, SMUD would file with the Commission a storm water pollution prevention plan that is approved by the Forest Service, the Water Board, and CDFG. During construction, operation and maintenance of the UARP, SMUD would prevent water pollution by implementing management practices identified in the Storm Water Pollution Prevention Plan and other requirements identified by the Forest Service, the Water Board, and Central California Water Board. All equipment for construction of the tunnel would be staged at least 100 feet from the SFAR. After construction activities are completed, all material used within the river bed would be removed, including siltation fabric.

Our Analysis

In order to conduct some necessary Project maintenance activities, SMUD needs to drain the associated Project canals/penstocks. Some of the agencies including the Forest Service and CDFG expressed concern as to potential adverse water quality effects that could result from using some release points to drain Gerle canal and the Project’s penstocks. SMUD would evaluate ways to minimize the potential for adverse water quality effects to result from emergency and/or planned use of the release points along Gerle canal and Project penstocks. We anticipate that this evaluation would focus on the potential for erosion and sideslope failure, which could result in substantial increases in turbidity and degradation of stream habitat in the vicinity of the release points. We conclude that developing a plan that designates preferred canal/penstock drainage structures and release points to be used for draining Project canals/spillways during maintenance would minimize adverse effects to water quality, particularly turbidity, and aquatic biota.

Construction of the proposed Iowa Hill development could potentially result in substantial adverse effects on water quality and related resources. Pathways by which this could occur include, but are not limited to, increasing erosion along and into surface waters, suspending sediments during construction of the new intake in Slab Creek reservoir, and introducing substances used during construction such as fuel, oil, and concrete. The risk of these events could be limited through implementation of best management practices including scheduling, minimizing in-water work, implementing erosion control practices, managing stormwater runoff, and restricting areas where equipment is allowed and where it is maintained. SMUD would develop detailed plans and a proposed schedule for its construction of the proposed Iowa Hill facilities before initiating construction activities. It would develop the plan in consultation with the appropriate federal and state agencies, and obtain all necessary permits and authorizations. We anticipate that conditions in these permits and authorizations along with the proposed storm water pollution prevention plan would provide reasonable assurance that water quality and aquatic habitat are not directly or indirectly adversely affected by SMUD's construction activities. We conclude that implementing Proposed Article 1-42, *Water Quality and Water Pollution*, would provide reasonable assurance that water quality and aquatic resources would not be adversely affected by construction of the proposed Iowa Hill facilities.

Effects of Recreational Activities on Water Quality

Recreational use concentrated around UARP and Chili Bar Project reservoirs and stream reaches has the potential to act as a source of human pathogens to surface waters in the area, which could lead to increased risk of adversely affecting human health. As recreational use of the area increases and additional recreational facilities are developed and used there could be increased contamination of surface waters.

Our Analysis

A recent study of fecal coliform bacteria concentrations in six UARP reservoirs indicates that fecal coliform concentrations have recently exceeded the upper allowable limit at three sites in Union Valley reservoir (see table 3-20). SMUD states that the most plausible source of this contamination is recreation at the Forest Service's Camino Cove, Fashoda Beach, and Jones Fork campgrounds, which are near the sampling locations.

Under the Proposed Action, SMUD would increase the potential for recreational access throughout the UARP area, particularly near the reservoirs and Slab Creek dam reach. Increased recreational use would add to the potential for contamination from human waste in these areas. SMUD proposes to address sanitation along with other recreation-related issues by annually paying the Forest Service to provide operation, maintenance, and administration of developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities (see section 3.3.6.2, *Specific Recreation Site Improvements*). SMUD also would prepare a recreation management plan that addresses whitewater recreational needs, including sanitation, in the Slab Creek dam reach, as discussed in section 3.3.6.2, *Recreation Streamflows*. Providing an appropriate level of operation and maintenance for recreational facilities, as proposed, would limit the potential for contamination from human waste, although there still would be a risk of creating conditions that could be hazardous to human health. We discuss the need to monitor this risk in section 3.3.2.2, *Water Quality Monitoring*.

A recent study indicates that fecal coliform bacteria concentrations have substantially exceeded their upper allowable limits at four sites in the Chili Bar dam reach (see table 3-20). Under the Proposed Action, PG&E would not add substantial new boating opportunities to the reach downstream of Chili Bar dam. Therefore, we expect negligible changes in coliform concentrations to result from implementation of the proposal. We discuss the need to monitor bacteria as an indicator of this risk in section 3.3.2.2, *Water Quality Monitoring*.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Development and maintenance of recreational facilities in the UARP vicinity would be virtually the same as those described in the Proposed Action. As a result, effects of the UARP-only Alternative on human pathogens would be the same as those described under the Proposed Action.

Water Temperature Monitoring

To document the effects of altered Project operations on water temperatures in the UARP and Chili Bar reaches, SMUD and PG&E would need to monitor water temperatures at numerous locations.

Primary Stream Flow and Reservoirs

Under Proposed Articles 1-5(9) and 2-4(5), *Monitoring Program*, both SMUD and PG&E would develop a water temperature monitoring plan. The applicants would: (1) consult with the agencies and BLM on development of the plan within 3 months of license issuance; (2) provide a draft plan to these agencies for a minimum 90-day review period; and (3) file a Water Board-approved plan with the Commission within 1 year of license issuance. For the UARP, the plan would include using continuous recording devices to monitor water temperatures at a minimum of 17 stream stations associated with the Project (table 3-27) from March 15 through September 30 in each year of the new license. Based on a review of the annual data and consultation with the Agencies, monitoring could be required at up to five additional water temperature monitoring stations. If SMUD demonstrates that the resulting thermal regime(s) reasonably protect the designated cold freshwater beneficial use, they may be able to cease temperature monitoring at some stations. Proposed Article 1-5(9) would also reserve the potential to recommend monitoring of water temperature profiles in reservoirs if the Agencies determine that reservoir temperatures are a controllable factor that may resolve stream temperature issues. If this should occur, vertical profiles would be monitored seasonally in the applicable reservoir(s) during multiple water year types to provide data necessary for decision making. Water temperature data would be used to determine the need for adaptively managing Project operations as described in section 3.3.2.2, *Effects of Project Operations on Water Quality*.

Table 3-27. Recommended continuous stream temperature monitoring stations under the Settlement Agreement.[a] (Source: SMUD and PG&E, 2007)

Reach	**Recommended Monitoring Stations**
Rubicon dam	Immediately downstream of Rubicon dam, Downstream of Little Rubicon River confluence (at the Project boundary)
Buck Island dam	Immediately downstream of Buck Island dam
Loon Lake dam	Immediately downstream of Loon Lake dam
Gerle Creek dam	Immediately downstream of Gerle Creek dam
Robbs Peak dam	Immediately downstream of Robbs Peak dam, Downstream of confluence with Gerle Creek (at Project boundary)
Ice House dam	Immediately downstream of Ice House dam, Immediately upstream of Junction reservoir
Junction dam	Immediately downstream of Junction dam, Immediately upstream of Camino reservoir[b]
Camino dam	Immediately downstream of Camino dam, Immediately upstream of confluence with SFAR
SFAR	None
Brush Creek dam	Immediately downstream of Brush Creek dam
Slab Creek dam	Immediately downstream of Slab Creek dam, Approximately 0.5 mile upstream of White Rock powerhouse, Downstream of White Rock powerhouse to measure powerhouse outflow temperatures
Chili Bar dam	Immediately downstream of Chili Bar dam, Upstream of the confluence with Dutch Creek, Immediately upstream of Camp Lotus, Immediately upstream of the confluence with Greenwood Creek

[a] All of the monitoring stations associated with the Chili Bar dam reach are included in Proposed Article 2-4(5), *Monitoring Program*; whereas, all of the other designated monitoring stations are recommended for the UARP under Proposed Article 1-5(9), *Monitoring Program*.

[b] In its comments on the draft EIS, SMUD indicates that Proposed Article 1-5 in the Settlement Agreement incorrectly described this location as "Immediately upstream of Camino reservoir dam" and requests that we delete "dam" in the final EIS. The monitoring station would be immediately upstream of Camino reservoir.

For the Chili Bar Project, the plan would include using continuous recording devices to monitor water temperatures at a minimum of four stream stations associated with the Project from March 15 through October 15 in each year of the new license. Up to two additional stream temperature monitoring stations may be added based on need determined through review of the annual data and consultation with the Water Board, CDFG, FWS, and BLM. Requirements for monitoring temperature could be altered based on demonstration of the need for additional monitoring. Under Proposed Article 2-4(5), *Monitoring Program*, PG&E would seasonally monitor vertical temperature profiles in Chili Bar reservoir during multiple water year types if the Water Board, CDFG, FWS, and BLM determine that reservoir temperatures are a controllable factor that may resolve temperature issues in the reach downstream of Chili Bar dam or if impoundment chemistry dictates a need for additional temperature considerations. We conclude that if PG&E demonstrates that the thermal regime under the new license reasonably protects the cold freshwater beneficial uses there would be little value in continuing to monitor temperature at these stations.

Edgewater of Streams and Reservoirs

As a component of the evaluation of habitat for amphibians and aquatic reptiles, Proposed Article 1-5(3), *Monitoring Program*, SMUD would use a minimum of six micro-thermographs to monitor water temperatures in stream margin habitats associated with known or suitable foothill yellow-legged frog breeding sites in the reaches downstream of the Camino and Slab Creek dams. Under Proposed Article 1-6(9), *Adaptive Management Program*, the Agencies would have the opportunity to use the results of this temperature monitoring effort along with the results of the associated monitoring of the foothill yellow-legged frog to determine whether the water temperature used is an indicator of breeding initiation, which is currently set at 12°C as a 7-day running average of mean daily temperatures in the proposed license article, should be increased or decreased. Proposed Articles 1-6(1) and 1-6(2) would use the selected temperature indicator of breeding initiation, results of monitoring water temperatures in the SFSC immediately upstream of Junction reservoir and the SFAR immediately downstream of Slab Creek dam, and documentation of the foothill yellow-legged frog to adaptively manage scheduled high flow releases to the Ice House dam reach and Slab Creek dam reach.

As a component of Proposed Article 1-40, *Aquatic Resources,* for the proposed Iowa Hill development, SMUD would monitor temperatures between May and September in edgewater of Slab Creek reservoir at locations approved by the Forest Service, CDFG, and the Water Board. These data in combination with monitored locations of hardhead would be used to confirm that the effects of proposed Iowa Hill development pump-discharge operations on the distribution of hardhead.

Our Analysis

SMUD and PG&E conducted substantial monitoring of water temperature for relicensing of the Projects. SMUD also conducted water temperature modeling as far downstream as Slab Creek dam reach for relicensing the UARP. This information provides the basis for our evaluation, in which we conclude that the proposed operations would generally reduce spring through summer stream temperatures in most of the reaches affected by the UARP and Chili Bar Project. These effects on temperatures would enhance the quality of habitat for desired aquatic-dependent communities.

Monitoring water temperature immediately downstream of the UARP dams, as proposed, would document thermal conditions at the upper end of the UARP bypassed reaches under any new Project operations. Monitoring at the other sites listed in table 3-27 along with up to five additional sites would document thermal conditions downstream of confluences, and in critical locations within the Ice House dam, Camino dam, and Slab Creek dam reaches. Monitoring temperature in the Ice House dam reach just upstream of Junction reservoir and in the SFAR immediately downstream of Slab Creek dam would provide the temperature data necessary to determine whether scheduled geomorphic pulse flow or recreational flow releases to these reaches may need to be adaptively managed to protect foothill yellow-legged frogs and other biological resources. See section 3.3.4.2, *Environmental Effects, Special Status Amphibians and Reptiles*, for our evaluation of these proposed measures.

Including the option to monitor temperature profiles in UARP reservoirs is expected to provide limited benefit in terms of the ability to use any cold water available in the reservoirs to further improve thermal conditions in UARP stream reaches. The results of SMUD's 2002 to 2004 monitoring of reservoir temperatures provides evidence that there is virtually no cold water available in the Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino reservoirs (table 3-15). Because substantial temperature data were collected within the past 10 years (DTA, 2005a), sufficient data likely already exist to answer most questions about coldwater availability in the other UARP reservoirs. Therefore, the existing temperature data could be used, as appropriate, to evaluate coldwater availability prior to collecting any additional reservoir temperature data. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 1-5(9), *Monitoring Program*, would document spring through summer water temperatures in UARP bypassed reaches under any new Project operations, and help confirm that desired fish and amphibian communities are supported, although there would be little benefit in monitoring temperatures in UARP reservoirs.

Monitoring the timing of amphibian breeding and larval periods along with water temperature in areas used by foothill yellow-legged frogs for breeding could provide data that would lead to a better indicator of the onset of foothill yellow-legged frog breeding. We discuss this further in section 3.3.4.2, *Environmental Effects, Special Status Amphibians and Reptiles*.

Monitoring water temperature immediately downstream of the Chili Bar dam, as proposed in Proposed Article 2-4(5), *Monitoring Program*, would document thermal conditions at the upper end of the Chili Bar reach under any new Project operations. Monitoring at the other three designated sites downstream of the Chili Bar dam with up to two additional sites would document thermal conditions in critical locations within the Chili Bar dam reach. Because this reach is not managed for coldwater fishes and results of PG&E's 2002 to 2004 temperature monitoring study show that little cold water is available in Chili Bar reservoir (table 3-15), we conclude that requiring PG&E to conduct additional monitoring of Chili Bar temperatures would not be warranted. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 2-4(5), *Monitoring Program*, would confirm that the temperature range would be suitable for the desired fish communities and amphibians under any new Project operations.

Iowa Hill Development

Simulations of the operation of the proposed Iowa Hill development suggest that operation of the development could lead to water temperatures in Slab Creek reservoir that are generally slightly cooler than occur currently. Because the model simulates conditions for a complete cross-sectional area of the reservoir, it is possible that water temperatures could be influenced even more along the edge of the reservoir. Monitoring water temperatures along the edge of the Slab Creek reservoir, per Proposed Article 1-40(2), *Aquatic Resources*, would provide data that could be used along with information about the distribution of hardhead to confirm that Iowa Hill development operations do not adversely affect hardhead by causing them to relocate to less desirable areas in the reservoir, including in front of the new intake structure for the Iowa Hill development where they could become entrained.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Therefore there would not be a need for monitoring water temperature in edgewater of Slab Creek reservoir.

Water Quality Monitoring

Water quality data indicate occasional seasonal exceedances of several water quality criteria. In addition, arsenic and mercury concentrations in fish exceed screening values set to protect anglers. Changing Project operations has the potential to alter water quality conditions. Increasing the carrying capacity for recreational access could potentially elevate fecal coliform concentrations. In order to document that water quality standards are met under any new license, and concentrations of metals are at safe levels for humans who consume fish from the Project area, it would be necessary to monitor water quality and body burdens of metals in fish.

Under Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program,* both SMUD and PG&E would develop a draft water quality monitoring program plan. Within 3 months of license issuance, the applicants would consult on the development of the plan with the Agencies, Central Valley Water Board, and BLM for the UARP. This plan would address monitoring water chemistry, physical properties, and bacteria. The plan would provide detail on field sampling (locations, sampling frequency, handling methods, and QA/QC); and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored. Following consultation, and within 6 months of license issuance, the applicants would submit the draft plan for review and approval by the Chief, Division of Water Rights, Water Board and then file the final plan with the Commission. The plan(s) could be modified pursuant to adaptive management program needs as recommended by Central Valley Water Board, CDFG, FWS, BLM, (and the Forest Service for the UARP plan), and approved by the Water Board and the Commission.

SMUD and PG&E would sample water chemistry to demonstrate seasonal conditions at all reservoir and stream locations described in the January 8, 2003 version of the Water Quality Study Plan that was approved by the plenary group for UARP and Chili Bar Project relicensing efforts. Laboratory analyses would use methods approved by EPA that are adequately sensitive to detect constituent levels for determination of compliance with recognized state and federal criteria. Table 3-28 describes the strategy and schedule for various water chemistry and physical properties of this recommended seasonal plan. Conditions at representative locations would be monitored by making *in situ* measurements of water temperature, DO, pH, specific conductance, and turbidity; collecting and analyzing water samples for minerals, nutrients, metals, hardness, and petroleum products; and measuring Secchi depths (reservoirs only).

SMUD and PG&E would also seasonally monitor bacteria in a manner consistent with the Basin Plan objectives for protection of the REC-1 (water contact recreation) beneficial uses at a minimum of 15 shoreline recreational locations within the UARP boundary and 8 shoreline recreational locations in the Chili Bar Project-affected reach. By May 31 of each designated sampling year, the licensees would select sampling locations for the upcoming season based on criteria that include known swimming and other water contact recreational areas, and potential sources of pathogen introduction to the water column in the immediate vicinity. Sampling would be conducted at each of the selected sites by collecting five near-shore samples during a 30-day period that spans either the Independence Day holiday or the Labor Day holiday, using the five samples in 30 days methodology or other protocol as amended in the Basin Plan. Bacterial monitoring would be conducted annually for the first 5 years after license issuance. Then, monitoring could be decreased in frequency to every other year at UARP reservoirs and Chili Bar Project sites where no exceedances of Basin Plan objectives for protection of REC-1 designated waters are identified during years 1–5, but would continue annually through the life of the license at reservoirs where data demonstrate bacterial concentrations that present risks to human health.

Table 3-28. Recommended strategy for monitoring water chemistry and physical properties under the Settlement Agreement.[a] (Source: Settlement)

Monitoring Type	Parameters	Monitoring Sites	Frequency/Duration
In situ at representative locations	Water temperature, DO, pH, specific conductance, and turbidity	UARP bypassed reaches and the SFAR downstream of Chili Bar dam	Seasonally in spring (April–May), summer (August), fall (November), and winter (January–February, as accessible) each year after license issuance
In situ at 1-meter intervals vertically	Water temperature, DO, pH, specific conductance, and turbidity	Loon Lake, Gerle Creek reservoir, Ice House reservoir, Union Valley reservoir, Junction reservoir, Camino reservoir, Slab Creek reservoir, and Chili Bar reservoir	Seasonally in spring (April–May) and fall (October–November) each year after license issuance
General chemistry at representative locations[b]	Minerals, nutrients, metals (total and dissolved fractions), hardness, and petroleum products	UARP dam release points from reservoirs, representative sites along all UARP bypassed reaches greater than 1 mile long, and at least three representative sites along the SFAR between Chili Bar dam and the confluence with Greenwood Creek.	Seasonally in spring, summer, fall, and immediately following the second or third measurable rain event of the fall–winter period, once every 5 years beginning in year 3 after license issuance
General chemistry at the surface and near bottom at multiple representative locations[b]	Nutrients, minerals, hardness, metals (total and dissolved fractions), and petroleum products	At the surface and near the bottom at multiple representative locations in each UARP impoundment and Chili Bar reservoir	Seasonally in spring, summer, fall, and immediately following the second or third measurable rain event of the fall–winter period, once every 5 years beginning in year 3 after license issuance
Water clarity[b]	Secchi depth	Loon Lake, Ice House reservoir, Union Valley reservoir, and Slab Creek reservoir	Seasonally in summer and fall once every 5 years after license issuance

[a] All of the monitoring sites associated with the Chili Bar dam reach are recommended for the Chili Bar Project; whereas, all of the other designated monitoring sites are recommended for the UARP.

[b] After a minimum of three data sets have been collected, if the data demonstrate that exceedances are not occurring at specific locations, the frequency may be reviewed to determine if it can be modified.

SMUD proposes to consult with the Central Valley Water Board, and the Agencies for selection of UARP sampling locations. Candidate monitoring sites would include developed recreational sites and frequently used dispersed sites at reservoir and riverine locations. The UARP bacterial monitoring sites would include a minimum of four annually rotating stations at Union Valley reservoir swim areas; and a minimum of two beach locations each at Buck Island reservoir, Loon Lake, Ice House reservoir, and Gerle Creek reservoir, along with three other selected stations.

For the Chili Bar Project, PG&E would consult with the Water Board, the Central Valley Water Board, CDFG, FWS, and BLM for selection of sampling locations. Candidate monitoring sites would include developed recreational sites and frequently used whitewater boating take-out sites along the Chili Bar dam reach. Chili Bar bacterial monitoring sites would include a minimum of four swim beach sites including the Coloma and Camp Lotus areas, along with four other selected sites.

Under Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, SMUD and PG&E also propose to monitor potential uptake of mercury, copper, lead, and silver through the aquatic food chain resident in impoundments affected by the UARP and Chili Bar Project. They would determine the target species and number of individuals, sampling strategy, and analytical methods through consultation so that they are consistent with the Water Board's Surface Water Ambient Monitoring Program needs. They would collect and analyze fish tissue samples for bioaccumulation once every five years. Collection of these samples would begin in the second year after license issuance and continue through the term of any new license.

For the UARP, SMUD would consult with the Agencies, the Central Valley Water Board, and the state Office of Environmental Health Hazard Assessment. Resident fish species would be collected from Loon Lake, Gerle Creek reservoir, Ice House reservoir, Union Valley reservoir, Camino reservoir, and Slab Creek reservoir and samples would be prepared and analyzed for concentrations of mercury, copper, lead, and silver. Under Proposed Article 1-6(8), *Adaptive Management Program*, the Agencies may request that SMUD conduct additional studies of metals bioaccumulation if comparing the results of metal testing to published scientific information leads to suspicion that the health of aquatic species are adversely affected.

For the Chili Bar Project, PG&E would consult with the BLM, FWS, CDFG, the Water Board and the Central Valley Water Board, and the state Office of Environmental Health Hazard Assessment. Resident fish species from Chili Bar reservoir would be collected and samples would be prepared and analyzed for concentrations of mercury, copper, lead, and silver. Proposed Article 2-4(6), *Monitoring Program*, also includes monitoring of an invasive algae species in the Chili Bar dam reach. We discuss the algae component of this proposed article along with proposed monitoring of algae at UARP sites in section 3.3.2.2, *Algae Monitoring and Adaptive Management*.

Our Analysis

Our review of available water quality information (section 3.3.2.1, *Water Quality*) indicates that UARP- and Chili Bar-affected waters typically comply with the applicable federal and state standards for most water quality parameters. However, available information indicates that waters affected by the Projects sometimes do not satisfy the applicable criteria for DO, pH, fecal coliform bacteria, and several metals. Sampling results from a study of bioaccumulation of several metals in fish residing in Project reservoirs indicate that arsenic and mercury exceed screening values set to protect anglers who consume their catch. One of the objectives used while developing proposed operations and environmental measures was to maintain water quality adequate to protect beneficial uses and meet state water quality standards. Monitoring water quality and body burdens of metals in resident fish under any new Project operations could confirm that the aforementioned objectives are met.

SMUD and PG&E's proposed approach for monitoring water chemistry and physical properties would document compliance with water quality standards, including support for the targeted aquatic ecosystem. Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, designate the general parameters that would be sampled and provides the schedule and general locations for each sampling effort. Specific parameters and sampling locations would be presented in the proposed monitoring plan, which would be developed in consultation with appropriate agencies.

Implementation of this plan would provide data to annually document seasonal variation in DO concentrations, pH, specific conductance, and turbidity in UARP-affected stream reaches and impoundments. SMUD and PG&E's proposal also would document concentrations of nutrients, minerals, hardness, metals, and petroleum products at 5-year intervals, which could be used to evaluate long-term trends. We note that concentrations of minerals are primarily controlled by geologic and hydrologic characteristics and many of the waters affected by the UARP and Chili Bar Project have little potential for contamination from petroleum products. Therefore, monitoring of each of these parameters at each monitoring location would likely provide little incremental benefit.

SMUD and PG&E's proposed approach to select specific metals and monitor bioaccumulation of the specified metals in aquatic organisms at 5-year intervals would ensure that results of this sampling effort are consistent with the Water Board's approach and would facilitate evaluation of changes in fish body burdens of these metals. However, we note that biomagnification of silver is unlikely (Howe and Dobson, 2002).

SMUD and PG&E's proposed approach to select and monitor 15 shoreline recreational locations within the Project boundary would document near worst-case bacteria concentrations at locations of greatest concern.

We conclude that Proposed Articles 1-5(10) and 2-4(6) would provide water quality regulators with sufficient data to document compliance with water quality standards under any new Project operations and identify any trends in risks to the health of humans and wildlife.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. However, the need for monitoring water quality and bioaccumulation of metals for the UARP-only Alternative would be the same as those described under the Proposed Action.

Algae Monitoring and Adaptive Management

Relicensing studies indicate that under existing conditions algae are abundant in some reaches of the Projects, particularly in the lower end of the Junction dam reach and the Chili Bar dam reach. In addition, there are anecdotal accounts of an exotic invasive species of diatom, *Didymosphenia geminata*, in the Chili Bar dam reach. Specific objectives of the Settlement Agreement include reducing or eliminating conditions that encourage algae growth in the Junction and Chili Bar dam reaches. We evaluate the effects of Project operations on algae and water quality above in section 3.3.2.2, *Effects of Project Operations on Water Quality*. In this section, we discuss monitoring algae and adaptive management associated with algae.

Under the Settlement Agreement, SMUD and PG&E would monitor algae. For the UARP (Proposed Article 1-5(6), *Monitoring Program*), SMUD would develop an algae species identification and monitoring plan in consultation with the Agencies. SMUD would provide a draft plan to these agencies for a minimum 90-day review and approval period, and implement the plan upon its approval. Under the plan, SMUD would collect, identify, and archive samples of the species of algae inhabiting the stream channel of the Junction dam reach using a lab selected in consultation with the Agencies. SMUD would collect additional baseline samples from the SFRR downstream of Robbs Peak dam, Camino dam reach, and Slab Creek dam reach. Additional sites or reaches may be added should algal species be deemed to have negative effects upon the aquatic ecosystem. The Settlement Agreement does not specify the proposed monitoring period for the UARP. However, because SMUD did not provide costs for this measure we assume that SMUD plans to monitor algae under Proposed Article 1-5(6), *Monitoring Program*, only within 1 or 2 years of license issuance.

Under Proposed Article 1-6(7), *Adaptive Management Program*, SMUD would adaptively manage algae based on results of monitoring algae in the Junction dam reach, SFRR downstream of Robbs Peak dam. If the new streamflow regime does not reduce algae growth in the Junction dam reach or SFRR downstream of Robbs Peak dam within 2 years of license issuance, SMUD would reduce or eliminate the excessive algae growth using a method approved by the Agencies. If any future pervasive algal growths are identified in any UARP-affected stream reaches, and the Agencies determine the algae needs to be reduced or eliminated, SMUD should reduce or eliminate the algae growth using a method approved by these agencies.

As a component of Proposed Article 2-4(6), *Monitoring Program*, PG&E would annually monitor for the presence/absence of the diatom *Didymosphenia geminata*, an invasive algae in the Chili Bar dam reach. This monitoring would be done in conjunction with the other water quality monitoring.

Our Analysis

SMUD has documented dense growth of green-colored algae in the Junction dam reach of Silver Creek that is abnormal. Excessive algae growth can substantially alter hydraulics and sediment transport and thereby adversely affect other aquatic plants, macroinvertebrates, and amphibian communities. In addition to these issues, CDFG indicates that it has observed *Didymosphenia geminata* nearby in the Middle Fork American River. In the past two decades, *D. geminata* has substantially expanded its geographical range in the United States and across much of the world, and has increasingly been found to form excessive growths in streams (EPA, 2006; IUCN, 2007; Kilroy, 2004). In some streams, *D. geminata* covers more than 90 percent of available substrates, and the dense mats can cover miles of stream length. These dense mats trap sediments and may suppress the native algae and invertebrate communities. In Rapid Creek, located in the Black Hills of South Dakota, brown trout populations have experienced severe declines that have been correlated to dense growths of *D. geminata* (SDGFP, 2006).

Given the extent of algae growth in the Junction dam reach and the potential for *D. geminata* to adversely affect the aquatic ecosystem, we conclude that it is important to determine the algae species present and their general level of abundance in this reach under the new flow regime. This information could be used to determine whether the new streamflow releases effectively reduce the extent of algae in the Junction dam reach. We conclude that the combination of Proposed Articles 1-5(6), *Monitoring Program*, and 1-6(7), *Adaptive Management Program*, would provide information to determine whether any new flow regime substantially reduces algae growth in the Junction dam reach and determine if *D. geminata* is present in the reach. Although algae does not appear to be a problem in the other UARP-affected stream reaches, Proposed Articles 1-5(6), *Monitoring Program*, and 1-6(7), *Adaptive Management Program*, would provide information to confirm that there are no algae-related problems in selected UARP-affected stream reaches. SMUD's proposal to monitor algae could also determine whether *D. geminata* is present in the other monitored UARP-affected stream reaches.

Given the extent of algae growth in the Chili Bar dam reach, and the potential for *D. geminata* to adversely affect water quality and the aquatic community, we conclude that it is important to periodically evaluate whether *D. geminata* has become established in this reach. We conclude that this could be accomplished by developing and implementing the plan in Proposed Article 2-4(6), *Monitoring Program*.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Monitoring and adaptive management requirements for algae would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on algae would be the same as those described under the Proposed Action.

3.3.2.3 Cumulative Effects

Water temperatures have been affected by natural events and by water and land management practices in the Rubicon River Basin to the SFAR Basin. Impoundment of water by the Project dams generally results in higher spring through fall temperatures near the surface of the reservoirs than would occur in the same reach if the stream was still free-flowing. Using low-level outlets for streamflow releases has substantially reduced water temperatures immediately downstream of some dams (e.g., Ice House and Loon Lake developments). However, diverting water around stream reaches tends to increase spring through summer temperatures in the bypassed reaches. Similarly, UARP's diversion of water from the Rubicon River Basin to the SFAR Basin has reduced flows in the Rubicon River Basin and thereby increased the potential for streamflow warming in the basin.

Fires have cleared much of the upland and riparian vegetation in portions of the UARP area, resulting in reduced shading of the streams and reservoirs. In the lower portion of the Ice House dam reach, the 1992 Cleveland Fire substantially reduced stream shading and thereby substantially increased stream temperatures. Riparian vegetation has recovered well along the stream banks, which has somewhat increased shading and reduced stream temperatures. Recovery of upland vegetation is expected to occur through any new license term and thereby increase stream shading and further reduce stream temperatures.

EID operates the El Dorado Project, which diverts up to about 165 cfs of water around a 22-mile-long section of the SFAR to its domestic water supply system and the El Dorado powerhouse, located a short distance further downstream than the river's confluence with Silver Creek. This has resulted in an incremental increase in spring through summer temperatures in the river between the confluence and the El Dorado powerhouse. Under a new FERC license issued for the El Dorado Project in 2006 (FERC, 2006), minimum flow releases from EID's dam to the SFAR were substantially increased, resulting in a reduction in the aforementioned incremental increase in spring through summer temperatures. The UARP and Chili Bar Project proposed increased minimum streamflows would tend to reduce spring through summer temperatures in most of the UARP- and Chili Bar Project-affected stream reaches. Operation of the proposed Iowa Hill development would reduce water temperatures emanating from Slab Creek reservoir by less than 0.5°C. This change would have no observable effect on water temperatures in Chili Bar reservoir or the Chili Bar dam reach. Under the Proposed Action, these cumulative effects are expected to provide a thermal regime that would support the designated beneficial uses including a coldwater habitat for resident fish and amphibians.

Water quality in the UARP and Chili Bar Project-affected reaches is generally good, although it currently does not always satisfy the Basin Plan water quality objectives for bacteria and some chemical parameters. Numerous factors, including mining, land management, water-resource projects, development, and water-oriented recreation, have all incrementally adversely affected water quality, particularly fecal coliform concentrations in heavily-used areas of reservoirs and in the Chili Bar dam reach and metals in several of the UARP and Chili Bar Project reservoirs. Additional increases in development and recreation are expected to further increase the potential for water quality degradation. In contrast, expansion of the Hangtown Creek Wastewater Treatment Plant in Placerville is expected to somewhat reduce bacteria and nutrient loadings from Weber Creek to the SFAR. EID's recent replacement of a damaged and unstable section of the El Dorado Project's canal with a 2-mile-long bypass tunnel is expected to reduce canal failures and resulting erosion and sedimentation that have occurred historically. Under the Proposed Action, SMUD would implement an erosion and sedimentation control plan and a storm water pollution prevention plan during the construction phase of the Iowa Hill development. Implementation of these plans is expected to minimize adverse effects on water quality during construction. The cumulative effects of these actions would be an overall improvement in water quality.

3.3.2.4 Unavoidable Adverse Effects

None.

3.3.3 Aquatic Resources

3.3.3.1 Affected Environment

Fisheries Resources

Table 3-29 lists fishes known to occur in the Sacramento-San Joaquin drainage basin in the vicinity of the UARP and/or Chili Bar Project.

Table 3-29. Fishes in the UARP and Chili Bar Project study area. (Sources: DTA and Stillwater Sciences, 2005c,d,e)

Common Name	Scientific Name	Status[a]	Sacramento-San Joaquin Drainage[b]
Fall-run Chinook salmon[c]	*Oncorhynchus tshawytscha*	--	Native
Rainbow trout	*Oncorhynchus mykiss*	MIS	Native
Kokanee salmon	*Oncorhynchus nerka*	--	Introduced
Brown trout	*Salmo trutta*	MIS	Introduced
Brook trout	*Salvelinus fontinalis*	MIS	Introduced
Lake trout (mackinaw)	*Salvelinus namaycush*	--	Introduced
Lahontan cutthroat trout[d]	*Oncorhynchus clarki henshawi*	FT	Introduced
Pacific lamprey[e]	*Lampetra tridentata*	--	Native
Sacramento hitch	*Lavinia exilicauda exilicauda*	--	Native
California roach[f]	*Lavinia symmetricus symmetricus*	CSC	Native
Hardhead	*Mylopharodon conocephalus*	CSC	Native
Sacramento pikeminnow	*Ptychocheilus grandis*	--	Native
Sacramento speckled dace	*Rhinichthys osculus* ssp.	--	Native
Carp	*Cyprinus carpio*	--	Introduced
Golden shiner	*Notemigonus crysoleucas*	--	Introduced
Sacramento sucker	*Catostomus occidentalis*	--	Native
Sacramento tule perch	*Hysterocarpus traski traski*	--	Native
Prickly sculpin	*Cottus asper*	--	Native
Riffle sculpin	*Cottus gulosus*	--	Native
Mosquitofish	*Gambusia affinis*	--	Introduced
Green sunfish	*Lepomis cyanellus*	--	Introduced
Bluegill	*Lepomis macrochirus*	--	Introduced
Smallmouth bass	*Micropterus dolomieui*	--	Introduced

[a] Status: FT – Federally Threatened; CSC - CDFG species of concern; MIS - listed by the Eldorado National Forest as a management indicator species.

[b] Native or introduced into the Sacramento-San Joaquin Drainage Basin. Prior to the California Gold Rush in 1848, all of the steams and natural lakes in the UARP area were fishless, with the exception of the lower 0.83 mile of Brush Creek, the lower 3.30 miles of Silver Creek, and the SFAR. Therefore, while considered native to the Drainage, any fish currently present in these formerly fishless areas should be considered ‘introduced’ in these areas.

[c] Excess hatchery stock planted in Folsom may migrate into reach downstream of Chili Bar dam.

[d] Stocked upstream of the Project area.

[e] Pacific lamprey no longer occur upstream of Nimbus dam, which is below Folsom dam.

[f] Some reports prepared by the licensees refer to the Sacramento roach, which is a subspecies of California roach. To minimize confusion, we will refer to Sacramento roach as California roach throughout this document.

Reservoirs

To determine fish species composition in the Project reservoirs, sampling was conducted at multiple sites in five Project reservoirs (Loon Lake, Ice House, Union Valley, Junction, and Slab Creek). Camino reservoir was not sampled due to safety and access constraints. Gerle Creek reservoir was surveyed to provide the Forest Service with information for trout management, and Chili Bar reservoir was surveyed since there was no historical fish survey information available. Rubicon, Buck Island, Robbs Peak and Brush Creek reservoirs and Rockbound Lake were not surveyed because there was no historical data, or there was no indication these areas supported fish that could be significantly affected by reservoir operations. Table 3-30 presents results from historical reports and reservoir surveys in 2002/2003.

Trout (brown and rainbow) dominated the fish collected from Gerle Creek, Ice House, and Loon Lake reservoirs (table 3-31). Trout were less dominant in lower elevation reservoirs, although kokanee salmon comprised 20 percent of the fish collected from Union Valley reservoir. Trout only accounted for 18 percent of the fish collected from Junction reservoir and less than 10 percent of the fish collected from Union Valley, Slab Creek, and Chili Bar reservoirs. The fish community was most diverse in Union Valley reservoir, which was dominated by smallmouth bass. Sacramento sucker were dominant in the Junction, Slab Creek, and Chili Bar reservoirs.

SMUD conducted intensive gill net, snorkel, and trawl surveys of Slab Creek reservoir to characterize the locations of greatest fish abundance in late fall (November 2003), spring (May 2004), and summer (July and August 2004). Results of this study indicate that hardhead, Sacramento sucker, and Sacramento pikeminnow use both the upper and lower reaches of the reservoir. Brown trout and rainbow trout also use the upper reservoir, but were not observed in the lower reservoir. The fish captured in the lower reservoir consisted primarily of Sacramento suckers and hardhead with a single Sacramento pikeminnow. More fish were captured at the 10- to 25-foot and 50-foot depths than at 100-foot sampling depths, although all three species were captured at each of the three sampling depths. Most of the juvenile fish captured in September 2004 were captured in the lower reservoir near the location of proposed Iowa Hill intake, and consisted of 79 percent hardhead and 21 percent Sacramento pikeminnow.

CDFG stocks fish into several of the UARP reservoirs, and in Wrights Lake located on SFSC upstream of Ice House reservoir. Between 1995 and 2004, CDFG stocked nearly 1.5 million fish, about 0.5 million of which were catchable size. The

Table 3-30. Fish species present in UARP and Chili Bar Project reservoirs reported during historical and relicensing studies. (Sources: DTA and Stillwater, 2005c,e)

Common Name	**Rubicon**	**Buck Island**	**Loon Lake**	**Gerle Creek**	**Robbs Peak**	**Union Valley**	**Ice House**	**Junction**	**Camino**	**Brush Creek**	**Slab Creek**	**Chili Bar[a]**
Rainbow trout	●	●	⦿	●	●	⦿	⦿	●	●	●	⦿	
Brown trout	●	●	⦿	⦿	●	●	⦿	⦿	●	●	⦿	○
Brook trout	●	●	●	●			●	●	●		●	
California golden trout	●											
Kokanee salmon						⦿	●	●			●	
Lake trout (mackinaw)						⦿						
Lahontan cutthroat trout						●						
Hardhead											⦿	○
California roach			⦿	○			○		●		●	
Sacramento pikeminnow											○	○
Sacramento speckled dace											●	
Golden shiner						●						
Sacramento sucker			⦿			⦿		⦿	●		⦿	○
Sacramento tule perch			●									
Riffle sculpin									●			
Mosquitofish						●						
Green sunfish			●			●	●					
Smallmouth bass						⦿					●	○

Note: ● indicates historical, ○ indicates relicensing studies, and ⦿ indicates historical and relicensing studies.

[a] In 2003, CDFG collected several Sacramento pikeminnow and a smallmouth bass from Chili Bar reservoir. However, PG&E did not collect either of these fish from Chili Bar reservoir during their sampling in 2002/2003.

Table 3-31. Number and composition of fish captured in reservoirs of the Projects using gill netting and beach seining, October to November 2002 and October 2003. (Source: DTA and Stillwater, 2005c)

Species	Loon Lake	Ice House	Gerle Creek	Union Valley	Junction	Slab Creek	Chili Bar
Total (number captured)	85	55	64	110	57	74	44
Rainbow trout (%)	8	20	0	6	0	0	0
Brown trout (%)	46	69	92	0	18	7	7
Lake trout (%)	0	0	0	1	0	0	0
Kokanee salmon (%)	0	0	0	20	0	0	0
Hardhead (%)	0	0	0	0	0	39	23
Sacramento pikeminnow (%)	0	0		0	0	1	0
Sacramento sucker (%)	2	0	0	15	82	53	70
Smallmouth bass (%)		0	0	58	0	0	0
California roach (%)	44	11	8	0	0	0	0

species and size of fish stocked into each of the reservoirs varies depending on management goals for the reservoir and availability of fish. CDFG typically stocks rainbow trout in Rubicon reservoir, Rockbound Lake, Loon Lake, Union Valley and Ice House reservoirs. Brown trout are stocked in Ice House reservoir and Wrights Lake, and kokanee salmon in Union Valley reservoir.

Streams

SMUD and PG&E used a variety of historical information to determine which fish species were known to exist in the stream reaches in the Project area (table 3-32). These data show that rainbow, brown, and brook trout have historically (post-Gold Rush) been present in most of the stream reaches evaluated, and Sacramento sucker and riffle sculpin have occurred in several of the lower elevation reaches. SMUD and PG&E conducted fish population surveys in October of 2002, 2003, and 2004 using electrofishing or snorkel surveys in reaches that depth or flow made electroshocking impractical. Figures 3-17 through 3-20 display the location of each of the stream segments where these fish population surveys were conducted, and table 3-33 displays results of these surveys. Sacramento suckers were observed in six of the 13 reaches surveyed, all six were lower elevation reaches. These results indicate that the reach downstream of Chili Bar dam has the most diverse fish community, followed closely by the Slab Creek reach and then the SFAR reach.

Table 3-32. Fish presence in Project stream reaches[a] observed during historical and relicensing studies. (Source: DTA and Stillwater Sciences, 2005d)

Common Name	Rubicon dam reach	Buck Island dam reach	Loon Lake dam reach	Gerle Creek dam reach	SFRR upstream of Robbs Peak	Robbs Peak dam reach	Ice House dam reach	Junction dam reach	Camino dam reach	SFAR reach	Brush Creek dam reach	Slab Creek dam reach	Chili Bar reach
Chinook salmon[b]													○
Rainbow trout	⦿	○	⦿	⦿	⦿	○	⦿	⦿	⦿	⦿	⦿	⦿	○
Brown trout	○		⦿	⦿		○	⦿	⦿	⦿		⦿	⦿	○
Brook trout	•		•	•									
California roach	○	○	•	•						⦿		○	
Hardhead										⦿		⦿	○
Sacramento pikeminnow										⦿		⦿	○
Sacramento speckled dace	○									⦿		⦿	○
Golden shiner		○											
Sacramento sucker							⦿	⦿	⦿	⦿		⦿	○
Prickly sculpin												○	○
Riffle sculpin								•	•	•		⦿	○
Green sunfish												•	○
Bluegill													○
Smallmouth bass												⦿	○

Note: • indicates historical, ○ indicates relicensing studies, and ⦿ indicates historical and relicensing studies.

[a] No fish population information (either historical or 2002–2004) is known to exist for Rubicon tunnel outlet reach or Rockbound dam reach.

[b] Likely fall-run Chinook stocked into Folsom Reservoir.

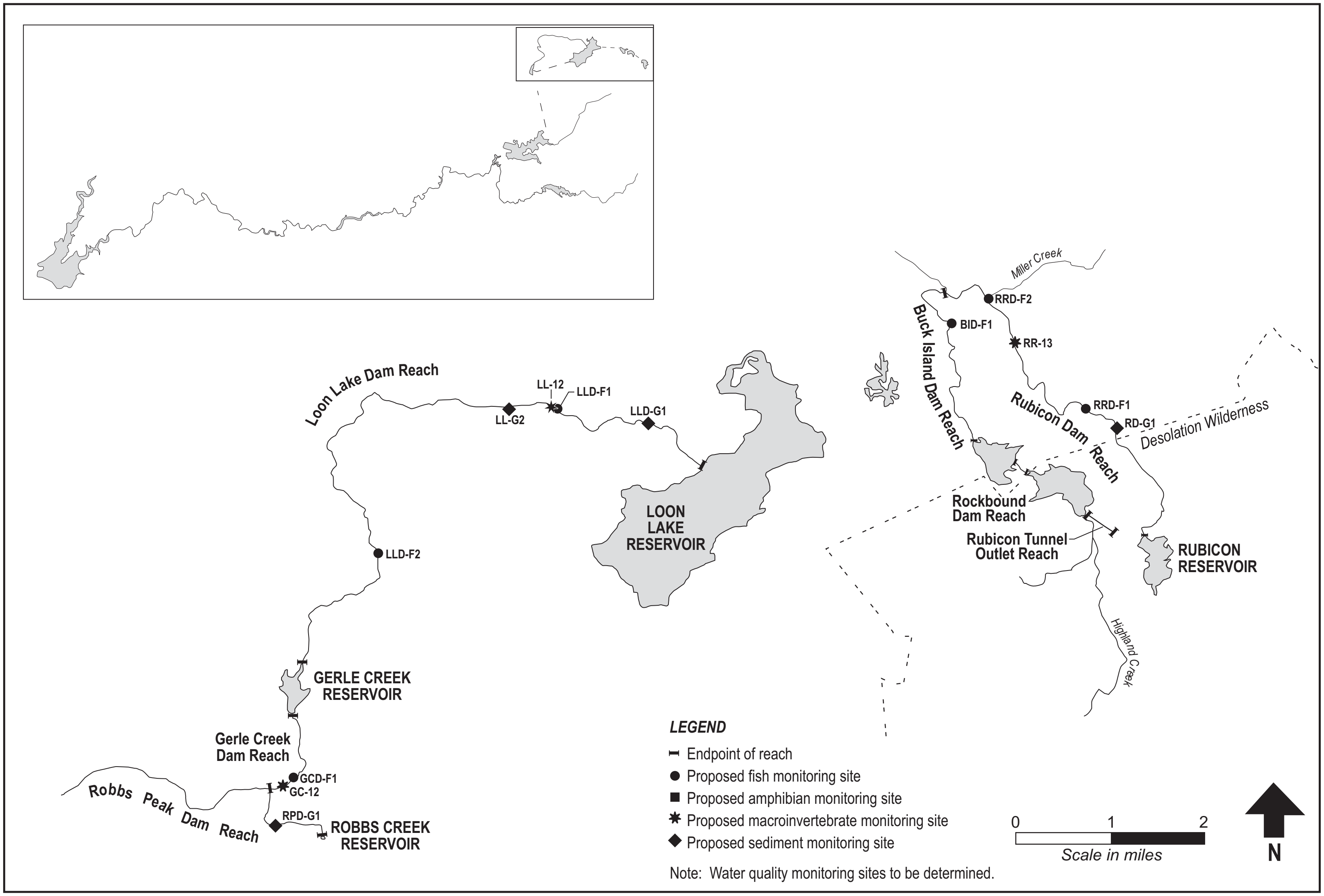

Figure 3-17. Stream segment sampling reaches—UARP northeast area. (Source: SMUD, 2005, as modified by the staff)

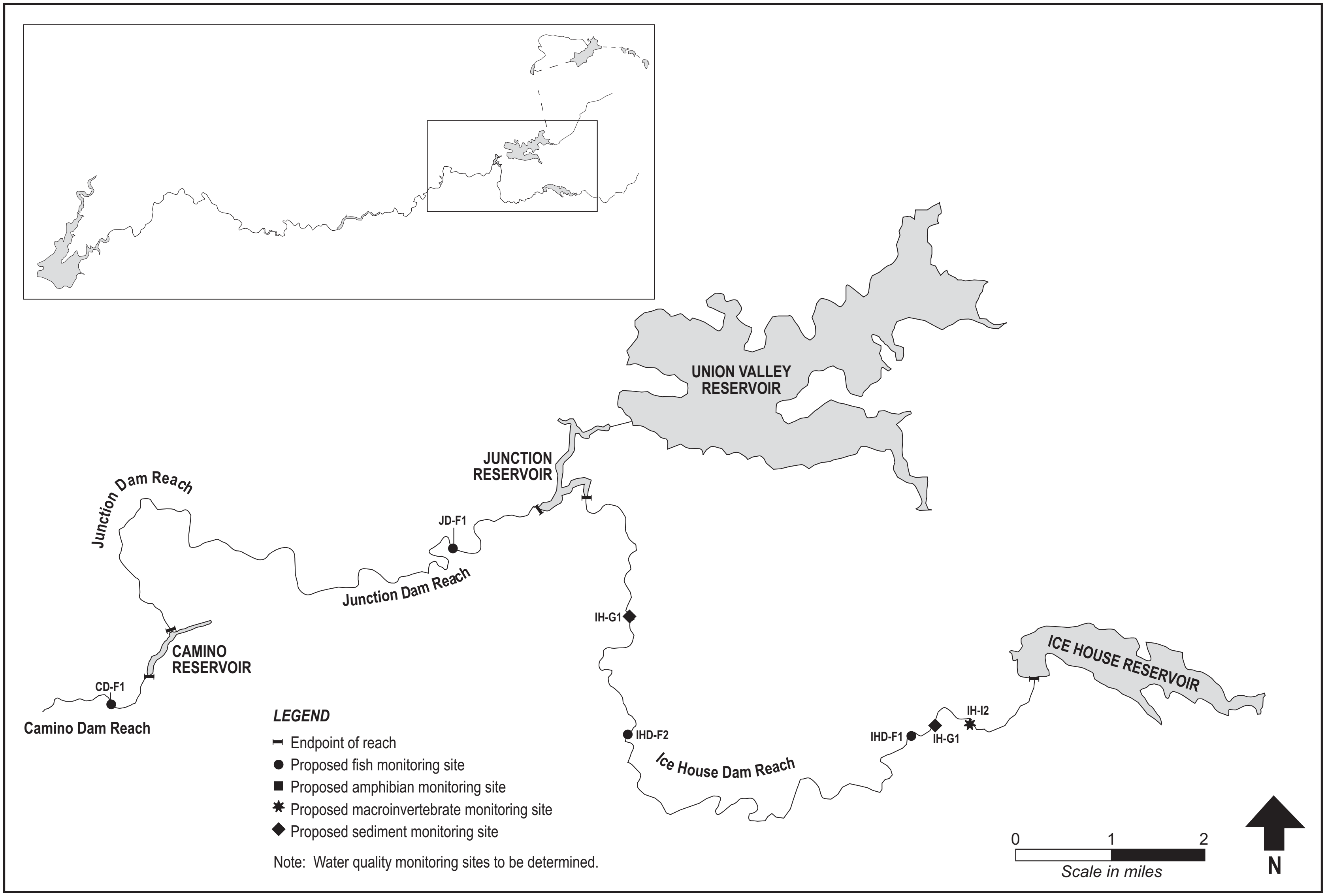

Figure 3-18. Stream segment sampling reaches—UARP southeast area. (Source: SMUD, 2005, as modified by the staff)

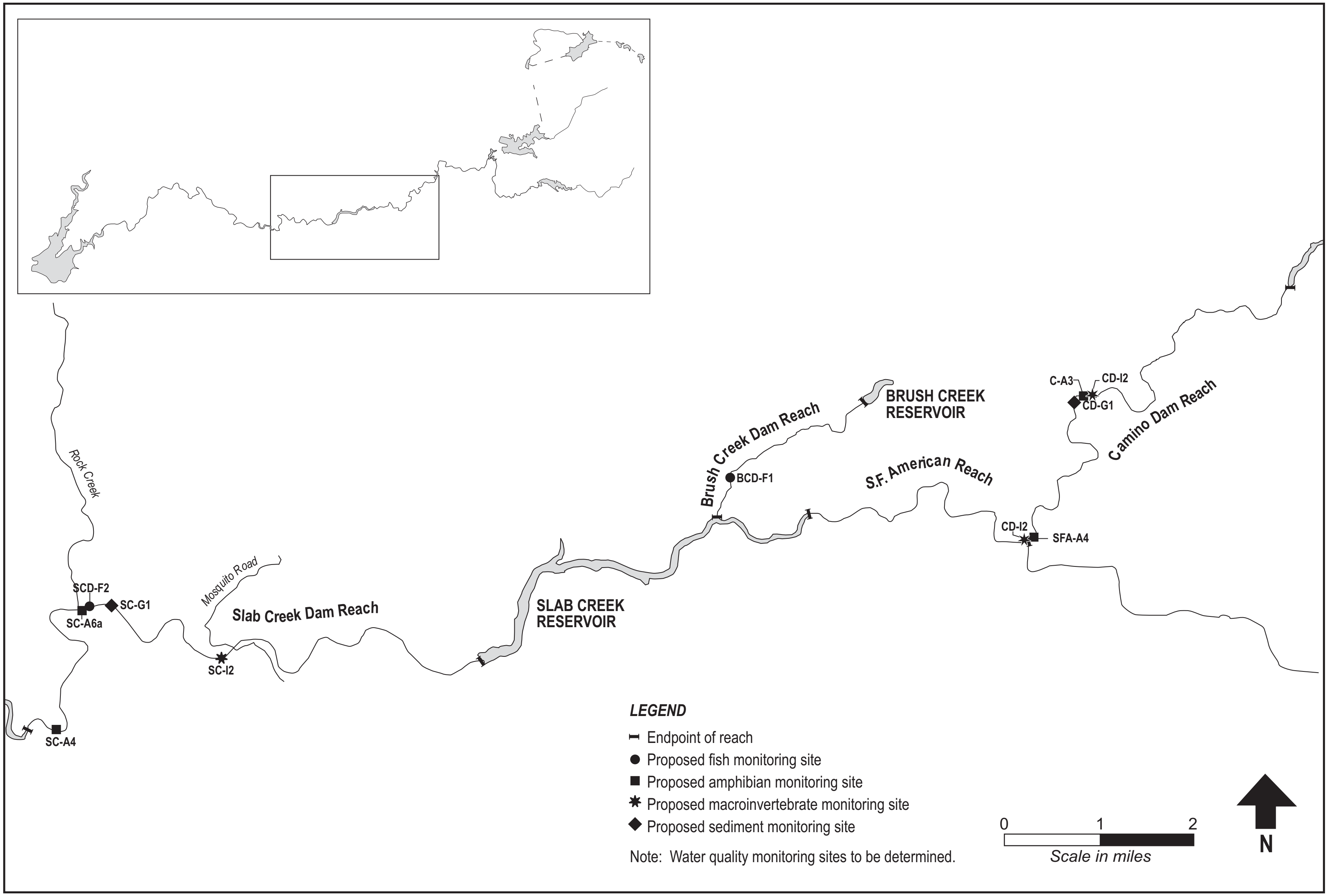

Figure 3-19. Stream segment sampling reaches—UARP southwest area. (Source: SMUD, 2005, as modified by staff)

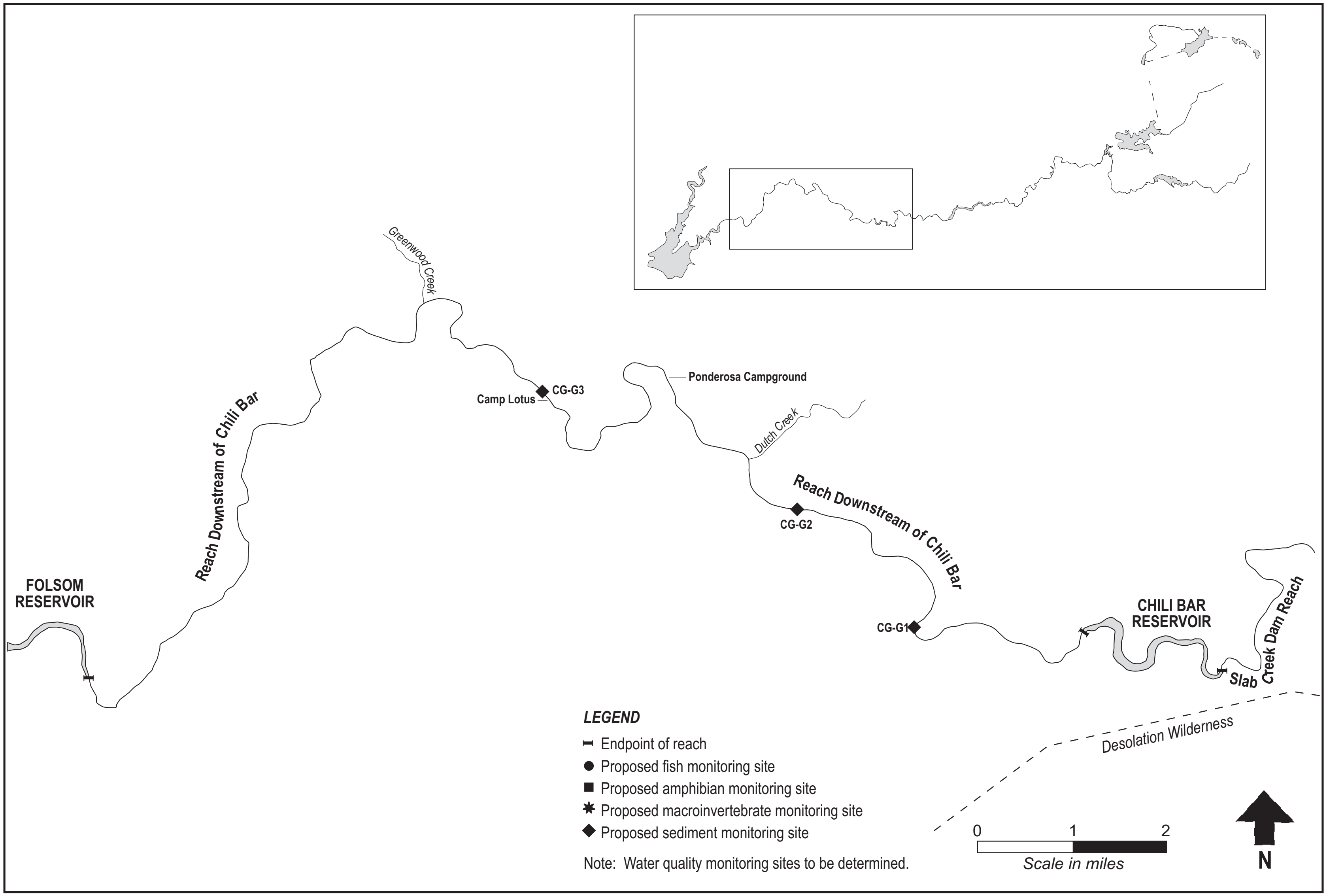

Figure 3-20. Stream segment sampling reaches—UARP western area. (Source: SMUD, 2005, as modified by the staff)

Table 3-33. Summary information from 2002 to 2004 stream fisheries studies. (Source: DTA and Stillwater Sciences, 2005d, CDFG, 2007)

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
Rubicon dam reach upstream of Rubicon Springs (RRD-F1)	Rainbow trout	Rainbow	11.3	YOY to 2+	YOY to 3+, but low recruitment of YOY in 2002 and 2003
Rubicon dam reach at Miller Cr. Confluence (RRD-F2)	Speckled dace and California roach	Brown	0.9	YOY to 1+	YOY to 3+ in 2002, up to 1+ in 2003
Little Rubicon River Buck Island dam reach (BID-F1)	Golden shiner	Rainbow	0	YOY to 2+	NA
Gerle Creek Loon Lake dam reach at Wentworth Springs (LLD-F1)	Brown trout	Brown	19.5	YOY to 2+	YOY to 3+
Gerle Creek Loon Lake dam reach at Rocky Basin Cr. Confluence (LLD-F2)	Brown trout	Brown	40	No YOY or 2+ in 2002 and 2003, only 2 YOY in 2004	YOY to 3+
Gerle Creek below Gerle dam reach (GCD-F1)	Rainbow trout	Rainbow	11.5	YOY to 2+ (most YOY)	Up to 3+
SFRR upstream of Robbs Peak reservoir (--)	Rainbow trout	Rainbow	7	YOY to 1+ (most 1+)	NA
SFRR Robbs Peak dam reach (RPD-F1)	Rainbow trout	Rainbow	23	YOY to at least 2+	YOY to 2+ with good distribution of older age classes

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
SFSC Ice House dam reach downstream of Silver Cr. Campground (IHD-F1)	Rainbow trout	Rainbow	10.6	Good distribution of YOY and 1+	YOY to 4+ (most 1+)
SFSC Ice House dam reach at Bryant Springs (IHD-F2)	Sacramento sucker	Rainbow /Brown	3	YOY to 2+	YOY to 3+
Silver Cr. Junction dam reach, 2 miles downstream of dam (JD-F1)	Rainbow trout	Rainbow	7.5	Most YOY	Older age classes evenly distributed
Junction dam reach upstream of Sugar Pine Cr. (JD-F2)	Rainbow trout	Rainbow	NC	YOY to 3+ (moderate recruitment of YOY and good distribution1+ to 3+)	NA
Silver Cr, Camino dam reach downstream of Tent Canyon (CD-F1)	Rainbow trout	Rainbow	NC	YOY to 3+	One 100 mm and one 150 mm
Silver Cr. Camino dam reach at Camino tunnel adit access (CD-F2)	Rainbow trout	Rainbow	NC	YOY to 4+ with peak in 2+	NA
Brush Creek dam reach (BCD-F1)	Rainbow trout	Rainbow	14.7	YOY to 3+ with strong recruitment of YOY	YOY to 3+ with strong recruitment of YOY

Stream Reach And Segment (Site ID)	Dominant Species	Dominant Trout	Mean Rainbow Trout Biomass (pounds/acre)	Rainbow Trout Age Classes	Brown Trout Age Classes
Slab Creek dam reach upstream of Rock Cr. powerhouse (SCD-F2)	Speckled dace/hardhead in 2002; riffle sculpin in 2003	Rainbow	4.65	Peak at YOY	Three fish older than YOY
Downstream of Chili Bar reach at Old Flume Memorial (CB-F1)	Rainbow trout, sculpin along margins	Rainbow	NC-	Low percentage of YOY	Only 5 fish [a]
Downstream of Chili Bar reach at Coloma State Park (CB-F2)	Sacramento sucker, sculpin along margins	Rainbow	NC	Peak at 125 mm (ages not discussed)	Only 4 fish [a]
Downstream of Chili Bar reach downstream of Camp Lotus (CB-F3)	Rainbow trout, sculpin along the margins	Rainbow	NC	Peak at 200 mm (ages not discussed)	Only 6 fish [a]
Downstream of Chili Bar reach at Weber Cr. Confluence (CB-F4)	Rainbow trout, sculpin along margins	Rainbow	NC	Peak at 175 mm (ages not discussed)	Only 1 fish [a]

Notes: -- – no data
mm – millimeter
NA – not applicable
NC – not calculated
YOY – young-of-the-year

[a] Size not given.

Table 3-33 summarizes the results of the applicant's 2002 through 2004 fish population studies and estimates of trout density and biomass in Project streams. All study segments contained rainbow trout and most contained brown trout; these were the dominant species in most of the stream segments sampled. Stream segments where trout were not dominant include sites in the lower Rubicon dam reach (RRD-F2), Buck Island dam reach (BID-F1), lower Ice House dam reach (IHD-F2), SFAR reach (SFAR-F1), lower Slab Creek dam reach (SCD-F2), and at a study site in the reach downstream of Chili Bar dam (CB-F2). SMUD's studies reported that average condition factors[35] for both rainbow and brown trout were close to 1.0 for all 3 years (i.e., 2002–2004), indicating that trout are generally in good condition in the reaches sampled.

SMUD evaluated the longitudinal distribution of fish in the Slab Creek dam reach by snorkeling 14 sites located between 3.65 and 7.64 miles downstream of Slab Creek dam (i.e., between 0.21 and 4.2 miles upstream of Chili Bar reservoir) in October 2004. SMUD did not evaluate the fish community within the first 2.5 miles downstream of the dam due to accessibility and safety concerns. Figure 3-21 displays the location where each fish species was observed. In total, nine species were observed in the reach, seven of which were observed during the 2004 longitudinal study. The distribution of fish species was consistent with longitudinal trends expected with increasing temperature downstream of Slab Creek dam. At the uppermost sample site, rainbow trout were dominant, and subdominant species included brown trout, Sacramento sucker and sculpin. Diversity of fish species was higher at downstream sample sites with the addition of transition zone species including hardhead, Sacramento pikeminnow, and California roach. The most abundant species was California roach followed by hardhead. Only one smallmouth bass (250 to 275 mm) was observed in the reach. SMUD reported that the cryptic marking and benthic nature of sculpins may have caused them to be under represented due to the difficulty in observing them while snorkeling.

Aquatic Habitat

Reservoirs

SMUD and PG&E conducted a study to evaluate reservoir habitat that could affect warmwater or reservoir spawning fishes in Project reservoirs. Based on the historical or suspected fish species present, Loon Lake, Ice House, Union Valley, Junction, Slab Creek, and Chili Bar were studied. Camino was excluded due to access and safety constraints. Primary characteristics, including water-level fluctuations,

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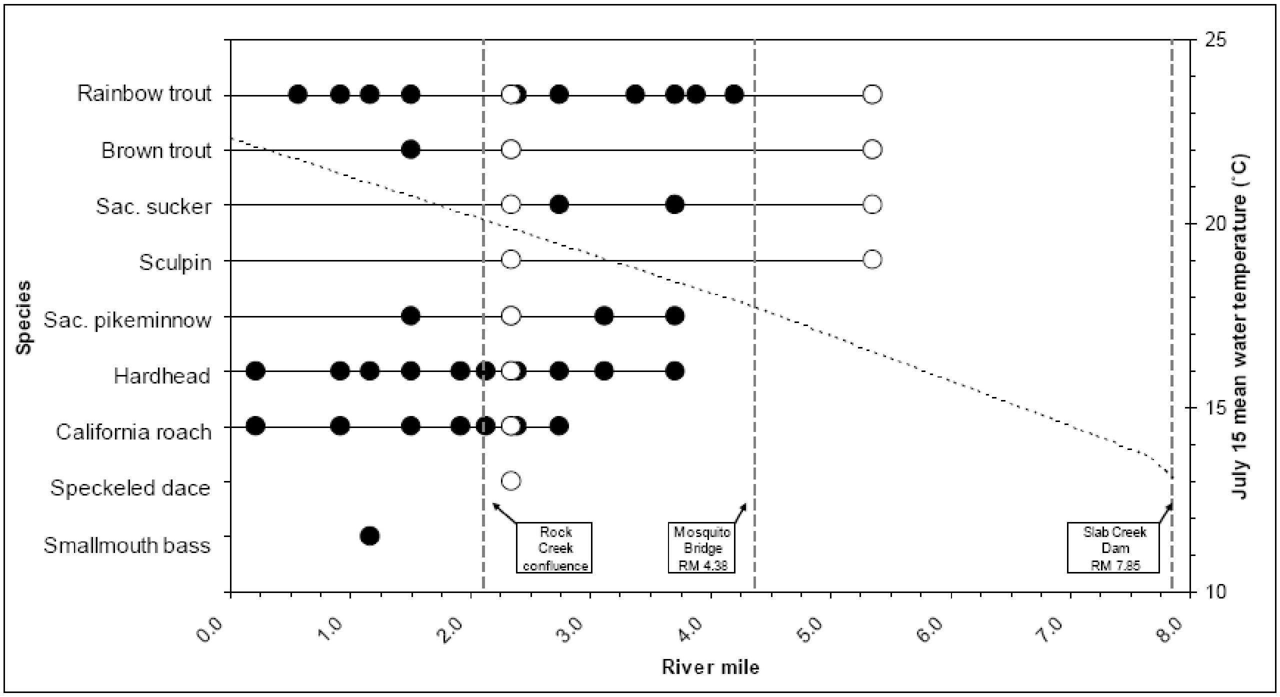
[35]Condition factor, or K, is a calculation used as an indicator of overall health of a fish, where $K = 10^5 \text{weight}/\text{length}^3$.



Note: Solid black circles indicate species observed in 2004, and open circles indicate species observed in 2002 and 2003 surveys. Dashed line is the water temperature relationship.

Figure 3-21. Species presence by river mile in Slab Creek dam reach. (Source: DTA and Stillwater Sciences, 2005d, figure 4.14-6)

physical shoreline habitat, number of tributaries and potential barriers to upstream fish migration, and shoreline fish spawning habitat were evaluated for each of these reservoirs. Note that we describe existing water level fluctuations in greater detail in section 3.3.2.1, *Water Quantity* (and erosion discussed in section 3.3.3.1, *Geology and Soils*).

Most of the shoreline of Junction, Slab Creek, and Chili Bar reservoirs is steep, but little erosion occurs along these shorelines due to bedrock and large-sized substrate along with dense vegetation along Chili Bar reservoir. Most of Loon Lake's shoreline, which is predominantly flat to moderately sloped, is also stable. In contrast, Ice House and Union Valley reservoirs have substantial mild erosion along their shorelines. Emergent vegetation is sparse along the shoreline of Ice House, Junction, and Union Valley reservoirs. Considerable emergent vegetation occurs in Chili Bar reservoir, and moderate levels of emergent vegetation occur in Loon Lake and Slab Creek reservoir.

No potential upstream fish migration barriers were identified for Loon Lake, Ice House, or Junction reservoirs. Potential barriers were identified for the other three reservoirs, although most of these barriers are not expected to preclude all fish species from entering the tributaries.

Streams

SMUD and PG&E evaluated stream habitat in numerous reaches affected by the Projects by conducting on-the-ground and aerial surveys during 2002 and 2003. This included on-the-ground mapping of seven reaches and aerial mapping of six reaches that were not safely accessible by foot or where ground surveys were not feasible. For both on-the-ground and aerial surveys, habitat units were delineated and categorized by habitat type, and then the percent of each habitat type was determined. The ground surveys recorded the type of substrate and cover, quantity of trout spawning gravel, large woody debris, potential upstream migration barriers for trout, and tributaries. The potential migration barriers were further evaluated to determine if they are absolute barriers to upstream trout migration or likely passable at anticipated high flows during spring runoff and/or winter storms. The results of these stream mapping and barrier evaluations are summarized in table 3-34.

Table 3-34. Summary characteristics for UARP and Chili Bar Project stream reaches. (Sources: DTA and Stillwater Sciences, 2005f, 2004a)

Reach (miles)	Cascade/High Gradient Riffle[a]/Low Gradient Riffle[a]/ Run/ Pool/ Pocket water %	Spawning Gravel (sq ft/ mile)	Large Woody Debris[b] (#/ mile)	# Trout Migration Barriers [c]	# of Tribu-taries
Rubicon River Rubicon dam[d] (5.8)	9.1/1.3/6.6/39.2/41.6/0.8	1,908	136	9/6	9
Rockbound dam (0.3)	13.5/11.7/28.9/8.8/37.2/0.0	0	329	4/2	0
Little RR Buck Island dam (2.5)	9.3/2.0/12.9/14.8/61.0/0.0	2	96	5/3	5
Gerle Cr Loon Lake dam (9.3)	10.4/7.8/18.9/25.9/35.9/1.1	3,932	194	7/3	2
Gerle Creek Gerle Creek dam (1.2)	18.1/0.0/4.6/1.1/36.7/39.4	1,606	7	0/0	4
SF Rubicon Robbs Peak dam (5.6)	25.2/11.5/18./15.8/25.2/3.4	--	--	2/1	--
Silver Cr. Ice House dam (12.3)	1.4/3.3/43.6/42.2/9.5/0.0	407	66	0/4	25
Silver Cr. Junction dam (8.3)	23.9/4.0/17.4/27.5/23.9/3.3	--	--	3/1	--
Silver Cr Camino dam (6.0)	16.3/2.8/2.6/14.0/59.0/5.6	--	--	1/0	--
Brush Creek dam (2.3)	17.0/10.6/21.9/19.2/31.3/0.0	134	42	19/8	0
SFAR Slab Creek dam (8.0)	4.9/13.3/18.9/28.8/26.1/8.0	--	--	0/0	--
SFAR Downstream of Chili Bar dam (19.1)	8.1/15.7/21.8/37.0/16.3/1.2	--	--	0/0	--

Note: -- indicates not reported.

[a] High gradient riffle has slope of greater than 4 percent. Low gradient riffle has slope of 4 percent or less.

[b] The minimum requirements used to define large woody debris were 6 inches in diameter and 3 feet in length where the total length was greater than or equal to one-half the channel width.

[c] Number before "/" is the number of migration barriers (other than the dam) to trout throughout the year. Number after "/" is the number of additional seasonal barriers that appear to be passable by trout at typical high flows during spring runoff and/or winter storms. Estimates for reaches where aerial mapping was done were made using aerial videography.

[d] Values for this reach include the Rubicon River from the base of Rubicon dam to the confluence with Miller Creek.

The estimated quantity of trout-spawning gravel for the seven ground-surveyed reaches ranges from zero to 3,932 square feet per mile. SMUD reports that virtually no spawning gravel occurs in the Rockbound dam and Buck Island dam reaches, but this is likely due primarily to geological features at these locations such as the predominance of relatively unweathered exposed bedrock. In contrast, more than 1,500 square feet of spawning gravel per mile occurs in the Loon Lake dam, Rubicon dam, and Gerle Creek dam reaches. Moderate volumes of spawning gravel exist in the Ice House dam and Brush Creek dam reaches.

The density of large woody debris ranged from 7 to 329 pieces per mile (table 3-34). The Gerle Creek dam reach had much less large woody debris than the other six reaches evaluated.

The applicants' trout barrier analysis revealed few year-round and seasonal barriers to upstream trout migration in the lower elevation reaches. The largest number of barriers to upstream passage was reported for the Brush Creek dam reach. Hardhead have relatively poor swimming abilities in cool water in comparison to trout, thus hardhead may have additional velocity barriers that permit the passage of salmonids (Moyle, 2002).

SMUD and PG&E sampled macroinvertebrate communities and assessed water quality by using measures of stream benthic macroinvertebrate community and physical/habitat characteristics to evaluate the biological integrity of stream ecosystems consistent with the California Stream Bioassessment Procedure (CDFG, 2003). They collected data at 30 sites in 13 reaches of the UARP during fall of 2002 and 2003, and at 6 sites in the reach downstream of Chili Bar dam in 2003 and 2004

About half of the distinct taxa identified at most UARP study sites were Ephemeroptera (mayfly), Plecoptera (stonefly), or Trichoptera (caddisfly). The overall number of mayflies, stoneflies, and caddisflies made up more than 40 percent of the organisms for the majority of the UARP study sites. However, mayflies, stoneflies, and caddisflies made up a much smaller percentage of the organisms at most of the sites downstream of the Chili Bar dam. The lowest percentage of organisms that were mayflies, stoneflies, and caddisflies occurred a short distance downstream of the Chili Bar and Junction dams, where they comprised about 6 and 14 percent of the total organisms, respectively.

Composite metric scores, which are indicators of biological integrity, were below average immediately downstream of the three largest UARP storage dams (Loon Lake, Ice House, and Junction) and generally increased with distance downstream of the reservoirs. Similarly, elmid beetles (riffle beetles of the family Elmidae) and perlid stoneflies (*Calineuria californica*), most of which are relatively long-lived taxa that require a full annual cycle or more for their development, are absent just below these reservoirs with increasing numbers further downstream. These factors suggest potential impairment immediately downstream of the Loon Lake, Ice House, and Junction dams, but recovery further down the corresponding reaches. Conversely, benthic macroinvertebrate composite metric scores decrease with distance downstream in the Camino and Slab Creek reaches, suggesting a decline in water quality at the lower ends of these reaches. Composite metric scores for the reach downstream of Chili Bar dam are consistently lower than at reference sites in the North Fork American and Cosumnes rivers, although this is partially due to the larger substrate in the upper end of the reach. Oligochaetes are dominant, and taxonomic richness and diversity are generally low in this reach, particularly at the upper end.

3.3.3.2 Environmental Effects

This section evaluates the environmental effects of the Proposed Actions on the aquatic resources of the Projects. Environmental measures are considered to have a significant effect if they interfere with reproduction, recruitment, or survival of fish to the degree that they adversely affect the species at the population level; cause water quality characteristics to become suboptimal for fish compared to reference conditions; or result in decreases in benthic macroinvertebrate diversity in Project reaches.

While historically the upper reaches of the UARP area were fishless, under the terms of the Settlement Agreement, the resource agencies chose trout (rainbow or brown trout) and hardhead biomass amounts as indicators of favorable ecological conditions in the Project areas. Specific indicators used include components articulated in the “Fish Community Assessment Metrics” (SMUD, 2004a), or biomass numbers. If the Fish Community Assessment Metrics, or existing biomass numbers are less than expected for Northern Sierra trout biomass numbers (according to Gerstung, 1973), the goal for the reach is to improve biomass to meet those numbers.

Table 3-35 compares existing rainbow trout biomass (and brown trout on some reaches) by reach, survey reach number, and measured stream width from 2002–2004 SMUD surveys with the trout biomass goals taken from Gerstung (1973) (CDFG, 2007). Agency objectives for each reach are also included in the table.

Table 3-35. Rainbow trout and brown trout biomass by reach from 2002–2004 SMUD Surveys, with agency objectives for trout biomass in each reach.

Reach Name (site #)	Objective	Existing Mean Biomass for Rainbow Trout (lbs/surface acre)	Rainbow Trout Biomass Goal[a] (lbs/surface acre)
Rubicon River below Rubicon dam (RRD-F1)	Increase RT	11.3	24
Rubicon River below Rubicon dam (RRD-F2)	Increase RT	0.9	33
Little Rubicon River below Buck Island dam (BID-F1 (upper)	Reduce or eliminate golden shiners and increase RT	0	Reduce or eliminate golden shiners and move toward 33 RT
Gerle Creek below Loon Lake dam (LLD-F1)	Increase RT and maintain BN	19.5	Combined biomass of RT and BN–24
Gerle Creek below Loon Lake dam (LLD-F2)	Increase RT and maintain BN	40	Combined biomass of RT and BN–24
Gerle Creek below Gerle dam (GCD-F1)	Increase RT and maintain BN	11.5	Combined biomass of RT and BN–24
SF Rubicon upstream of Robbs Peak dam	Increase RT	7	33
SF Rubicon below Robbs Peak dam (RPD-F1)	Increase RT and maintain BN	23	Combined biomass of RT and BN–24
SF Silver below Ice House dam (IHD-F1)	Increase RT	10.6	RT-24
SF Silver below Ice House dam (IHD-F2)	Increase RT	3	24
Silver Creek below Junction Dam (JD-F1)	Increase RT	7.5	24
Silver Creek below Junction dam (JD-F2)	Increase RT	Use Fish Community Assessment Metrics[b]	
Silver Creek below Camino dam (CD-F1)	Increase RT	Use Fish Community Assessment Metrics[b]	278 catchable trout per mile[a]
Brush Creek (BCD-F1)	Increase RT	14.7	35

Reach Name (site #)	Objective	Existing Mean Biomass for Rainbow Trout (lbs/surface acre)	Rainbow Trout Biomass Goal[a] (lbs/surface acre)
SFAR Below Slab Creek dam (SCD-F2)	Provide healthy age class distribution of transitional fishery (coldwater to warmwater)	4.65 RT; Age class distribution that represents healthy population of hardhead. Use Fish Community Assessment Metrics [b]	13 rainbow trout; use electrofishing and snorkeling for hardhead
SFAR Below Chili Bar dam (CB-1 and F4)	Provide healthy age class distribution of transitional fishery (coldwater to warmwater)	Use Fish Community Assessment Metrics [b] rainbow trout and hardhead	

Note: RT = rainbow trout, BN = brown trout.

[a] Gerstung (1973)

[b] SMUD (2004a)

Minimum Streamflows

The proposed minimum streamflow schedule would apply to the Rubicon River below Rubicon dam, Little Rubicon River below Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle Creek dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, and the SFAR below Slab Creek dam.

The proposed schedules specify minimum streamflows by month and water year type for each of the specified stream reaches, and allow the licensees a 3-year period after the license is issued or 3 years after completion of necessary facility modifications, whichever is later, to adjust operations to meet the required minimum streamflows. During this time period, daily mean streamflows may vary up to 10 percent below the amounts specified in the minimum streamflow schedules, provided that the average monthly streamflow in any given month equals or exceeds the required minimum amount for the month. After the applicable period, the licensees would meet the minimum streamflow requirements specified in the minimum streamflow schedules.

The minimum streamflow schedules are separated into five water year types: Wet, AN, BN, Dry, and CD. For the Proposed Action, SMUD would determine water year type based on the predicted unimpaired inflow to Folsom reservoir and spring forecasting information provided by DWR Bulletin 120 report of water conditions in California each month from February through May. The water year types are defined as follows:

- Wet = greater than or equal to 3.5 MAF.
- AN = greater than or equal to 2.6 MAF but less than 3.5 MAF.
- BN = greater than 1.7 MAF or equal to but less than 2.6 MAF.
- Dry = greater than 0.9 MAF or equal to but less than 1.7 MAF.
- CD = less than 0.9 MAF.
- SD = any CD year that is immediately preceded by a Dry or CD year or any Dry year that is immediately preceded by any combination of two Dry or CD years. Applies to flows below Chili Bar dam only.

In our analysis of the potential effects of the proposed minimum streamflow schedules on aquatic resources, we refer to the results of water temperature monitoring shown in table 3-16, in section 3.3.2.1, *Water Quality*, and the summary characteristics of the stream reaches presented in table 3-34 and Agency objectives for aquatic resources shown in table 3-35.

Rubicon River below Rubicon Dam

Historically, the high-elevation Rubicon River was fishless. Rainbow trout, brown trout, California roach and speckled dace now inhabit the reach. Rainbow trout biomass observed at sample sites in this reach were low, with 11.3 pounds per surface acre in the upper sample site (RRD-F1), and 0.9 pounds per surface acre in the lower site (RRD-F2) (see table 3-33), below the management goal of 24, and 33 pounds per surface acre, respectively. Spawning gravels in the reach are comparatively high, with 1,908 square feet per mile.

Resource agency objectives for this reach are to increase rainbow trout habitat, and "de-emphasize" California roach and speckled dace populations. Settlement Agreement Proposed Article 1-1, Minimum Streamflows, calls for a minimum streamflow schedule that varies by water year and month, in an attempt to more closely mimic a natural hydrograph (table 3-36).

Our Analysis

The presence of warm, slow moving water likely accounts for the fact that California roach and speckled dace are dominant over trout in this reach. Both rainbow and brown trout both appear to be reproducing here, with age classes of rainbow trout up to 2+, and brown trout up to 3+ (see table 3-33). According to PHABSIM analysis conducted by CDFG (CDFG, 2006a), approximately 100 percent of rainbow trout available Weighted Usable Area[36] (WUA) for spawning in this reach of the Rubicon River occurs at 60 cfs (figure 3-22). In the Settlement Agreement, the May flow in a BN water year (beginning of rainbow trout spawning) was set at 35 cfs, which provides 84 percent of available WUA for rainbow trout, and provides 40 to 55 feet of wetted perimeter. After the May minimum streamflow was established, the unimpaired hydrograph was used to shape the streamflow regime for the remainder of the BN water year. For CD water years the minimum May streamflow was set at 48 percent WUA, since during natural conditions, fish would have had less habitat available during these dry years.

Table 3-36. Proposed minimum streamflow schedule (cfs) for the Rubicon River below Rubicon dam. (Source: SMUD and PG&E, 2007)

Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
July–February	6 or NF	6 or NF	6 or NF	6 or NF	6 or NF
March	6 or NF	8	15	15	15
April	8	12	20	20	20
May	10	15	35	35	35
June	6 or NF	8	15	15	15

Note: If Natural Flow (NF) measured in the Rubicon River above Rubicon reservoir is below 1 cfs, the minimum streamflow would be 1 cfs. In CD water year types, if the useable storage in Rubicon reservoir is less than 60 acre-feet and the licensee cannot maintain 1 cfs due to lack of NF into and storage in Rubicon reservoir, SMUD would notify the Agencies at least 30 days prior to not meeting the streamflow. After notification of the Agencies, SMUD may reduce minimum flows below 1 cfs, but at no time would the minimum streamflow be less than the NF into Rubicon reservoir, until sufficient water is available to resume prescribed minimum streamflow releases.

SMUD would maintain an over-wintering minimum pool of 6,527 feet in elevation in Rubicon reservoir once the reservoir begins to freeze for the protection of aquatic species. Below an elevation of 6,527 feet, streamflow releases from Rubicon reservoir would equal the lesser of the applicable flow listed in the table or the NF into Rubicon reservoir.

Proposed increases in minimum stream flows are expected to benefit the rainbow trout population by creating more available spawning habitat during April, May, and June in all water year types. Increasing flows during these months would slightly lower water temperatures in the stream during May and June resulting in temperatures that would benefit the preferred trout species, but that are less favorable for California roach and speckled dace.

[36] Weighted Usable Area is the amount of usable habitat available for a given fish species.

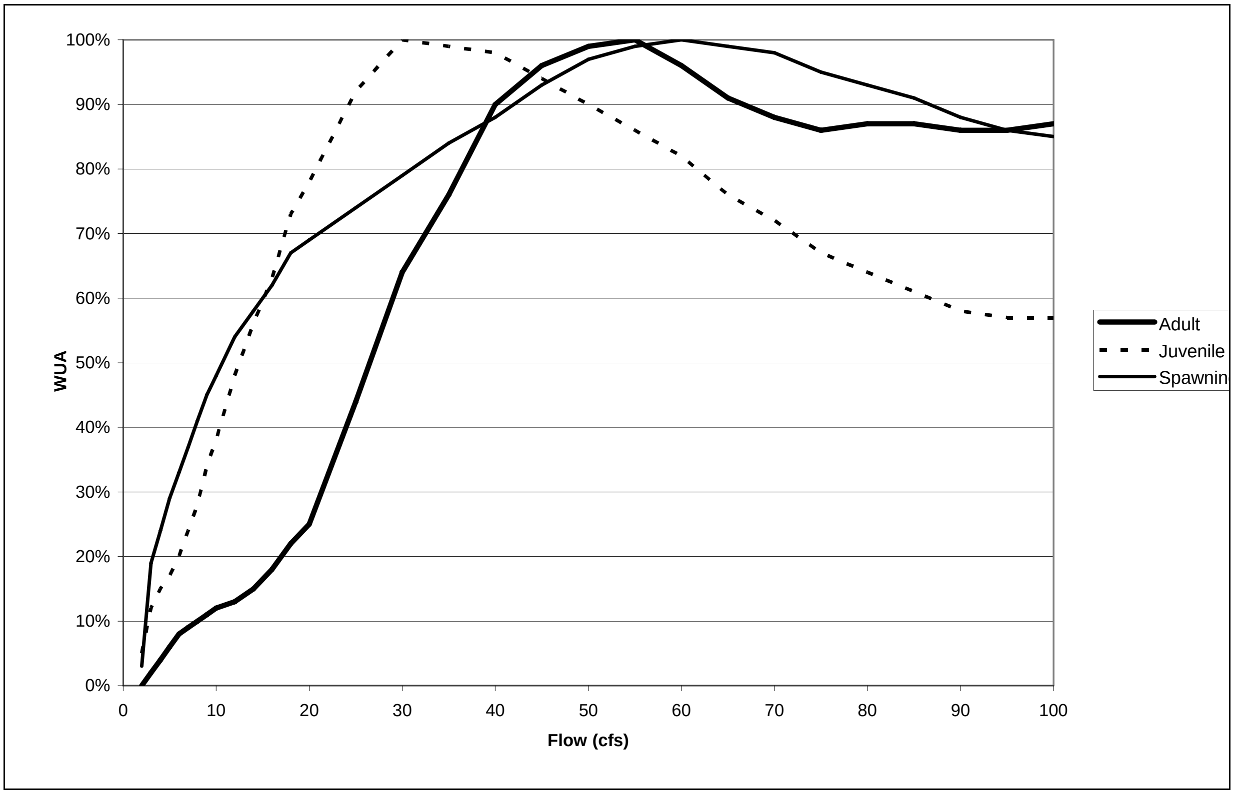


Figure 3-22. Weighted usable area for rainbow trout in the Rubicon River downstream of Rubicon dam. (Source: CDFG, 2006b)

Little Rubicon River below Buck Island Dam

Historically, the Little Rubicon River reach was fishless, and currently rainbow trout and golden shiners are found in the reach. There is a lack of spawning habitat for trout (less than 5 square feet in the entire reach), and there are 9 potential fish migration barriers. Without the current constant 1 cfs flow release, the high-elevation river would likely freeze in the winter, with limited habitat available only in deeper pools, and the river would be intermittently dry in the summer months. Water temperatures during March to April are near 0ºC, and during the summer the lower portions of the reach can reach 26ºC, near lethal temperatures for rainbow trout. These conditions result in low flow, warm water conditions during the summer that are more favorable for golden shiners, an exotic species that were likely introduced into the reach as baitfish.

Agency objectives for fish in this reach are to reduce or eliminate golden shiners, and increase existing populations of rainbow trout. The minimum streamflow schedule was developed by taking the Rubicon River minimum streamflows, and adjusting them by watershed area. There are approximately 26.5 square miles in the Rubicon River watershed, and approximately 6 square miles in the Little Rubicon River watershed, therefore the minimum flow regime was determined by dividing the Rubicon River minimum flows by 4.4. The proposed minimum flows are presented in table 3-37.

Table 3-37. Proposed minimum streamflow schedule (cfs) for the Rubicon River below Buck Island dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
July to February	1	1	1	1	1
March	1	2	3	3	3
April	2	3	5	5	5
May	2	3	8	8	8
June	1	2	3	3	3

Notes: Compliance point, USGS gage 11428400, located at the outlet structure on Buck Island dam. If Natural Flow (NF) measured in Highland/Rockbound Creek above Buck Island reservoir is below 1 cfs, the minimum flow would be 1 cfs. In CD water year types, if the useable storage in Buck Island reservoir is less than 60 acre-feet and the licensee cannot maintain 1 cfs due to lack of NF into and storage in Buck Island reservoir, SMUD would notify the Agencies at least 30 days prior to not meeting the streamflow. After notification of the Agencies, the licensee may reduce minimum flows below 1 cfs, but at no time would the minimum streamflow be less than the NF into the Buck Island reservoir, until sufficient water is available to resume prescribed minimum streamflow releases.

Our Analysis

Few fish inhabit this reach of the Little Rubicon River. Sampling at two sites in 2002 and 2003 yielded only 5 rainbow trout in total. In 2002, 12 golden shiners were captured, and in 2003 over 200 young-of-the-year golden shiner were captured. These young fish may have originated in the Buck Island reservoir. The small amount (less than 5 square feet) of spawning gravels present for trout along with the 9 passage barriers render this reach unproductive for trout at almost any flow. The proposed minimum streamflow schedule provides for increased flows from March through June in all but CD years. In CD years flows would be increased during April and May. The volume of watershed runoff that enters the reach as accretion during these months is significantly greater than the proposed increase in minimum flows, which would likely mask any potential benefit of the increased releases. Increases in minimum flow, particularly during May and June may benefit trout by lowering streamflow temperatures in the reach slightly; however, given the lack of available spawning gravels, this benefit may be limited to preventing pools in the stream from drying and providing rearing habitat.

Gerle Creek below Loon Lake Dam

Brown trout, a non-native but desirable fish species, and rainbow trout are relatively abundant in this reach (see table 3-31) and support an important recreational fishery. Agency objectives for Gerle Creek flows below Loon Lake dam are to emphasize rainbow trout and brown trout fisheries, reintroduce some similarity to the natural hydrograph to restore ecosystem processes that have been altered by Project operations, and to inundate banks to a greater degree than present to move fines and to improve riparian condition.

The Settlement Agreement proposed minimum streamflow schedule is shown in table 3-38. To facilitate fish passage to Gerle Creek below the reservoir, the Settlement Agreement also contains a provision (Proposed Article 1-8, *Fish Passage at Gerle Creek*) that specifies that the reservoir level at Gerle Creek reservoir be maintained at an elevation that provides fish passage into Gerle Creek from August through October.

Table 3-38. Proposed minimum streamflow (cfs) schedule for Gerle Creek below Loon Lake dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October–November	7	11	16	20	23
December	8	13	18	22	26
January	12	15	19	23	28
February	14	18	22	27	32
March	19	24	30	37	44
April	23	32	40	49	58
May	25	32	40	49	58
June	10	16	22	27	32
July	5	14	22	27	32
August–September	5	10	14	17	20

Note: Compliance point, USGS gage 11429500, located on Gerle Creek approximately 0.3 mile downstream from Loon Lake dam.

Our Analysis

The proposed minimum streamflow schedule was developed to accomplish several objectives. These include increasing available habitat for brown trout and rainbow trout, particularly during their respective spawning seasons; providing cold freshwater instream habitat; ensuring low terraces and flood-prone areas are inundated during the growing season; and providing flows that will reduce encroachment of riparian vegetation in the channel. Allowing flows to vary among seasons and more closely follow flow patterns of an unimpaired flow regime would help to accomplish these objectives.

Brown trout typically spawn during a natural low-flow period of the year in October and November, and rainbow trout spawn during April through June. Results of CDFG's WUA analysis (CDFG, 2006b) for rainbow trout and brown trout are presented in figures 3-23 and 3-24. The current 8 cfs minimum flow provides 85 percent, 98 percent and 77 percent WUA for rainbow trout adult, juvenile, and spawning, respectively, and 92 percent, and 100 percent, and 77 percent WUA for brown trout adult, juvenile, and spawning, respectively. The Proposed Action would increase flows and available WUA for all life stages of rainbow trout and brown trout spawning in all water years, with the exception of brown trout spawning in CD years, where WUA would decrease slightly in October and November.

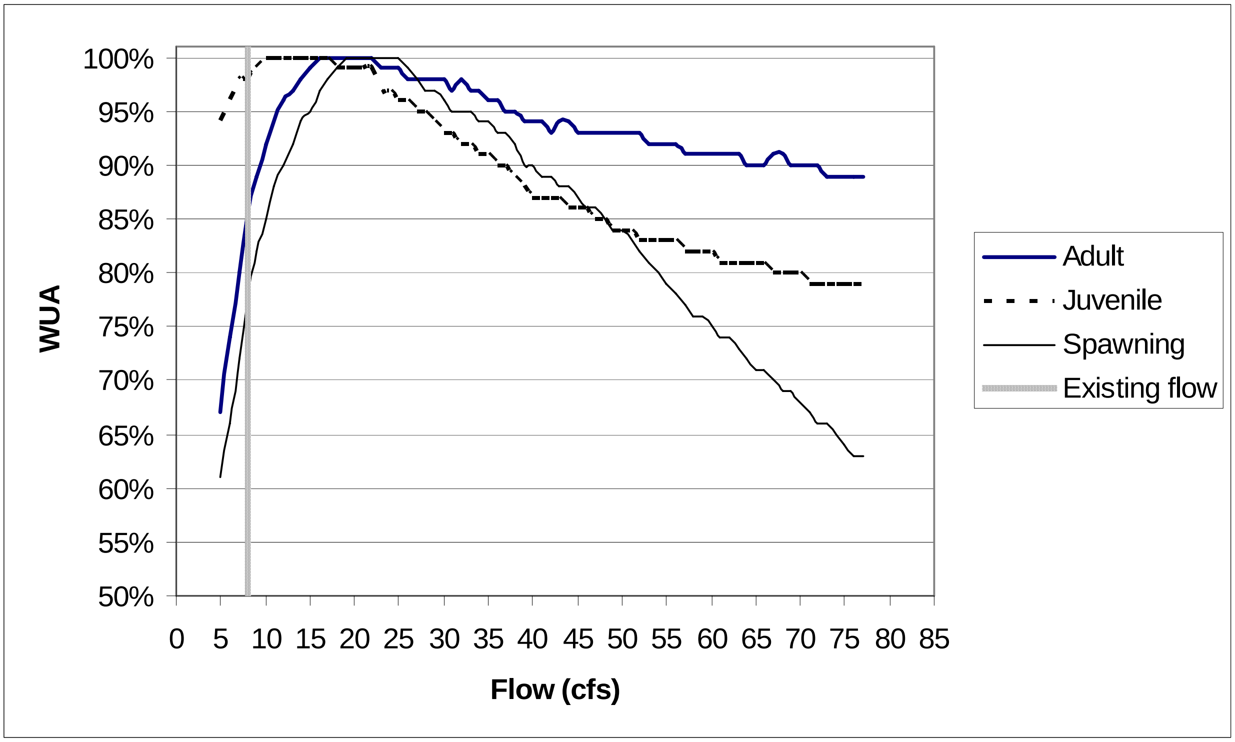


Figure 3-23. Rainbow trout composite WUA for Gerle Creek below Loon Lake dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Associate Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, Sacramento Valley Central Sierra Region CDFG, dated October 9, 2006)

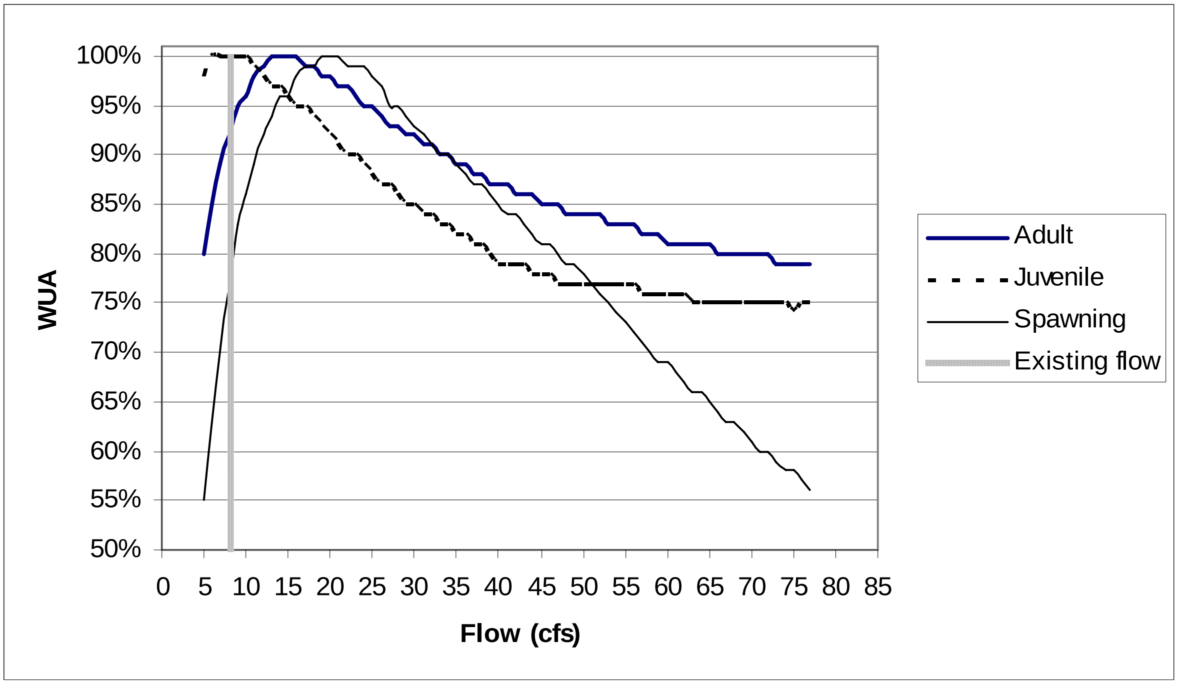


Figure 3-24. Brown trout composite WUA for Gerle Creek below Loon Lake dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Associate Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, Sacramento Valley Central Sierra Region CDFG, dated October 9, 2006)

The proposed increases in minimum streamflows would result in increased channel size and wetted perimeter downstream of the meadow section of Loon Lake reach of Gerle Creek, where channel mapping showed that increased flow would add habitat along the sides of the stream that may serve as a nursery for juvenile trout.

Increased flows during the spring months would result in inundation of stream margin habitats and primary flood terraces that would occur under an unimpaired flow regime. Such variations in streamflows and inundation are anticipated to increase the health of riparian vegetation and increase functioning of the riparian ecosystem by promoting stream bank stability and water quality, reducing the potential for erosion, increasing storage of nutrients and water, and providing forage and habitat for wildlife.

Gerle Creek has been identified as an important and unique brown trout fishery by sports anglers who recreate in the Crystal Basin. Brown trout residing in Gerle reservoir travel upstream to Gerle Creek for their October and November spawning.

The confluence of Gerle Creek with Gerle reservoir is marked by an alluvium delta deposit in the stream channel, which varies in location and depth due to the ongoing geomorphic processes. Recent information (letter from SMUD to FERC dated November 13, 2007) indicates that this alluvium deposit, consisting of mostly boulders and cobbles, is located mostly on the left side of the channel and currently does not have the potential to pose a migration barrier for brown trout. However, SMUD also indicates in its letter that cobble and boulders deposited at the head of the delta extends well upstream of the reservoir to an elevation of 5,231 feet. SMUD notes that this sediment deposit is caused by sediment falling out of the water as the stream slows due to the backup of water at Gerle Creek reservoir.

In streams such as Gerle Creek that are capable of carrying large sediments, these deposits can progressively work their way upstream as the sediments that are deposited at the head of the delta act to extend the backwater effect of the reservoir farther and farther upstream. Passage conditions in these areas can be altered substantially by flood events, which may alter the shape of the channel through the deposit or increase the size of the deposit by contributing large volumes of new material from upstream. Changes in the size and shape of the delta that could cause possible passage barriers are hard to predict and would vary in the future depending on sediment load, flood events, reservoir levels, and other factors and may require measures such as channel modifications by SMUD to ensure continued upstream passage of brown trout into Gerle Creek.

Robbs Peak Dam Reach and Gerle Creek below Gerle Dam

Rainbow trout and non-native brown trout populations inhabit the Gerle Creek dam reach. Agency goals for fish are to increase biomass of rainbow trout and maintain that of brown trout in Gerle Creek, and improve cold freshwater habitat.

The proposed minimum flows are presented below in table 3-39. Minimum streamflows for this reach are currently measured as combined flows below the confluence of Gerle Creek and SFRR.

Table 3-39. Proposed minimum streamflow (cfs) schedule for Gerle Creek below Gerle dam. (Source: SMUD and PG&E, 2007)

Month	**CD**	**Dry**	**BN**	**AN**	**Wet**
October	5	9	10	10	10
November	4	4	6	6	6
December	4	5	6	6	6
January to February	5	6	6	6	6
March	7	10	12	9	9
April	9	12	15	9	9
May to June	9	12	15	15	15
July	7	10	13	15	15
August	5	9	12	12	12
September	5	9	10	10	10

Our Analysis

Currently brown trout and rainbow trout are present in this short reach, providing valued opportunities for anglers. The existing minimum flows in this reach range between 4 cfs (CD, Dry, and BN years) and 7 cfs (during May through Oct of AN and Wet years). The current 4 cfs flows provide only 59 and 76 percent of WUA for brown trout and rainbow trout, respectively (figures 3-25 and 3-26). The proposed minimum flows would provide higher streamflows during the spring, which would increase the WUA available for rainbow trout spawning and adults, which may lead to increased production in the reach. The proposed minimum flows provide for increased flows during the fall brown trout spawning season as well, which could benefit production in the reach. The proposed flow releases more closely resemble an unimpaired hydrograph, which would likely benefit the production of healthy riparian vegetation and improve channel morphology.

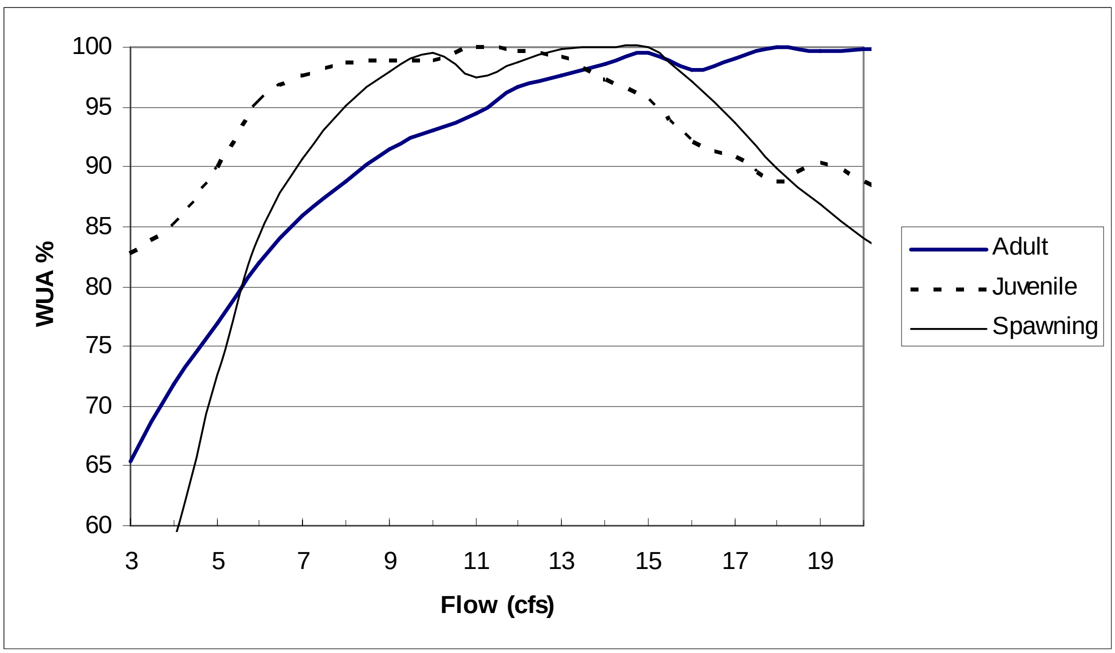


Figure 3-25. Brown trout composite WUA for Gerle Creek below Gerle dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, CDFG, dated October 9, 2006)

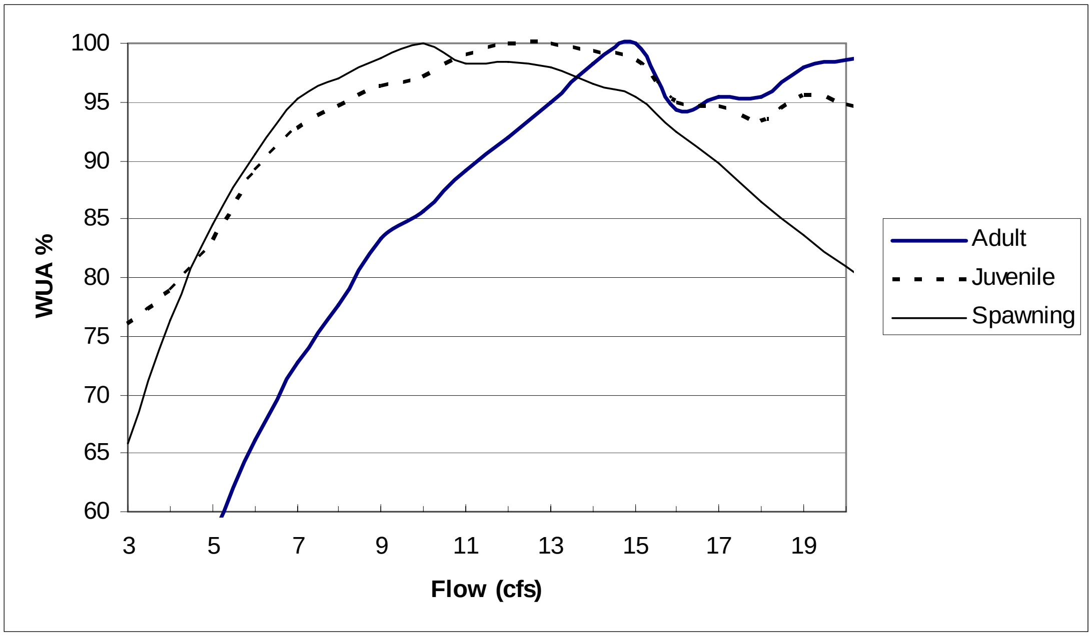


Figure 3-26. Rainbow trout composite WUA for Gerle Creek below Gerle dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Associate Fishery Biologist, CDFG, dated October 9, 2006)

South Fork of the Rubicon River below Robbs Peak Dam

Agency objective for the fisheries resources in this reach are to increase rainbow trout production and maintain production of brown trout. Current minimum flow releases for this reach are 1 cfs for all months and water years, except that in AN and Wet years 3 cfs are released from May through October. The proposed minimum streamflow schedule is presented below in table 3-40.

Our Analysis

The proposed minimum streamflow schedule would establish a more natural hydrograph compared with the existing 1 or 3 cfs releases. The Agency goal for fisheries in this reach is to increase rainbow trout and maintain brown trout biomass.

Table 3-41 shows the percent WUA for all water types for rainbow trout for the proposed minimum flows. For all water year types there will be more juvenile and adult trout habitat available under the proposed flow regime than there would be under the unimpaired hydrograph or under the existing flow regime. The increased flows are also anticipated to decrease the potential for entrainment at the entrance to the Robbs Peak powerhouse tunnel. If this is found not to be successful based on monitoring results, the adaptive management program described in Proposed Article 1-6, *Adaptive Management Program* of the Settlement Agreement includes, but is not limited to, mitigation for the entrainment by installing a partial-flow fish screen in the

SFRR upstream of Ice House Road, or other appropriate mitigation measures that are approved by the Forest Service, CDFG, and the Water Board.

Table 3-40. Proposed minimum streamflow (cfs) schedule for the SFRR below Robbs Peak dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	3	3	3	3	3
November	1	2	3	3	3
December	1	3	4	4	4
January	2	5	7	7	7
February	2	5	8	8	8
March	3	7	11	9	9
April	4	9	13	10	10
May to June	4	9	13	13	13
July	3	5	6	13	13
August	3	5	6	11	11
September	3	5	6	6	6

Table 3-41. Percent WUA for all water year types for rainbow trout for SFRR below Robbs Peak dam. (Source: CDFG, 2007)

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
October to December	CD	1–3	53–86 (no PHABSIM for 1 cfs)	Adult
	Dry	2–3	53–86	Adult
	BN, AN, Wet	3–4	86–93	Adult
January to March	CD	2-3	53–86	Adult
	Dry	5-7	98	Adult
	BN	7-11	90-98	Adult
	AN, Wet	7-9	90-98	Adult
April	CD	4	93/85	Adult/spawning
	Dry	9	90/98	Adult/spawning
	BN	13	69/100	Adult/spawning
	AN, Wet	10	85/99	Adult/spawning
May to June	CD	4	93/81/100	Adult/spawning/juvenile
	Dry	9	90/98/90	Adult/spawning/juvenile

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
	BN, AN, Wet	13	69/100/82	Adult/spawning/juvenile
July	CD	3	86/72/99	Adult/spawning/juvenile
	Dry	5	98/85/99	Adult/spawning/juvenile
	BN	6	100/90/97	Adult/spawning/juvenile
	AN, Wet	13	69/100/82	Adult/spawning/juvenile
August	CD	3	86/99	Adults/juveniles
	Dry	5	98/99	Adults/juveniles
	BN	6	100/97	Adults/juveniles
	AN, Wet	11	80/85	Adults/juveniles
September	CD	3	86/99	Adults/juveniles
	Dry	5	98/99	Adults/juveniles
	BN, AN, Wet	6	100/97	Adults/juveniles

The PHABSIM modeling showed the May minimum streamflow of 13 cfs would inundate some areas of the primary flood terrace in the reach, which is anticipated to benefit riparian vegetation during the growing season, thus improving riparian cover in the reach.

The proposed increase in winter flow releases from Robbs Peak reservoir would help maintain the wetted width of the channel, which would help to minimize freezing and the chance of significant ice formation, and increase available overwintering habitat for adult and juvenile trout.

Minimum streamflows for this reach and Gerle Creek below Gerle dam are currently combined and measured below the confluence of Gerle Creek and SFRR. Therefore current the streamflow gaging in this reach is inadequate to determine actual flows. Installation of a stream gage as proposed in Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, would ensure minimum streamflows are being released.

South Fork of Silver Creek below Ice House Dam

The Ice House dam reach of SFSC was historically fishless; however, it now contains naturalized populations of rainbow trout, brown trout and, in the lower reaches, Sacramento sucker. Currently the watershed in the lower portion of the reach is not forested because of a wildfire that swept through the area in 1992. The trout biomass is well above average in the upper portion of Ice House dam reach, while the lower portion of the reach exhibits below average trout biomass, which may be related, in part, to a combination of habitat features and high mean daily temperatures during summer months in SFSC. Water released from Ice House dam originates in the hypolimnion of

Ice House reservoir and remains cold throughout the year, with summertime temperatures of about 7ºC. In the summer, temperatures in the lower portions of this reach are often 20º to 21ºC, outside the optimal range for rainbow trout. While stream flow strongly influences stream temperature in the reach, high summer temperatures in the lower segment of the Ice House dam reach are also likely due to the loss of vegetation shading throughout most of the reach as a result of the 1992 wildfire.

Agency objectives for minimum flow releases to SFSC below Ice House dam for fisheries include providing peak flows to ensure bedload is moved through this reach; providing out-of-bank flows to inundate the lower terrace and floodplain to maintain the riparian ecosystem and keep the banks stabilized; providing temperatures that allow for management of native coldwater fish species. The goals for improving rainbow trout biomass at study sites in the reach are listed in table 3-35. Currently, rainbow trout biomass in the SFSC below Ice House dam is below agency objectives for the reach. The proposed minimum streamflow schedule is presented in table 3-42.

Table 3-42. Proposed minimum streamflow (cfs) schedule for SFSC below Ice House dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	10	15	15	15
November	5	7	8	8	8
December	5	8	11	11	11
January to February	6	12	18	18	18
March	8	16	24	24	24
April	15	28	41	41	41
May	30	46	68	68	68
June	25	31	46	46	46
July	21	21	30	30	30
August	14	14	15	15	15
September	10	10	15	15	15

Note: Compliance point, USGS gage 11441500, located on SFSC approximately 0.4 mile downstream from Ice House dam.

Our Analysis

The proposed minimum flow regime would more closely simulate the snowmelt period in the spring and provide quality habitat coinciding with the life history of native fish and amphibians. Figure 3-27 and table 3-43 show the percent WUA that would be available under the proposed flow regime. The minimum streamflow schedule was developed with the goal of maximizing both rainbow trout adult habitat and spawning habitat, particularly in May.

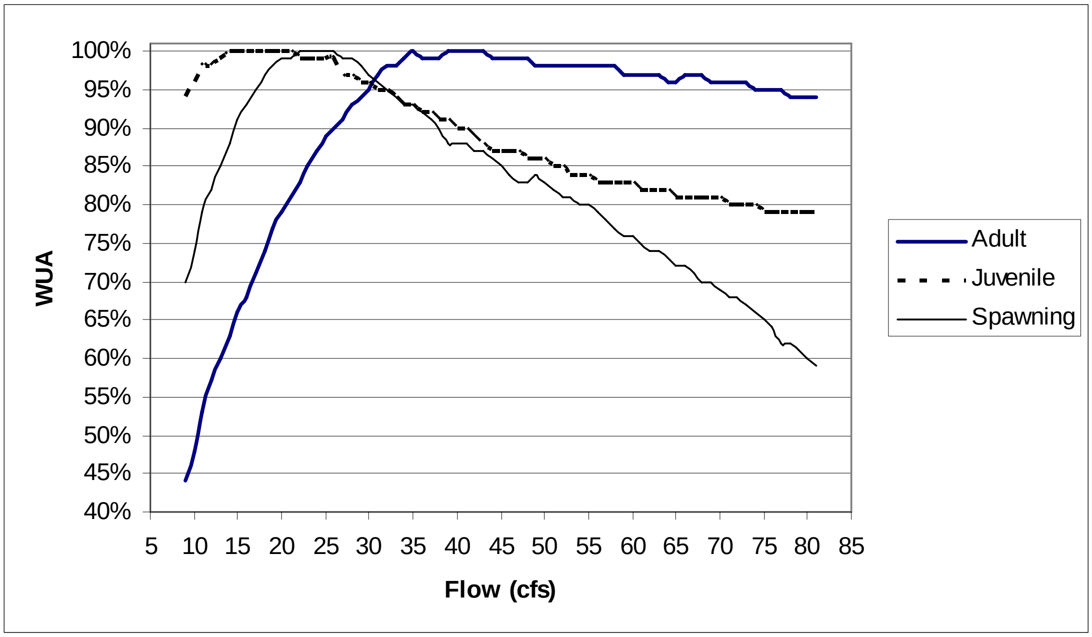


Figure 3-27. Rainbow trout composite WUA for the SFSC below Ice House dam. (Source: CDFG, 2006b; memorandum from R.W. Hughes, P.E., Hydraulic Engineer, Fisheries Engineering Team, CDFG, to S. Lehr, Fishery Biologist, CDFG, dated October 9, 2006)

Table 3-43. Percent WUA for all water year types for rainbow trout for SFSC below Ice House dam. (Source: CDFG, 2007)

Month	Water Year Type	Flow Range (cfs)	Percent WUA	Benefiting Life Stage
October	CD	5	44/73	Adults/juveniles
	Dry	10	48/76	Adults/juveniles
	BN, AN, Wet	15	65/88	Adults/juveniles
November to December	CD	5	Below 44	Adults
	Dry	7 to 8	Below 44	Adults
	BN, AN, Wet	8 to 11	Below 44 to 53	Adults
January to February	CD	6	Below 44 to 53	Adults
	Dry	12	57	Adults
	BN, AN, Wet	18	74	Adults
March	CD	8	Below 44	Adults
	Dry	16	68	Adults

Month	Water Year Type	Flow Range (cfs)	Percent WUA	Benefiting Life Stage
	BN, AN, Wet	24	87	Adults
April	CD	15	65	Adults
	Dry	28	93	Adults
	BN, AN, Wet	41	100	Adults
May	CD	30	95/97	Adult/spawning/juvenile
	Dry	46	99/84	Adult/spawning
	BN, AN, Wet	68	96/71	Adult/spawning
June	CD	25	89/100/99	Adult/spawning
	Dry	31	97/96/100	Adult/spawning
	BN, AN, Wet	46	99/84/97	Adult/spawning
July	CD	21	81/99/96	Adult/spawning
	Dry	21	81/99/96	Adult/spawning
	BN, AN, Wet	30	95/97/100	Adult/spawning
August to September	CD, Dry	10 to 14	48/76 to 63/86	Adult/juvenile
	BN, AN, Wet	15	65	Adult/juvenile

The Agencies state the recommended minimum streamflows were referenced against the PHABSIM transects to ensure that inundation of the primary flood terraces and bank margins would occur. This would benefit riparian vegetation during the spring by promoting initial scouring, sediment and nutrient deposition, and seed dispersal (CDFG, 2007).

As stated in section 3.3.3.2, water temperature modeling shows the proposed minimum flows would result in cooler June and July conditions than existing minimum flows, and mean daily temperatures of 20°C or less would be maintained throughout the entire reach. Simulated temperatures were as much as 15°C cooler (7°C versus 22°C existing) just downstream of the dam, about 3 to 4°C cooler near the middle of the reach, and virtually the same at the lower end of the reach. Bell (1991) reports an optimal range for rainbow trout of 12 to 19°C, while Moyle (2002) reports an optimal growth range of 15 to 18°C, therefore cooler temperatures would benefit rainbow trout populations in the reach.

Silver Creek below Junction Dam

The Junction dam reach was historically fishless, but now supports reproducing populations of rainbow trout and brown trout. Agency objectives for establishing minimum flows in Silver Creek below Junction dam include providing temperatures that allow for management of native fish and address foothill yellow-legged frog breeding, to establish some similarity to the natural hydrograph, and to provide connectivity of flows from the SFSC below Ice House dam through Silver Creek below Junction dam. The existing biomass for rainbow trout for this reach is 7.5 pounds per surface acre, below the resource agency biomass objective of 24 pounds per surface acre. The proposed minimum streamflow regime (table 3-44) was designed to increase instream habitat to improve the rainbow trout biomass and move it closer to the objective. Currently, SMUD releases between 5 and 20 cfs during various flow years.

Table 3-44. Proposed minimum streamflow (cfs) schedule for Silver Creek below Junction dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	10	15	15	15
November	5	7	20	20	20
December	5	8	20	20	20
January to February	6	12	20	20	20
March	8	16	25	25	25
April	15	28	42	42	42
May	30	46	68	68	68
June	25	31	50	59	59
July	21	21	30	35	35[a]
August	14	14	15	18	18[a]
September	10	10	15	18	18[a]

[a] SMUD would be required to release additional water into Silver Creek below Junction dam annually in July, August and/or September in Wet water year types for temperature control upon approval of the Agencies. A block of water would not exceed the acre-feet of water as follows: July, 1,044 acre-feet; August, 491 acre-feet; September, 475 acre-feet. Details of the block of water release flows are described in Proposed Article 1-1, *Minimum Streamflows*.

Our Analysis

The proposed minimum streamflows provide for increased flows through the reach for most all months and water year types. The minimum streamflow regime maximizes WUA for adult rainbow trout during most water years, although it decreases WUA available for rainbow trout spawning WUA when compared to existing conditions (figure 3-28). Table 3-45 displays the percent WUA for all water year types for rainbow trout for Silver Creek below Junction dam for the proposed minimum flow releases. The increase in streamflows during May through July would likely substantially reduce stream temperatures in the reach, which could benefit trout spawning, however the decrease in flows during August and September of AN and Wet years may slightly increase temperatures. However these warmer temperatures would most likely occur in edgewater habitat in lower portions of the reach (see discussion in section 3.3.2.2, *Water Temperature*) and would not likely have an impact on adult fish.

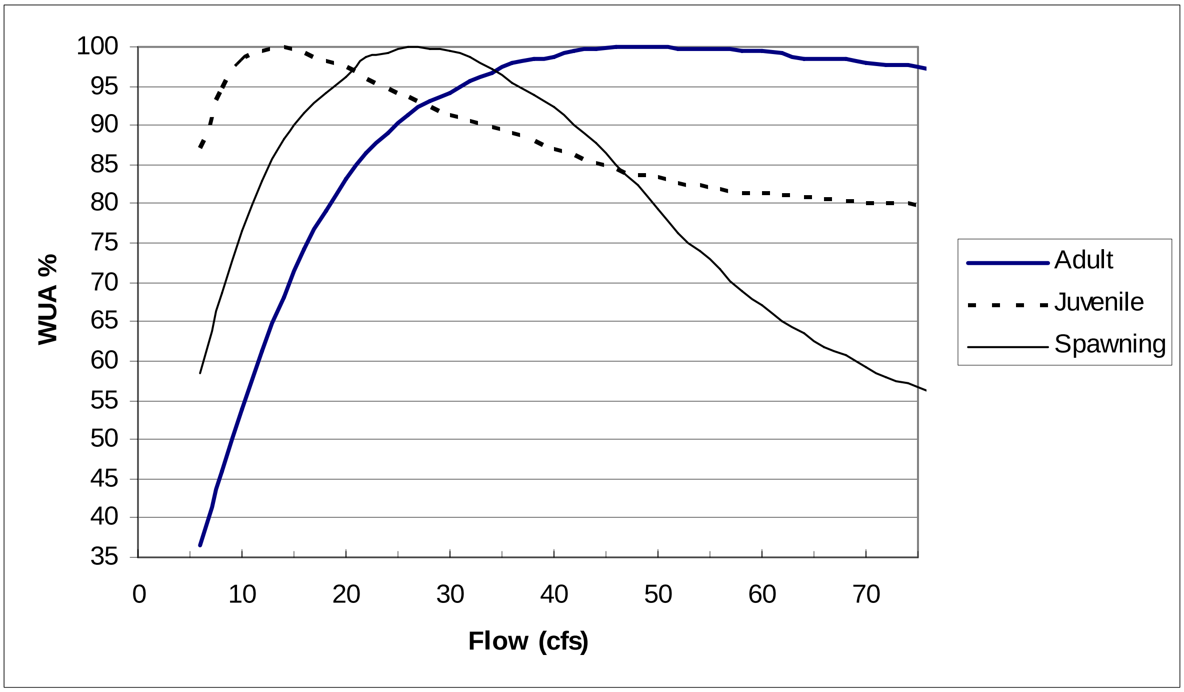


Figure 3-28. Rainbow trout WUA for Silver Creek below Junction dam. (Source: DTA and Stillwater Sciences 2004b)

Table 3-45. Percent WUA for all water year types for rainbow trout for SFSC below Junction dam. (Source: DTA and Stillwater Sciences, 2004b)

Month	Water Year Type	Flow (cfs)	Percent WUA	Benefiting Life Stage
October	CD	5	<36/<86	Adult/juvenile
	Dry	10	54/98	Adult/juvenile
	BN	15	71/99	Adult/juvenile
	AN	15	71/99	Adult/juvenile
	Wet	15	71/99	Adult/juvenile
November to February	Dry	7	41	Adult
	BN	20	83	Adult
	AN	20	83	Adult

Month	Water Year Type	Flow (cfs)	Percent WUA	Benefiting Life Stage
	Wet	20	83	Adult
	CD	8	46	Adult
March	CD	8	46	Adult
	Dry	16	74	Adult
	BN	25	90	Adult
	AN	25	90	Adult
	Wet	25	90	Adult
April	CD	15	71/90	Adult/spawning
	Dry	28	93/100	Adult/spawning
	BN	42	100/90	Adult/spawning
	AN	42	100/90	Adult/spawning
	Wet	42	100/90	Adult/spawning
May	CD	30	95/100	Adult/spawning
	Dry	46	100/85	Adult/spawning
	BN	68	98/61	Adult/spawning
	AN	68	98/61	Adult/spawning
	Wet	68	98/61	Adult/spawning
June	CD	25	90/99/94	Adult/spawning/juvenile
	Dry	31	95/99/91	Adult/spawning/juvenile
	BN	50	100/79/84	Adult/spawning/juvenile
	AN	59	100/68/81	Adult/spawning/juvenile
	Wet	59	100/68/81	Adult/spawning/juvenile
July	CD	21	85/97/96	Adult/spawning/juvenile
	Dry	21	85/97/96	Adult/spawning/juvenile
	BN	30	94/100/91	Adult/spawning/juvenile
	AN	35	97/96/89	Adult/spawning/juvenile
	Wet	35	97/96/89	Adult/spawning/juvenile
August to Sept	CD	14	68/98-100	Adult/juvenile
	Dry	14	68/98-100	Adult/juvenile
	BN	15	71/99	Adult/juvenile
	AN	18	79/98	Adult/juvenile
	Wet	18	79/98	Adult/juvenile

Currently, coldwater releases from Junction dam in summer months create a mean daily temperature range between approximately 8°C at the dam and 20°C at the bottom of the reach. Bell (1991) reports an optimal range for rainbow trout of 12 to 19°C, while Moyle (2002) reports an optimal growth range of 15 to 18°C. As stated in section 3.3.3.2, the large increases flow in May through July would substantially reduce temperatures in the reach, which may benefit trout. Reducing flows during August and September of Wet and AN years would likely only slightly increase temperatures.

Monitoring water temperatures and releasing blocks of water as described in Proposed Article 1-1, *Minimum Streamflows*, would provide a larger influx of cooler water, helping to maintain instream temperatures below 20°C and protecting trout in the stream.

Silver Creek below Camino Dam

Agency objectives for minimum flows in this reach are to provide habitat for healthy macroinvertebrate populations and foothill yellow-legged frogs in the entire reach, provide connectivity of flows from SFSC below Ice House dam through Silver Creek below Junction and Camino dams, provide temperatures that allow for management of native fish, and provide good water/habitat quality, resulting in improved bioassessment composite metric scores for rainbow trout, particularly in the lower reach. The proposed minimum streamflow schedule is presented in table 3-46.

Table 3-46. Proposed minimum streamflow (cfs) schedule for Silver Creek below Camino dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	5	10	15	15	15
November	5	7	20	20	20
December	5	8	20	20	20
January–February	6	12	20	20	20
March	8	16	25	25	25
April	15	28	42	42	42
May	30	46	68	68	68
June	25	31	50	59	59
July	21	21	30	35	35[a]
August	14	14	15	18	18[a]
September	10	10	15	18	18[a]

[a] SMUD would be required to release additional water into Silver Creek below Camino dam annually in the months of July, August, and/or September in Wet water year types for temperature control upon approval of the Agencies. A block of water would not exceed these amounts: July, 1,044 acre-feet; August, 491 acre-feet; and September, 475 acre-feet. Details of the block of water release flows are described in proposed Article 1-1, *Minimum Streamflows*.

Our Analysis

Flows in this reach were shaped to mimic the natural hydrograph, with decline of discharges during the summer that result in decreasing water depths and warmer water temperatures in order to facilitate reproduction of the foothill yellow-legged frog in the reach (CDFG, 2007). The flow regime was also developed to provide continuous streamflows from Silver Creek below Junction dam to improve habitat for rainbow trout in the reach.

Based on snorkel surveys, there are an estimated 137 rainbow trout per mile in this reach (CDFG, 2007), and the stated goal for this reach is 278 adult fish per mile. The proposed minimum streamflows regime in this reach would result in an increase in available WUA for rainbow trout adults and spawning habitat during most months in all water years, although habitat for rainbow trout juveniles will decrease somewhat due to the higher flow regime (figure 3-29). The increase in habitat for adult and spawning rainbow trout is greater than the loss of juvenile habitat, thus the net result is anticipated to be that production of trout in the reach would likely increase.

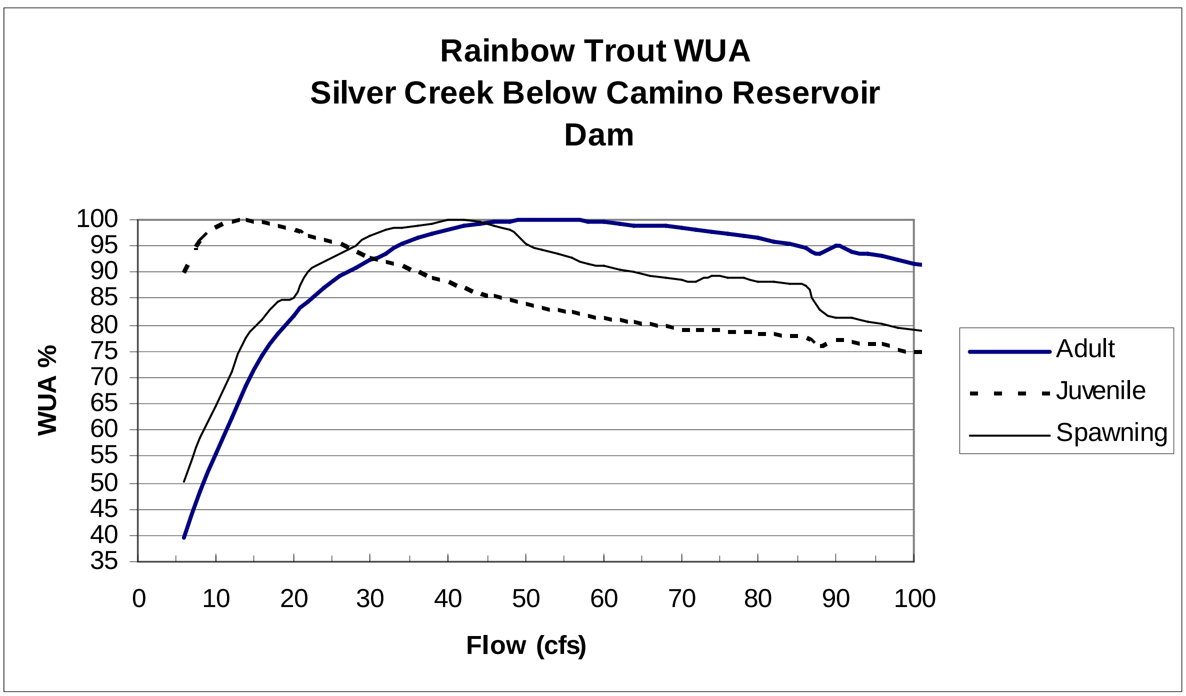


Figure 3-29. Rainbow trout WUA for Silver Creek below Camino dam. (Source: DTA and Stillwater Sciences 2004b)

As discussed in section 3.3.3.2, instream temperatures exceeded 20ºC in the lower end of the reach nearly 70 percent of the time in July, 20 percent of the time in June and August, and occasionally in May. The proposed streamflow release schedule would reduce mean daily temperatures approximately 5ºC in May and June, about 3ºC in July. It would likely keep stream temperatures below 20ºC from May through July in

BN years, which would benefit rainbow trout in the reach during those months. However it is not clear if the increased streamflows in other years would lower temperatures below 20ºC, particularly in July and August. Monitoring water temperatures and releasing blocks of water as described in Proposed Article 1-1, *Minimum Streamflows*, would provide a larger influx of cooler water, helping to maintain instream temperatures below 20°C, thereby keeping temperatures closer to the preferred levels for trout in the stream.

Brush Creek below Brush Creek Dam

Historically, Brush Creek was fishless except at its confluence with the SFAR. Naturalized populations of rainbow and brown trout now occupy the stream. This reach has the highest productivity, in terms of fish per mile, of any of the other streams surveyed in 2003, and it appears there is strong recruitment of YOY fish for both trout species, with a distribution of older age classes up to the 3+ age group. The presence of multiple age classes indicates the rainbow and brown trout populations in the reach are reproducing in the reach.

Agency objectives for this reach are to manage flows to benefit native aquatic species. The Agencies recommended a mean rainbow trout biomass objective of 35 pounds per surface acre. The current mean biomass present in Brush Creek is 14.7 pounds per surface acre, so the recommended minimum streamflows were developed to increase biomass by increasing the available stream habitat. The proposed minimum streamflow schedule is presented in table 3-47.

Table 3-47. Proposed minimum streamflow (cfs) schedule for Brush Creek below Brush Creek dam. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October	4 or NF	4 or NF	4 or NF	4 or NF	4 or NF
November	6 or NF	7 or NF	8 or NF	9 or NF	9or NF
December–May	6 or NF	7 or NF	8 or NF	9 or NF	10or NF
June	6 or NF	7 or NF	8 or NF	9 or NF	9 or NF
July	5 or NF	5 or NF	5 or NF	5 or NF	5 or NF
August	4 or NF	4 or NF	4 or NF	4 or NF	4 or NF
September	3 or NF	3 or NF	3 or NF	3 or NF	3 or NF

Notes: NF=natural inflow. In all months and all water year types, if natural inflow is below 1 cfs, the minimum flow would be 1 cfs. Compliance point, USGS gage 11442700, located on the Brush Creek dam outlet structure.

Our Analysis

Current minimum streamflow releases from Brush Creek dam range from 2 to 3 cfs from June through October, and 4 to 6 cfs from November through May. The proposed minimum flow regime varies from 3 to 12 cfs from June through October, and 6 through 10 cfs from November through May (or natural inflow, or 1 cfs if natural inflow is less than 1 cfs).

The proposed minimum flows are increased over existing releases in all water years and months, except for the month of September in wetter years, where is it unchanged. Based on analysis of rainbow trout WUA, these proposed flows will increase available habitat for adult, juvenile, and spawning rainbow trout in Brush Creek compared to the existing conditions (figure 3-30). An increase in available habitat is anticipated to increase production of trout to meet agency biomass objective for this reach.

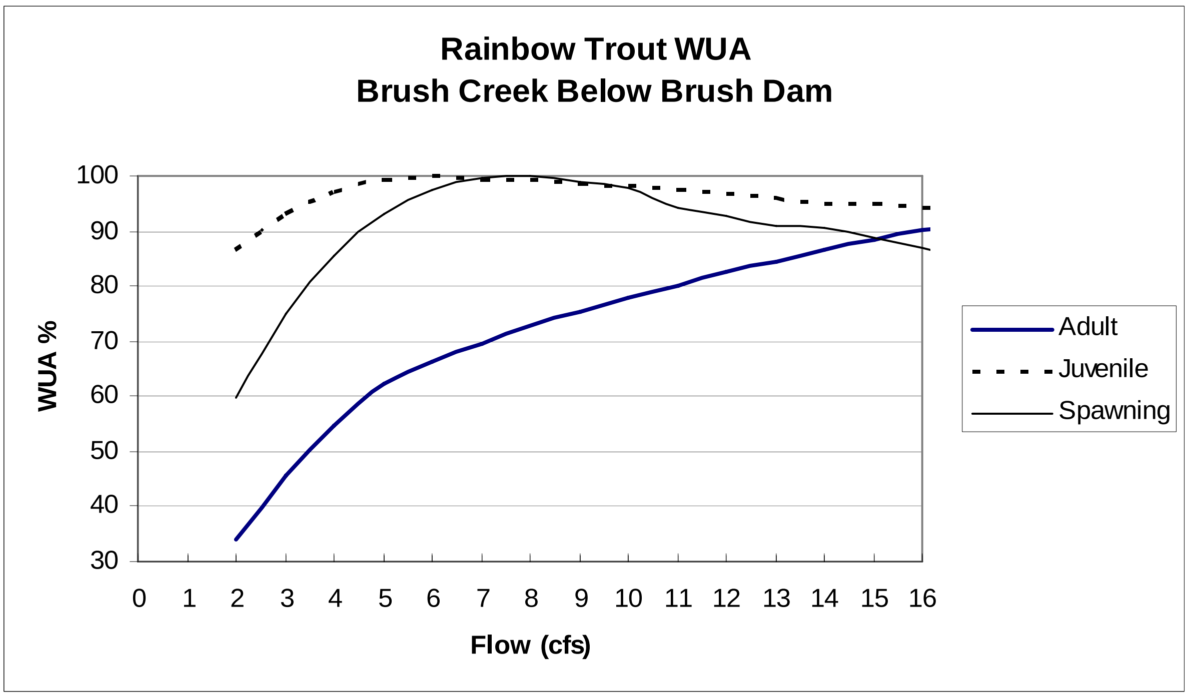


Figure 3-30. Rainbow trout WUA for Brush Creek below Brush Creek dam. (Source: DTA and Stillwater Sciences 2004b)

South Fork of the American River below Slab Creek Dam

The existing flow regime in the Slab Creek dam reach supports a wide variety of fish species. The reach is located within a transitional zone where the stream fish community comprises both coldwater and coolwater species. Trout are dominant in the upper portion of the reach, while hardhead, a special status species, are found as part of a native transition zone fish community (sucker-pikeminnow-hardhead) in the lower portion of the reach. The primary cause of this is rising water temperatures from upstream to downstream. The Agencies' objectives for fisheries resources in the SFAR below Slab Creek dam are to provide habitat for hardhead, and to provide temperatures that allow for management of native fish (hardhead and rainbow trout); to reduce non-native species, such as bullfrogs and bass; to reestablish some similarity to a natural hydrograph; and to maintain streamflows in the SFAR above Slab Creek reservoir below Slab Creek dam.

The proposed minimum flow releases schedule is presented in tables 3-48 and 3-49. Because the higher spring flows would require SMUD to modify facilities, there is a minimum streamflow regime for years 1 to 3 of the new license that is within the capability of the existing facility, and then the minimum streamflows increase once appropriate facility modifications are made to accommodate the flows.

Our Analysis

The coldwater releases from Slab Creek reservoir facilitate a coldwater trout fishery in the upper portion of the reach, although there is a warmer water "transition zone" fishery above Slab Creek reservoir. The summer flow regime creates warmer water conditions in the lower portion of the reach that do not sustain a significant trout population. The existing biomass for rainbow trout in this reach is 4.6 pounds per surface acre, below the agency biomass objective of 13 pounds per surface acre. The proposed flow regime is designed to improve instream habitat to increase the trout biomass and move it closer to the desired objective.

Table 3-48. Proposed minimum streamflow (cfs) schedule for SFAR below Slab Creek dam, years 1–3. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October–February	63	63	70	80	90
March	63	101	110-130-150-180	110-130-150-180	110-130-150-180
April	100	101-132-156-183	188-197-213-222	188-197-213-222	188-197-213-222
May	109	164-145-126-107	229-236-247-263 [a]	229-236-247-263[a]	229-236-247-263 [a]
June	90	90	228-193-158-123	228-193-158-123	228-193-158-123
July	77	90	90	90	90
August	63	70	70	70	70
September	63	63	70	70	70

Note: In months with more than one minimum streamflow, SMUD would maintain each minimum streamflow listed for 1 week prior to reducing to the next minimum streamflow for the month. Minimum streamflow would be measured at USGS gage 11443500, located approximately 500 feet upstream from Iowa Canyon Creek.

[a] Or maximum capacity of the valve, whichever is less.

Table 3-49. Proposed minimum streamflow (cfs) schedule for SFAR below Slab Creek dam, years 4 through term of license. (Source: SMUD and PG&E, 2007)

Month	CD	Dry	BN	AN	Wet
October–February	63	63	70	80	90
March	63	101	110-130-150-180	110-130-150-180	110-130-150-180
April	100	110-130-150-183	222-236-247-263	222-236-247-263	222-236-247-263
May	109	164-145-126-107	272-286-297-303	272-316-367-395[a]	272-337-387-415[a]
June	90	90	255-210-165-120	324-256-188-120	352-274-197-120
July	77	90	90	90	90
August	63	70	70	70	70
September	63	63	70	70	70

Note: In months with more than one minimum streamflow, SMUD would maintain each minimum streamflow listed for 1 week prior to reducing to the next minimum streamflow for the month. Minimum streamflow would be measured at USGS gage 11443500, located approximately 500 feet upstream from Iowa Canyon Creek.

[a] Or maximum capacity of the valve, whichever is less.

Rainbow trout spawning in the reach occurs in pocket gravels, pool-tail crests and small lateral bar areas that increase in availability and area with higher flows. Results of licensee’s WUA analysis of flows in this reach are presented in table 3-50 and figure 3-31. The proposed release schedule would increase releases from the dam during the all months. Increasing minimum streamflows would provide increase available rainbow trout WUA compared to the existing flow regime (figure 3-31). The WUA analysis predicted rainbow trout spawning habitat would increase as flow increases to a point where the flow inundates the entire channel and additional spawning habitat is not available

Table 3-50. Percent WUA for all water year types for rainbow trout for SFAR below Slab Creek dam. (CDFG, 2007)

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
October through February	CD	63	80	Adult rainbow trout
	Dry	63	80	Adult rainbow trout
	BN	70	83	Adult rainbow trout
	AN	80	89	Adult rainbow trout
	Wet	90	92	Adult rainbow trout

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
March	CD	63	80	Adult rainbow trout
	Dry	101	95	Adult rainbow trout
	BN	180	100	Adult rainbow trout
	AN	180	100	Adult rainbow trout
	Wet	180	100	Adult rainbow trout
April/May	CD	100–109	81–82	Rainbow trout spawning
(years 1–3)	Dry	107–183	81–82	Rainbow trout spawning
	BN	222–263	93–95	Rainbow trout spawning
	AN	222–263	93–95	Rainbow trout spawning
	Wet	222–263	93–95	Rainbow trout spawning
April/May	CD	100–109	81–82	Rainbow trout spawning
(years 3 through license term)	Dry	107–183	81–82	Rainbow trout spawning
	BN	263–303	95–96	Rainbow trout spawning
	AN	263–395	95	Rainbow trout spawning
	Wet	263–415	95	Rainbow trout spawning
June	CD	90	75	Rainbow trout spawning
(years 1 through 3)	Dry	90	75	Rainbow trout spawning
	BN	123–228	84–94	Rainbow trout spawning
	AN	123–228	84–94	Rainbow trout spawning
	Wet	123–228	84–94	Rainbow trout spawning
June	CD	90	75	Rainbow trout spawning
(years 3 through license term)	Dry	90	75	Rainbow trout spawning
	BN	120–255	84–92	Rainbow trout spawning
	AN	120–324	84–97	Rainbow trout spawning
	Wet	120–352	84–97	Rainbow trout spawning

Month	Water Year Type	Flow Range	Percent WUA	Benefiting Life Stage
July	CD	77	85/87	Rainbow trout juveniles / adults
	Dry	90	80/92	Rainbow trout juveniles / adults
	BN	90	80/92	Rainbow trout juveniles / adults
	AN	90	80/92	Rainbow trout juveniles / adults
	Wet	90	80/92	Rainbow trout juveniles / adults
August/September	CD	63	90/80	Rainbow trout juveniles / adults
	Dry	70	88/83	Rainbow trout juveniles / adults
	BN	70	88/83	Rainbow trout juveniles / adults
	AN	70	88/83	Rainbow trout juveniles / adults
	Wet	70	88/83	Rainbow trout juveniles / adults

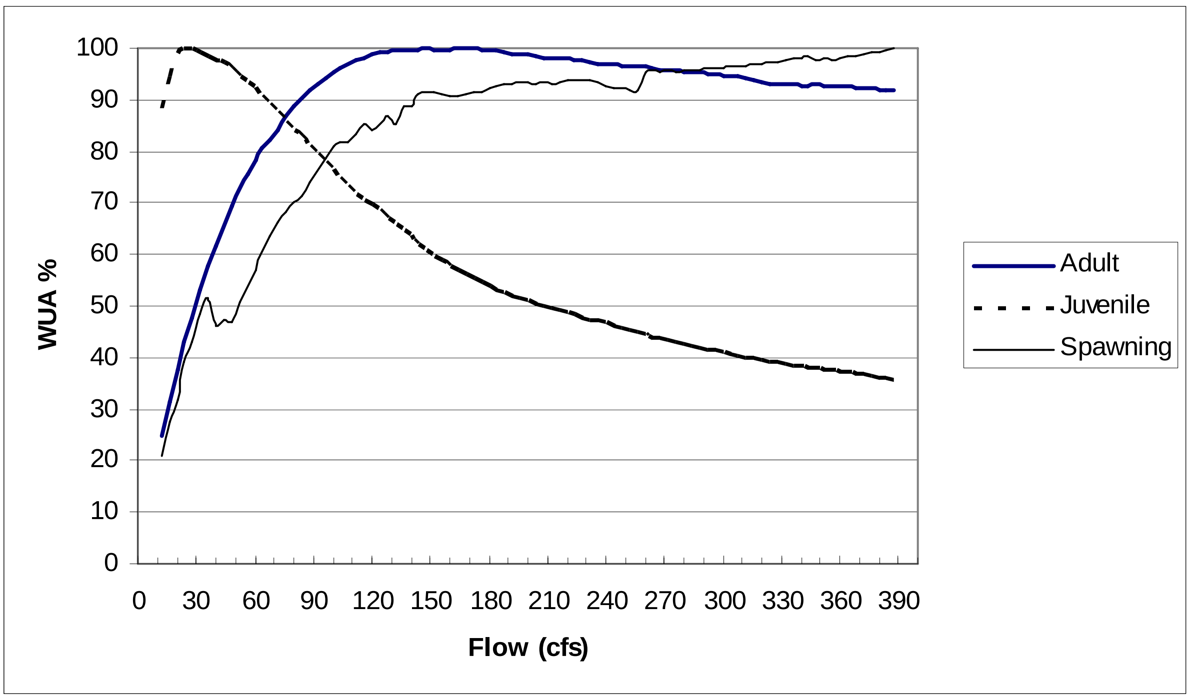


Figure 3-31. Rainbow trout WUA in the SFAR below Slab Creek dam. (Source: DTA and Stillwater Sciences, 2004b)

The proposed flow schedule would also restore to the reach a flow regime that more closely resemble a natural hydrograph, with increase in flows during the spring (March through June), and decreasing flows later in the year. This decline in the hydrograph during June is anticipated to serve as an important cue for hardhead spawning. Details on hardhead spawning are not yet fully understood, however they mainly spawn in spring, when the hydrograph is declining (Moyle, 2002) therefore the proposed flow regime may facilitate hardhead spawning in the reach.

Higher spring flows in BN, AN, and Wet years would redistribute spawning gravels to maintain trout habitat and transport some large woody debris downstream. Because approximately 75 percent of this reach is low gradient, large woody debris and spawning gravels should frequently settle into niche areas.

Modeling the proposed release flows indicates that mean daily temperatures are the lower end of the reach would be substantially reduced compared to existing conditions (section 3.3.2.1, *Water Resources*, *Water Quality*), extending downstream the range of temperatures preferred by rainbow trout. Mean daily temperatures would generally be 10 to 15ºC in May, 14 to 21ºC in June, 19 to 22 ºC in July, 17 to 21 ºC in August, and 13 to 19 ºC in September. While in years when temperatures above 20 ºC would be less optimal for rainbow trout, they would still support hardhead (optimal temperatures for hardhead appear to be 24 to 28ºC (Moyle, 2002).

South Fork of the American River below Chili Bar Dam

Flow fluctuations can affect aquatic resources in this reach by influencing the potential for fish stranding, causing changes to fish habitat, benthic macroinvertebrate populations, changing stream flow time-of-travel, and affecting fish access to and use of tributaries of the SFAR. This reach showed a low overall abundance of fish; however, low number of juvenile fish observed may not necessarily indicate spawning limitations in this reach. The sampling methods used (snorkeling) were appropriate to document the abundance of adult fish, but the snorkeling surveys may likely have underestimated the true abundance of juvenile fish present as juvenile fish are difficult to observe. The proposed minimum streamflow schedule is presented in table 3-51.

Table 3-51. Proposed minimum streamflow (cfs) schedule for SFAR below Chili Bar dam. (Source: SMUD and PG&E, 2007)

Month	SD	CD	Dry	BN	AN	Wet
September–October	150	185	200	250	250	250
November–March	150	185	200	200	200	250
April	150	200	250	250	300	350
May	150	200	250	250	350	500
June	200	200	250	250	350	500
July	150	185	200	250	300	350
August	150	185	200	250	300	300

Our Analysis

Fish abundance is low in this reach. The specific mechanisms causing low fish abundance are unclear but flow fluctuations above the typical base flow reduce the quantity of suitable habitat for all species and life stages studied. The flow fluctuations cause disturbance and subject fish to stresses that may limit feeding behavior, making it more difficult to forage for food during these daily high velocity events and increasing risks of stranding during rapid dewatering as flows decrease.

The current flow fluctuation regime in this reach does not appear to have significant effects on most metrics of the benthic macroinvertebrate community in the base flow channel, although overall benthic macroinvertebrate abundance appears to be low and benthic macroinvertebrates decrease in numbers in the flow fluctuation zone. In areas of the stream channel with periodic exposure to air due to flow fluctuations, total taxa richness, total insect taxa, total Ephemeroptera (mayfly), Plecoptera (stonefly), or Trichoptera (caddisfly) taxa, and individuals per square foot of benthic macroinvertebrates decrease as the period of time the substrate is exposed increases.

The Settlement Parties report the minimum streamflow regime would reduce the difference between daily high and low flows, and increase wetted perimeter. This would provide more stable and suitable habitat for benthic macroinvertebrate colonization and for fish, which will likely result in greater productivity in the reach. If the standing crop of benthic macroinvertebrate were increased, it would likely lead to a reduction in the energetic demands on foraging fish, and thereby support fish growth in the reach.

Ramping Rates

Significant rapid flow reductions in a stream channel have the potential to strand fish in areas of the channel that are relatively low-gradient, or where pockets or side channels exist in the river channel. Smaller juvenile fish (less than about 2 inches long) are most vulnerable to potential stranding due to weak swimming ability and preference for shallower, near-shore areas with slower velocities in a stream channel. Up-ramping flows generally do not affect fish stranding; however, the magnitude of flow change both upward and downward can affect fish behavior and habitat use, as well as affect production of benthic macroinvertebrates, which are an important source of food for most riverine fish species. Rapid changes in flow also can affect benthic macroinvertebrates, which become vulnerable to stranding and drift (leaving the substrate and floating downstream).

Proposed Article 1-3, *Ramping Rates*, specifies 1 foot per hour ramping rates for the following Project-controlled releases:

1. Pulse flows in Gerle Creek below Loon Lake dam and SFSC below Ice House dam.
2. Minimum streamflow releases in Silver Creek below Junction dam, Camino dam and the SFAR below Slab Creek dam.
3. Recreational streamflow releases in SFSC below Ice House dam, and the SFAR below Slab Creek dam.

For the SFAR below Chili Bar dam, the proposed ramping rates are shown in table 3-52.

Table 3-52. Proposed ramping rates for the SFAR below Chili Bar dam. (Source: SMUD and PG&E, 2007)

Ramp Up	Ramp Down
500 cfs per hour for flows between 150 and 1,000 cfs	1 foot per hour for flows between 1,000 and 1,950 cfs
1 foot per hour for flows between 1,000 and 1,950 cfs	500 cfs per hour for flows between 1,000 and 600 cfs
	250 cfs per hour for flows between 600 cfs and 150 cfs

Our Analysis

Implementation of controlled fluctuations in flows may result in dramatic changes over a short term to the wetted perimeter of stream channels. The magnitude and temporal progression of the change is a function of the stream channel morphology, and extent of flow fluctuation in the reach. Impacts associated with ramping are variable, depending on species, life-stage, and in some case, time of day of the ramping event. Limiting ramping rates would decrease the potential for such stranding to occur. The proposed 1 foot ramping rate is typical for other hydropower projects in the Sierras, and has a history of success (CDFG, 2007).

Studies conducted by SMUD and PG&E in the reach below Chili Bar dam indicated that fish stranding potential at most study sites peaked when flows decrease in the 400- to 200-cfs and 600- to 400-cfs ranges, with smaller peaks occurring in the 1,400- to 1,200-cfs and 800- to 600-cfs ranges. The Gorilla Rock study site was the primary site for stranding impacts at these lower flow ranges and the Camp Lotus site was affected largely by the flow fluctuations from 2,400 to 2,000 cfs and 400 to 200 cfs. The study concluded that base flows established at or above 600 cfs would minimize the impacts of stranding throughout the reach, and minimum flows of 400 cfs could significantly reduce losses.

Proposed minimum flows for most months of the Wet and AN water year types are high enough to moderate rates of stranding, and monthly base flows for all other water year types should provide an improvement over the existing rate of stranding (CDFG, 2007). Adherence to the proposed ramping rates will reduce the effects of flow fluctuations on sensitive aquatic species that are vulnerable to sudden changes in flow.

Pulse Flows

In an unregulated system, periodic peak flows serve to improve channel conditions by shaping and maintaining depositional features, transporting sediments, and moving large woody debris, all important elements in maintaining well-functioning habitat for aquatic resources. Under natural conditions, periodic high flows would move sediments through the river system. Based on geomorphology studies, SMUD and the Agencies identified three reaches that would benefit from periodic pulse flows: Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam (see section 3.3.1.2, *Geology and Soils*, for a description of pulse flows under Proposed Article 1-2, *Pulse Flows*).

Our Analysis

The addition of pulse flows in these three reaches would simulate peak flows that would occur naturally. Such flows help reduce riparian vegetation that is encroaching in the channels, which would benefit fish and other aquatic species. Pulse flows also serve to sort and clean spawning gravel, increase depth of pools by scour, and form exposed bar features, which are important components of healthy aquatic ecosystems.

In the SFSC below Ice House dam reach, the flushing flows would scour the finer sediments in areas where sediment supply has exceeded transport capacity, which in turn would restore the channel condition that existed before the deposition of fines from the Cleveland Fire. In all reaches where pulse flows are proposed, the channel bed would continue to be mobilized more frequently, so that future events that affect the channel substrate could be flushed in a more natural period of time. This would help improve instream habitat for fish and facilitate increased production towards the desired biomass goals.

Monitoring and Adaptive Management Program

In order to assess the effects of ongoing Project operations under the terms of the new license, SMUD and PG&E would develop and implement monitoring plans in consultation with the Agencies. Results of the monitoring would be used to determine the need for measures described in Proposed Articles 1-6 and 2-5, *Adaptive Management Program*.

Fish monitoring methods include repeating electrofishing and/or snorkeling surveys (as conducted in 2002–2003 by the licensee) during late summer/fall for brown trout in the Gerle Creek below Loon Lake dam reach only, and hardhead sampling in SFAR below Slab Creek dam reach only.

Rainbow trout would be monitored in the Rubicon River below Rubicon dam, Little Rubicon River below Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle Creek dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam. Brush Creek below Brush Creek dam would be surveyed once every 10 years after license issuance. Hardhead snorkeling would be conducted in the SFAR below Slab Creek dam from immediately downstream of Mosquito Road Bridge to and including site SCD-F2.

Electrofishing and/or snorkeling for rainbow and brown trout would be conducted in the SFAR at two stations. Hardhead detected would be noted.

The frequency of fish monitoring actions would be as follows:

- Rainbow trout and brown trout: Years 5, 6, 10, 11, 15, 16, and thereafter for 2 consecutive years during every 10 years for the term of the license.
- Hardhead: Years 2, 3, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 10 years for the term of the license.

The proposed adaptive management monitoring program calls for an examination of whether fish are being entrained in the Robbs Peak powerhouse during downstream migration. If so, the measure calls for the licensee to implement appropriate adaptive management measures as approved by the agencies.

SMUD and PG&E would develop and implement an aquatic macroinvertebrate monitoring plan in consultation with the Agencies. Monitoring would include sites in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam (impaired reach), SFRR below Robbs Peak dam, SFSC below Ice House dam (impaired reach), Silver Creek below Junction dam, Silver Creek below Camino dam, the SFAR below Slab Creek dam, and the SFAR below Chili Bar dam (see figures 3-17 through 3-20). Reference streams that were sampled as part of the macroinvertebrate monitoring program during the relicensing would be incorporated into the monitoring program if the Agencies determine they are necessary.

Our Analysis

SMUD and PG&E have conducted extensive sampling of aquatic resources in the Project area, and the resources agencies have developed objectives and goals for instream resources for each reach affected by Project operations (see table 3-35). The Proposed Action includes measures intended to improve habitat conditions and increase biomass of desired populations of fish, amphibians, and invertebrates in the Project area. In the case of minimum flow releases, for example, the post-license hydrograph in many reaches would change. Monitoring the response of instream resources to the new measures over the term of the license would provide information that can be used to inform resource managers whether or not the stated goals are being met.

Analysis of monitoring results would allow the parties to determine any need to modify proposed measures. Decisions based on monitoring results, new scientific information, or new technologies would aid in the achievement, or modification where appropriate, of goals and objectives established during the Settlement Agreement process.

Currently there is little evidence that fish are being entrained at the Robbs Peak powerhouse. Studies performed by the licensee showed that the population of rainbow trout in the SFFR upstream of the powerhouse is naturally limited by intermittent summer flow, sub-optimal water temperatures, and unfavorable winter conditions (DTA and Stillwater Sciences, 2005g). Fish that transit the Gerle Canal from Gerle reservoir may also become entrained in the powerhouse. However, the canal provides very little suitable habitat for trout; during a canal maintenance drawdown conducted in October, 2004, only 97 California roach, 41 brown trout, and 3 rainbow trout were captured in the 1.9-mile-long canal (DTA and Stillwater Sciences, 2005g). While studies performed during relicensing show that the potential for fish to become entrained at Robbs Peak powerhouse is extremely low, the adaptive management program nevertheless calls for development of mitigation measures should monitoring indicate fish are being entrained there. The development of mitigation to minimize any entrainment at Robbs Peak afterbay through the adaptive management program would likely protect the few native trout currently in the SFRR, where populations appear to be declining.

Large Woody Debris

Large woody debris is an important component of a healthy stream ecosystem. Large trees and snags that fall into streams play an important role in forming pools, metering sediment, trapping spawning gravels, and creating a more complex stream environment. Heavier pieces require higher flows for mobilization, and longer pieces are more likely to be caught by the stream bank and its vegetation. The presence of dams can interfere with downstream movement of large woody debris.

Under Proposed Articles 1-9 and 2-7, *Large Woody Debris*, SMUD and PG&E would ensure that, provided conditions permit safe and reasonable access and working conditions, mobile instream large woody debris continues downstream beyond Robbs dam, Junction dam, Camino dam, Slab Creek dam, and Chili Bar dam. At a minimum, all sizes greater than both 20 centimeters wide and 12 meters long would be allowed to continue downstream beyond the dams. Smaller sizes would be allowed but would not be required to be moved beyond these dams.

Our Analysis

Currently SMUD removes woody debris at each of the Project reservoirs prior to July 15 of each year. SMUD reports that this is a necessary procedure due to concerns over boating safety and the eventual sinking of the material and resultant clogging of intake structures or low-level outlets. The removed woody debris is stockpiled in various locations within the Project boundary and eventually burned.

Transporting woody debris that collects in the UARP and Chili Bar Project reservoirs to the natural stream downriver will result in an enhancement of aquatic resource habitat and populations in each of the Project reaches included in the plan.

Iowa Hill Development

The proposed Iowa Hill development may affect aquatic resources in Slab Creek reservoir if operation or construction alters fish habitat by affecting water quality (turbidity or temperature) or physically changing the shoreline habitat used for rearing or spawning through water level fluctuations, or if fish become entrained in the intakes.

Slab Creek reservoir historically supported three species of fish that potentially spawn in reservoirs: kokanee salmon, speckled dace, and smallmouth bass. Kokanee salmon and smallmouth bass would have been introduced and recent surveys have not documented their persistence in the reservoir. Kokanee salmon and speckled dace typically spawn in tributary streams and would not be affected by fluctuation in reservoir levels associated with the Proposed Action. The reservoir contains a very small amount of spawning habitat for these species.

Five fish species historically documented in Slab Creek reservoir could potentially rear in the reservoir: Sacramento sucker, smallmouth bass, hardhead, Sacramento pikeminnow, and kokanee salmon. Juvenile pikeminnow, hardhead, and suckers are known to rear in the SFAR upstream of Slab Creek reservoir. Juvenile suckers would find little rearing habitat within the reservoir due to the lack of emergent vegetation. Smallmouth bass may find some habitat in Slab Creek reservoir for rearing, since the upper sections of the reservoir contain moderately shallow edges along with some woody debris, although the species is not currently documented there. Habitat for smallmouth bass may be restricted due to cool water temperatures and the high velocity of the water flowing through this section that makes the habitat unsuitable. Kokanee salmon would be expected to find rearing habitat in Slab Creek reservoir, although the species is not currently documented there. Hardhead are known to inhabit Slab Creek reservoir.

Studies conducted to document fish abundance and distribution in the reservoir show hardhead and Sacramento sucker were the most common, and were observed throughout the reservoir. The highest frequency of occurrence for hardhead was along the shorelines. In spring months, the concentration of hardhead appears to be much higher in the upstream segments of the reservoir. In summer, hardhead shift in distribution to the lower end of the reservoir, with the highest concentrations occurring along the shoreline. In the pelagic (open water) zone, hardhead numbers decrease with depth, with the lowest hardhead numbers occurring at the 100 foot depth. Surveys were not conducted in water deeper than 100 feet.

Spawning and rearing habitat for hardhead occurs primarily in streams (Moyle, 2002). While juvenile hardhead are known to rear upstream of Slab Creek reservoir in the SFAR, they also rear in the reservoir since they can utilize woody debris or other larger cover objects that occur in the reservoir in place of vegetation. This was confirmed by the capture of juvenile hardhead along the margins of Slab Creek reservoir. However, even though the reservoir contains their preferred warm-water environment (primarily downstream from the inlet of the SFAR) with large cobble and boulder substrate, it is missing the preferred habitat characteristics of shallow water and densely vegetated shorelines (Moyle, 2002), thus rearing habitat is limited.

Under Proposed Article 1-40, *Aquatic Resources*, SMUD would:

1. For 2 years prior to and 2 years after the Iowa Hill development begins to operate, monitor hardhead during all four seasons of the year to establish the locations of all life stages in Slab Creek reservoir (including edgewater locations) and in the water fluctuation zone upstream on SFAR above and below the Iowa Hill development.
2. Monitor edgewater temperatures of Slab Creek reservoir between May and September in locations approved by the Agencies to demonstrate that pump discharge is not affecting hardhead distribution by reducing temperatures in shallow water areas of the Slab Creek reservoir.
3. Ensure the operation of Iowa Hill would not further reduce water temperature below 12°C during the months of June (after the descending limb of the hydrograph), July, and August in the Slab Creek dam reach below Mosquito Bridge.
4. Ensure that flow fluctuations in the SFAR below Slab Creek dam do not occur as a result of the Iowa Hill development, with the exception of flow fluctuations that occur as a result of specific requirements of the license (recreational streamflows).
5. Monitor hardhead using a method approved by the Agencies to determine whether entrainment is occurring as a result of the Iowa Hill development. If entrainment is occurring, the Agencies reserve the right to establish appropriate mitigation measures.

Our Analysis

Historically, the Slab Creek reservoir elevation levels remained fairly constant with a minimal average daily fluctuation of 3.3 feet (DTA and Stillwater Sciences, 2005b). Under the proposed Iowa Hill development project operations, water elevations in the reservoir would increase then decrease 9 to15 feet (maximum of 30 feet) on a daily basis (DTA and Stillwater Sciences, 2005b). This change in water levels at the upstream end of the reservoir could affect fish passage at Brush Creek and Slab Creek by limiting connectivity to those coldwater streams when temperatures in the reservoir are not optimal for trout, or by making habitat unsuitable that was previously used for trout spawning. Although operation of the Iowa Hill development would increase the daily range of fluctuation and the rate of drawdown, it would not change the current weekly range of water surface fluctuation in Slab Creek reservoir (i.e., between 1,810 and 1,850 feet).

As discussed in section 3.3.1.2, *Geology and Soils*, the daily drawdown of the reservoir would mobilize a small amount of sediment in the upstream portion of Slab Creek reservoir, but neither high turbidity nor chronic erosion of sediments in the vicinity of the intake/outlet structure would occur in Slab Creek reservoir. The minor increase in turbidity that would occur at the beginning of operations would not likely affect any fish in the vicinity of the intakes. Shoreline in the reservoir is predominately steep bedrock, boulder and cobble, and not likely to experience significant erosion associated with the increased frequency of reservoir fluctuations. Because the operation of the Iowa Hill development would have a less-than-significant effect on turbidity and sedimentation in Slab Creek reservoir, and no effect on shoreline erosion, its operation would not affect the abundance and composition of near-shore habitat for fishes in the reservoir.

Water temperature modeling results show that operation of the Iowa Hill development would not significantly alter the thermal regime of Slab Creek reservoir or the SFAR (section 3.3.3.2, *Water Quality*); therefore, there would likely be no effects on fishery resources and hardhead due to changes in reservoir water temperatures or for about 4.3 miles of the downstream reach

Trout is a management indicator species (MIS) for the Eldorado National Forest. An MIS analysis was completed for the Iowa Hill development (Williams, 2007a). Trout adults and juvenile life stages could be affected by the Iowa Hill development as a result of the daily pumping of stored water. The proposed Iowa Hill development would have the potential to entrain trout and other fish that may be in the vicinity of the intakes. The base of the multi-port intake/outlet facility in the reservoir would be located at an elevation of approximately 1,770 feet. Although not specifically described in SMUD's filings with the Commission, it appears that the top of the intake structure would be at approximately 1,785 feet. SMUD states that the typical weekly fluctuation of Slab Creek reservoir would be between 1,820 feet and 1,850 feet. Historical records show that the reservoir elevation has dropped down to 1,820 feet and even down to 1,810 feet during 1998 and 1999, and 1,807 feet in 2005. Therefore, the depth of water above the Iowa Hill intake structure would normally fluctuate between 50 and 80 feet, although during low flow years it could be 35 feet or less. Trout were found only at the 10- to 25-foot depths, and hardhead were primarily found at depths of 50 feet or less (DTA and Stillwater Sciences, 2005b). This suggests that entrainment of trout into the intake would be minimal, since most of the fish are at shallower depths and/or near the reservoir margins.

The highest frequency of occurrence of hardhead was along the shoreline, and juvenile hardhead are not expected to occur at the depth of the intake. Because hardhead exist at depths of 35 feet, the depth at which the intake structure could be located during the pumping phase, there is the potential that hardhead may be entrained during the pumping phase. Also, because hardhead can exist even below 35 feet, though in reduced numbers, there is the potential that hardhead may be entrained when the water depth above the intake structure is deeper than 35 feet. Depending on the operations, the potential for entrainment could have substantial effects on the hardhead population within Slab Creek reservoir.

It is unknown whether hardhead upstream from the reservoir would move into the reservoir and be entrained. Monitoring using fish tagging may be able to determine this. SMUD's proposal to monitor hardhead distribution and whether entrainment of these fish (or others) occurs as a result of the Iowa Hill development would document whether this expectation is borne out. If entrainment is found to occur, the reservation of the right of the Agencies to establish appropriate mitigation measures would be expected to address entrainment mortality.

Based on the above information, we find that Project-level habitat effects would likely contribute to a stable forest-wide habitat trend for trout (Williams, 2007a).

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. Minimum flows, pulse flows, ramping rates, monitoring and adaptive management programs, and large wood debris management would remain the same as described under SMUD's Proposal. As a result, the effects of the UARP-only Alternative on fish populations and macroinvertebrates would be the same as those described under the Proposed Action, except that the effects associated specifically with the Iowa Hill development would not occur.

3.3.3.3 Unavoidable Adverse Effects

None.

3.3.4 Terrestrial Resources

3.3.4.1 Affected Environment

Vegetation

The UARP area encompasses a mosaic of forests, shrublands, grasslands, wetlands, agriculture, and other vegetation cover types within parts of the Central Valley, Sierra Nevada Foothills, and Sierra Nevada Highlands floristic regions. Undeveloped lands support vegetation typical of these regions: coniferous forests in theSierra Nevada Highlands and upper Sierra Nevada Foothills floristic regions, and grasslands and oak woodlands in the Central Valley and lower Sierra Nevada Foothills regions.

Upland Vegetation

Twenty-nine vegetation alliances are found in the Project area, including 16 forested and nine shrubland alliances. Upland vegetation generally reflects the topographic and precipitation patterns of the area. Uplands surrounding the Rubicon and Loon Lake reservoirs are dominated by broad expanses of high-elevation evergreen shrubs such as huckleberry oak interspersed with granitic outcrops devoid of vegetation and sparse tree cover. Coniferous forests are the dominant upland vegetation type beginning just below Loon Lake reservoir and continuing west past the Slab Creek reservoir area, including the lands surrounding the Gerle Creek, Union Valley, Ice House, Junction, Camino, and Brush Creek reservoirs and their associated reaches. White fir, red fir, and Jeffrey pine are common dominants near Ice House and Gerle Creek reservoirs, giving way to Douglas-fir, ponderosa pine, and California black oak at lower elevations.

UARP transmission line corridors that traverse coniferous forests are subject to large tree removal, which results in the corridors having a mixed chaparral habitat dominated by shrubs such as mountain whitethorn, wedgeleaf ceanothus, bitter cherry, and greenleaf manzanita. At the lower elevations west of White Rock powerhouse, however, chaparral becomes a common habitat across the landscape. Typical species in chaparral habitats of the Project vicinity include whiteleaf manzanita, hoary coffeeberry, deerbrush, and western poison oak.

Upland vegetation at the Iowa Hill development was identified and mapped by SMUD in 2003 as part of a focused relicensing study. Mapped sites included proposed locations of the upper reservoir and berm, intake structure, transportation and construction access routes, temporary spoils sites, laydown areas, and a preliminary transmission line route (the precise alignment of the transmission line had not yet been established by engineering field surveys). Nearly 520 acres were mapped into five different types using the California Wildlife Habitat Relationships classification system. The following vegetation types were identified: Sierran Mixed Conifer (397.2 acres), Ponderosa Pine (93.2 acres), Mixed Chaparral (15.2 acres), Montane Hardwood (12.1 acres), and Barren (0.9 acre). Habitat types were further subdivided based on size class and canopy coverage. Most of the study area was mature mixed-conifer with dense (>60 percent) canopy closure (390.8 acres, 75.4 percent). These stands were dominated by Douglas-fir, with black oak subdominant, and ponderosa pine, sugar pine, canyon live oak, and incense cedar as common associates. Stands that had been selectively logged predominantly comprised ponderosa pine, with fewer Douglas-fir; these stands were classified as Ponderosa Pine habitat type. Montane Hardwood dominated by canyon live oak occurs on the steep, west-facing slope above Slab Creek reservoir, and patches of Mixed Chaparral dominated by whiteleaf manzanita also occur. A small, partially eroded area near the edge of Slab Creek reservoir was characterized as Barren.

The Chili Bar Project area is located on the steep slopes along the SFAR. Overall, much of the Chili Bar Project area is composed of cismontane woodlands and lower montane coniferous forests. Dominant canopy species along south-facing slopes include interior live oak, black oak, California buckeye, ponderosa pine, and gray pine. Douglas fir and white fir dominate many of the north-facing slopes. Much of the understory is dominated by poison oak, scotch broom, California wild grape, and Himalayan blackberry.

Special-Status Plants

Fifteen special-status plants are found in the UARP area (table 3-53). Special-status plants are not uniformly distributed; rather, a few key habitats support most occurrences. Chief among these is the gabbro chaparral near Pine Hill, in the westernmost section of the Project area. Three federally listed species, Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannelbush (*Fremontodendron decumbens)*, and Layne's ragwort (*Senecio layneae*) occur within the Pine Hill area and discussed in section 3.3.5, *Threatened and Endangered Species*.

Table 3-53. Summary of special-status plant occurrences documented in the UARP area in 2000 and 2003. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Allium jepsonii Jepson's onion	Fed: none CA: none CNPS: 1B ENF: none	1 occurrence. Serpentine outcrop in Greenstone Country subdivision
Bolandra californica Sierra bolandra	Fed: none CA: none CNPS: 4 ENF: W	1 occurrence. Forest near Camino reservoir
Calochortus clavatus var. *Avius* Pleasant Valley mariposa lily	Fed: none CA: none CNPS: 1B ENF: S	3 occurrences. Chaparral and *Quercus chrysolepis* forest near Junction and Camino reservoirs
Ceanothus roderickii Pine Hill ceanothus	Fed: E CA: R CNPS: 1B ENF: none	1 occurrence. Transmission line corridor near Pine Hill

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Chlorogalum grandiflorum Red Hills soaproot	Fed: none CA: none CNPS: 1B ENF: W	3 occurrences. Transmission line corridor near Pine Hill and Independence Point
Clarkia biloba ssp. *Brandegeeae* Brandegee's clarkia	Fed: none CA: none CNPS: 1B ENF: none	1 occurrence. Roadcut along Slab Creek reservoir access road
Drosera rotundifolia Round-leaved sundew	Fed: none CA: none CNPS: none ENF: W	3 occurrences. Seepage area south of Ice House Dam, Silver Creek, and a wetland at Union Valley reservoir
Fremontodendron decumbens Pine Hill flannelbush	Fed: E CA: R CNPS: 1B ENF: none	4 occurrences. Transmission line corridor near Pine Hill
Navarretia prolifera ssp. *Lutea* Yellow bur navarettia	Fed: none CA: none CNPS: 4 ENF: S	4 occurrences. Transmission line corridor between Iowa Hill and Badger Hill
Phacelia stebbinsii Stebbins' phacelia	Fed: none CA: none CNPS: 1B ENF: S	Numerous occurrences. Three general localities in chaparral and rock outcrops near Camino and Junction reservoirs
Phacelia vallicola Mariposa phacelia	Fed: none CA: none CNPS: none ENF: W	1 occurrence. Rock outcrops near Camino reservoir
Senecio layneae Layne's ragwort	Fed: T CA: R CNPS: 1B ENF: S	2 occurrences. Transmission line corridor near Pine Hill

Scientific Name/ Common Name	Status[a]	Number and General Location of Occurrences
Taxus brevifolia Pacific yew	Fed: none CA: none CNPS: none ENF: W	4 occurrences. Transmission line corridor southeast of Slab Creek reservoir; mouth of Brush Creek at Brush Creek reservoir
Viola tomentosa wooly violet	Fed: none CA: none CNPS: 1B ENF: W	10 occurrences. Campgrounds at Union Valley and Gerle Creek reservoirs, transmission line corridor west and southwest of Loon Lake reservoir
*Wyethia reticulata*El Dorado County mule ears	Fed: none CA: none CNPS: 1B ENF: none	2 occurrences. Transmission line corridor near Pine Hill

[a] Status listings definitions are as follows:

Federal:

E = listed as endangered under the Endangered Species Act.

T = listed as threatened under ESA.

California (CA):

R = state listed rare plant.

California Native Plant Society (CNPS):

1B = plants considered to be rare, threatened, or endangered in California and elsewhere.

2 = plants considered to be rare, threatened or endangered in California, but more common elsewhere.

3 = plants about which more information is needed – a review list.

4 = plants of limited distribution – a watch list.

Eldorado National Forest (ENF):

S = sensitive plants. Plants known to occur or that have the potential to occur on National Forest Lands that are considered valid candidates for federal threatened or endangered classification under the ESA.

W = a watch list of plants that do not meet all the criteria to be included on the Regional Forester's Sensitive List, but are of sufficient concern that they need to be considered in the planning process.

A serpentine-soil outcrop in the western half of the UARP supports the only known occurrence of Jepson's onion (*Allium jepsonii*) in El Dorado County. Key habitats elsewhere in the Project area include rock outcrops, roadcuts, and chaparral near UARP reservoirs and facilities, which support occurrences of Stebbins' phacelia (*Phacelia stebbinsii*), mariposa phacelia (*Phacelia vallicola*), Sierra bolandra (*Bolandra californica*), and Pleasant Valley mariposa lily (*Calochortus clavatus* var. *avius*). Round-leaved sundew (*Drosera rotundifolia*) occurs in small wetlands immediately below Ice House dam and nearby Silver Creek, and in a meadow adjacent to Union Valley reservoir. Only Pacific yew (*Taxus brevifolia*) and woolly violet (*Viola tomentosa*) are found in the forested habitats most common in the UARP area, and these occur in riparian zones and granitic gravel and duff, respectively.

No sensitive plant species are known or expected to occur within the Iowa Hill development area. No special-status plant species were observed within the Chili Bar Project boundary during 2004 special-status plant surveys. Potentially suitable habitat was found for five special-status species: Big-scale balsamroot (*Balsamorhiza macrolepis* var. macrolepis), Brandegee's clarkia (*Clarkia bibloa* ssp. *brandegeeae*), Butte County fritillary (*Fritillaria eastwoodiae*), Stebbin's phacelia (*Phacelia stebbinsii*), and oval-leaved viburnum (*Viburnum ellipitcum*).

Noxious and Invasive Weeds

The Noxious and Invasive Weeds Study conducted by UARP in 2000, 2003, and 2004 identified 10 species within the UARP area (table 3-54). Noxious and invasive weeds are concentrated in the western part of the Project area (primarily in the lower transmission line corridor west of White Rock powerhouse), and are especially prevalent near development, along roadsides, in agricultural fields, and in annual grassland and oak woodland habitats. In this western area, dominance by yellow starthistle or medusahead is uniformly associated with disturbed habitats, and roadsides are commonly infested with rush skeleton weed. Few weeds occur in the forested habitats found in the eastern parts of the Project area, even where transmission line clearing has resulted in bare soil and sparsely vegetated areas. Burned areas along the Jones Fork-Union Valley transmission line are a notable exception, supporting strong infestations of cheatgrass and ripgut grass.

Five weeds are found in close association with UARP facilities. Yellow starthistle occurs near White Rock access roads and powerhouse, Slab Creek access roads and dam areas, Camino reservoir access road and Jaybird powerhouse, and Union Valley campgrounds. Scotch broom occurs near White Rock powerhouse access roads, adit, and penstock. Goatgrass is found near Slab Creek reservoir access roads and Camino reservoir access road. Italian thistle occurs near White Rock powerhouse and access roads, Slab Creek access roads and reservoir, Brush Creek reservoir access road, and Camino reservoir access road. Rush skeleton weed is found near Camino reservoir access road.

Table 3-54. Noxious weeds located during 2000, 2003 and 2004 survey efforts. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Scientific Name **Common Name**	**Distribution in Study Area**
Aegilops triuncialis Goatgrass	Uncommon to occasional in annual grasslands and along roadsides. Western and southwestern sections of the study area
Carduus pycnocephalus Italian thistle	Uncommon to occasional in annual grasslands. Western section of the study area
Centaurea solstitialis Yellow starthistle	Common to dominant in physically disturbed areas, especially roadsides and developed areas. Western and southwestern sections of the study area.
Chondrilla juncea Rush skeleton weed	Occasional along roadsides or in developed areas. Western and southwestern sections of the study area
Cytisus scoparius Scotch broom	Occasional along roadsides and in transmission line corridor. Southwestern and upper western sections of the study area
Genista monspessulana French broom	Occasional along roadsides and in transmission line corridor. Southwestern and upper western sections of the study area
Lythrum salicaria Purple loosestrife	One occurrence in wetland/creek. Far western section of the study area
Bromus tectorum cheatgrass	Occasional in annual grasslands and along roadsides; common in burned areas under transmission line. All sections of the study area
Bromus diandrus Ripgut grass	Occasional to dominant in annual grasslands, less often on roadsides; common in burned areas under transmission line. West, southwest, southeast sections of the study area
Taeniatherum caput-medusae Medusahead	Occasional to common in annual grasslands; dominant where physically disturbed. Western section of the study area

Four noxious weed species were documented on the site of the proposed Iowa Hill development: ripgut grass, cheatgrass, Italian thistle, and rush skeleton weed. These weeds are uncommon and concentrated in areas of disturbance such as along roads and in clear-cuts.

PG&E identified eight species of noxious weeds within the Chili Bar Project area: barbed goatgrass, Italian thistle, yellow starthistle, rush skeletonweed, Scotch broom, klamathweed, Himalayan blackberry, and medusahead. Scotch broom dominated significant portions within the Project area including the reservoir shorelines and roadsides. Smaller populations of other noxious weeds, including barbed goatgrass, Italian thistle, yellow starthisle, rush skeletonweed, klamathweed, and medusahead were observed and mapped throughout the Project area. In addition, Himalayan blackberry, a non-target, invasive weed, was observed throughout the Project area, dominating portions of the riparian understory and other adjacent areas.

Riparian Vegetation

The applicants conducted an overlapping study for both Projects to identify riparian vegetation within both Project boundaries and along Project-affected stream reaches. About 360 acres of riparian vegetation are found in the UARP boundary, mostly in the form of a narrow fringe on the edge of the stream channel. Riparian vegetation is sparse or absent in sub-reaches characterized by bedrock or boulder banks, but generally occurs elsewhere, wherever there are suitable substrates. Nine riparian vegetation alliances are found; however, three are predominant: Mountain Alder, White Alder, and Mixed Riparian Hardwoods. Riparian vegetation alliances follow predictable patterns based on elevation (table 3-55), with composition similar to that reported elsewhere for North and Central Sierra Nevada riparian systems.

At most sites where riparian vegetation is found, there is evidence of periodic regeneration of woody vegetation, based on moderate to high numbers of seedlings and saplings, and the presence of relatively young mature shrubs. However, more stable conditions and only infrequent replacement may occur at the Robbs Peak dam reach site (less than 0.5 mile downstream of dam) and the uppermost Ice House dam reach site (about 1.5 miles downstream of the dam), where there are dense, mature shrubs and few seedlings or saplings.

Channel encroachment by woody species is generally not evident. However, at the Robbs Peak dam reach site, dense woody vegetation has colonized alluvial bars on both sides of the stream, suggesting an absence of recent high flows capable of scouring vegetation. In the Loon Lake dam reach just below the dam, there is also limited encroachment by small mountain alder and lodgepole pine. The number of herbaceous species is highest in the upper reaches where the dominant species are strongly indicative of moist soil conditions.

The dominant vegetation alliances around Chili Bar reservoir are upland forests supporting ponderosa pine, Douglas fir, and canyon live oak. In general the occurrence of riparian vegetation along the reservoir is constrained by steep slopes and well-drained substrates. Some small areas of riparian-influenced (but often upland) vegetation do occur, most often as patches or thin bands of relatively modest gradient. The riparian habitats are dominated by tree and shrub-sized shining willow, California sycamore, Freemont cottonwood, and white alder, with lesser coverage of black walnut, tree-of-heaven, and occasional upland species such as black oak.

The reach of SFAR below Chili Bar dam extends 19.1 miles from the base of Chili Bar dam to the normal high water line of Folsom Lake, ranging in elevation from 960 feet to approximately 470 feet. The reach downstream of Chili Bar contains three geomorphic sub-reaches: the Georgia Sub-reach, the Coloma Sub-reach, and the Canyon Sub-reach. Of these only the Coloma Sub-reach is confined and line with poorly vegetated boulder/cobble complexes, areas that are geomorphically unable to sustain well-developed stands of riparian vegetation.

Table 3-55. The extent, type, and limitations of riparian vegetation along UARP reaches. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Project Reach	Length of Reach	Percent of Reach with Riparian Vegetation	Width of Riparian Vegetation Zone	Dominant Riparian Vegetation Alliance	Limiting Factors
Rubicon Dam	4.2	15.4	5–50 feet	Mountain alder	Bedrock and boulder banks extensive; some steep sections
Rockbound Dam	0.3	None detectable	Not applicable	Not applicable	Entirely bedrock banks and steep
Buck Island Dam	2.5	1.5	5–20 feet	Mountain alder	Bedrock banks extensive, mostly steep
Loon Lake Dam	8.5	94.7	5–200 feet	Mountain alder	About a third of reach is steep with bedrock, but much is lower gradient with alluvium or glacial till
Gerle Creek Dam	1.2	97.0	5–30 feet	Mountain alder	Small areas of bedrock and boulder banks
Robbs Peak Dam	5.9	43.2	5–65 feet	Mountain alder	Extensive areas of bedrock
Ice House Dam	11.5	81.5	5–80 feet	Mountain alder	Width of riparian zone limited by valley form
Junction Dam Reach	8.3	29.7	5–35 feet	White alder	Extensive areas of bedrock
SFAR	2.8	27.3	5–70 feet	White alder	Extensive bedrock confinement
Camino Dam	6.2	42.1	10–85 feet	White alder	Extensive bedrock banks and steep slopes
Brush Creek Dam	2.2	Not discernible	Unknown	Unknown	Very steep
Slab Creek Dam	8.0	83.2	10–85 feet	White alder	Relatively steep canyon limits width; areas of bedrock and boulder banks have scant vegetation

The near-channel species composition of areas that are vegetated is similar in each sub-reach. Overstory dominants are typically white alder, arroyo willow, or shining willow, most often 10 to 20 feet in height and fewer than 20 years old, based on increment bores. In the Coloma Sub-reach, but rarely elsewhere, Freemont cottonwood is well represented, either as large trees on high banks, or as occasional young saplings (few cottonwood of intermediate size occur anywhere on the reach downstream of Chili Bar). Overall, 62 percent of the shoreline of the reach downstream of Chili Bar supports riparian vegetation. A total of about 192 acres of riparian vegetation were mapped, 167.4 acres (87.3 percent of the total) of which were Mixed Riparian Hardwood. Other vegetation alliances mapped were Willow (11.7 acres), Fremont Cottonwood (6.5 acres), White Adler (5.8 acres), and Wet Meadow (0.4 acre).

Wetlands

The applicants conducted an overlapping study for both Projects to identify wetlands within both Project boundaries. Wetlands can be found near the three UARP storage reservoirs (Union Valley, Ice House, and Loon Lake), and at Gerle Creek, Buck Island, and Rubicon reservoirs (table 3-56). Most reservoir-associated wetlands are in good condition, dominated by native plant species with few or no weeds. Wetlands are located on shorelines and small lakeshore-basin meadows with only slight topographic relief at Rubicon, Buck Island, and Gerle Creek reservoirs. Vegetation comprises inflated sedge and a few other species.

Other wetlands within or adjacent to the Project areas are located along the UARP transmission lines, near the Gerle Canal, and adjacent to the Robbs Peak penstock. These include a very large (more than 10 acres) wetland complex at Robbs Valley behind a commercial campground, which includes emergent, shrubs, and forested components. The remaining wetlands are less than 0.25 acre in size. Some of these wetlands are proximate to, or intersected by, Project service access roads, and two appear to be created and maintained because the roads impede drainage.

No palustrine wetlands were found within the area of the proposed Iowa Hill development. Small drainages on the site are generally intermittently flooded and do not fall within the definition of riverine wetlands. At least one small drainage located along the proposed transmission line route is a seasonally flooded riverine wetland.

Although NWI wetland maps do not indicate any wetlands along the steep-sided Chili Bar reservoir, field investigations conducted in 2004 by PG&E documented occasional small herbaceous wetlands within the water fluctuation zone of Chili Bar reservoir. In general they are too small to map and exist as a thin (less than 7 feet wide), steep fringe of hydrophytes that is frequently submerged. According to NWI maps, a series of palustrine scrub-shrub and palustrine forested wetlands occurs along that reach downstream of Chili Bar, mostly within the Coloma Sub-reach. No palustrine emergent wetlands occur.

Table 3-56. The extent, type, and limitations of wetlands associated with UARP. (SMUD, 2005, PG&E, 2005, as modified by staff)

Reservoir	Area (acres)	Types	Limiting Factors
Rubicon	15.0	Lakeshore meadows	Wetlands mostly restricted to a few shallow coves and gradually sloping shorelines.
Buck Island	8.2	Lakeshore meadows	Wetlands mostly restricted to small areas of gradually sloping shorelines. Through most of the growing season water level varies by no more than 6 feet.
Loon Lake	37.9	Lakeshore meadows, and depressions within swales	Wetlands occur in shallow bays and associated with swales, but are absent in areas of bedrock and areas submerged for prolonged periods by deep water.
Gerle Creek	0.9	Lakeshore meadows	Wetlands occur in the relatively narrow fluctuation zone on a few gradually sloping shorelines.
Ice House	4.9	Lakeshore meadows	Wetlands scarce because of steep slopes and extensive areas of bedrock. Little or no supplemental hydrology.
Union Valley	140.0	Lakeshore meadows, and sloping meadows	Wetlands absent on steep slopes without supplemental hydrology (drainages) and in areas submerged for prolonged periods by deep water. Sloping wetlands all begin well above reservoir high water.

Wildlife

The UARP area comprises a mosaic of forests, shrublands, grasslands, wetlands, agriculture, and other vegetation cover types ranging in elevation from roughly 6,500 feet at Rubicon reservoir to less than 450 feet above sea level at Folsom Junction, the terminus of the UARP transmission line. These lands support a diverse terrestrial fauna with an estimated 337 terrestrial wildlife species known or believed to occur in the vicinity of the Project.

The proposed Iowa Hill development is located on the southeast slope of the Slab Creek reservoir, north of Iowa canyon. In 2003, SMUD conducted a focused study to map vegetation and characterize wildlife habitat at the site. SMUD identified and mapped nearly 520 acres of existing vegetation, with Sierran Mixed Conifer being predominant and with smaller amounts of Ponderosa Pine, Mixed Chaparral, and Montane Hardwood. Based on the type, size, and age-class of existing vegetation, SMUD used California Wildlife Habitat Relationship database software to predict the potential occurrence of 256 species of terrestrial vertebrates within or adjacent to the study area based on a low threshold of habitat suitability. Of the total, 209 species were primarily associated with Sierran Mixed Conifer or Ponderosa Pine forest, 26 were associated only with Mixed Chaparral, and 46 were associated with adjacent aquatic habitat found on Slab Creek reservoir, but not terrestrial habitats.

Reptiles and Amphibians

Twenty-three species of reptiles are known or believed to occur in the UARP area and 11 species were observed by biologists conducting relicensing studies during 2002–2005 including: western fence lizard, northern alligator lizard, gopher snake, western aquatic garter snake, and western rattlesnake. Eighteen amphibians and aquatic reptiles have the potential to occur in the vicinity of the UARP. Of these, four species—foothill yellow-legged frog, mountain yellow-legged frog, California red-legged frog, and western pond turtle—are special-status species.

Birds

An estimated 230 species of birds are known or believed to occur in the vicinity of the UARP. Biologists engaged in relicensing studies during 2002–2005 observed 150 of these species. Project reservoirs, streams, and shorelines provide potential foraging, resting, and breeding habitat for at least 50 species of waterbirds (i.e., loons, grebes, pelicans, cormorants, egrets, herons, geese, ducks, swans, rails, coots, shorebirds, and gulls). Of these, 36 species were observed during relicensing studies including: common loon, pied-billed grebe, eared grebe, American white pelican, great blue heron, Canada goose, wood duck, mallard, blue-winged teal, bufflehead, common merganser, ruddy duck, common moorhen, American coot, spotted sandpiper, and ring-billed gull.

The diverse vegetation types within the UARP area provide habitat for at least 29 species of raptors (i.e., vultures, hawks, eagles, falcons, owls). Of these, 18 species were observed in the Project area during 2002–2005 relicensing studies including: turkey vulture, osprey, white-tailed kite, bald eagle, northern goshawk, red-tailed hawk, American kestrel, barn owl, flammulated owl, great horned owl, and California spotted owl. In addition to waterbirds and raptors, the UARP area provides habitat for a diversity of upland game birds, pigeons and doves, swifts and hummingbirds, woodpeckers, passerines, and other avifauna.

The Chili Bar reservoir is in a steep canyon with no emergent wetland, herbaceous vegetation, or low shrub-land along the shoreline to serve as nesting habitat for waterfowl. There is no shallow-water wetland or upland grazing that would provide suitable foraging. A total of 5 species was observed during the boat surveys that were part of the bald eagle study: Canada goose, mallard, American wigeon, wood duck, and common merganser. None of these species was observed in large numbers.

Cavity Nesting Birds

Population status and trend were monitored by the breeding bird survey (BBS)[37] from 1966 to 2004 within the Sierra Nevada bioregion for four cavity nesting bird species: pileated woodpecker, red-breasted sapsucker, Williamson's sapsucker, and hairy woodpecker.

Pileated Woodpecker—The Sierra Nevada-wide BBS data classify pileated woodpecker as "possibly decreasing" (Siegel and DeSante, 1999), with a decrease of –1.8 percent (range –4.6 to 1 percent) per year in 21 routes. The Regional Credibility ranking is "Yellow," i.e., data with small sample size and low precision due to low abundance on routes.

Red-breasted Sapsucker—The Sierra Nevada-wide BBS data classify red-breasted sapsucker as "possibly decreasing" (Siegel and DeSante 1999), with a decrease of –3.18 percent (range –7.8 to 1.6 percent) per year in 24 routes. The Regional Credibility ranking is "Blue," i.e., data with larger sample size and at least moderate precision and moderate abundance on routes).

Williamson's Sapsucker—The Sierra Nevada-wide BBS data indicate an increase of 1.6 percent (range –12.8 to 15.9 percent) per year in 6 routes for Williamson's sapsucker. The Regional Credibility ranking is "Red," i.e., poor, due to small sample size. However, this trend is consistent with trends observed at the state and survey-wide scales.

Hairy Woodpecker—Sierra Nevada-wide BBS data classify hairy woodpecker as "definitely stable" (Siegel and DeSante, 1999), with a slight decrease of -0.1 percent (range –2.5 to 2.3 percent) per year in 624 routes. The Regional Credibility ranking is "Blue."

Mammals

An estimated 83 species of native and introduced terrestrial mammals are known or believed to occur in the UARP vicinity. Biologists engaged in relicensing studies during 2002–2005 observed 32 species. American marten, black bear, mountain lion,

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[37]The Breeding Bird Survey (BBS) is an annual, volunteer-based point count survey coordinated by the Biological Resources Division of the USGS and the Canadian Wildlife Service. The survey consists of a continent-wide array of roadside point count transects, or routes. Each route is 24.5 miles long, and comprises 50 point counts at 0.5-mile intervals. Expert volunteer observers conduct point counts once each year during the peak of the breeding season, recording numbers of every species detected within a quarter mile radius. BBS data provide the most extensive, long-term data set available on landbird population trends and are therefore tremendously valuable for conservation planning (Institute for Bird Populations, 2007).

and mule deer all occur within the Project area. In addition to bats, mesocarnivores, and large mammals, the UARP area provides habitat for a diversity of insectivores, rabbits and hares, chipmunks, tree squirrels, gophers, mice, weasels, skunks, and other mammalian species.

The Sierra Nevada provides roosting and foraging habitat for an estimated 17 species of bats. Bats can be found in all vegetation types and elevation zones present in the Project area, foraging extensively on insects taken in flight over aquatic and upland locations or gleaned from foliage. Suitable roosts vary by species and include a variety of natural (e.g., caves, trees, cliffs) and man-made (e.g., buildings, bridges, powerhouses, mines) structures. Five species of bats were captured around existing Project features: fringed myotis, Yuma myotis, California myotis, big brown bat, and Brazilian free-tailed bat.

Bat trapping and acoustic sampling was performed at the proposed Iowa Hill development in 2004. This effort resulted in the capture of two bat species, California myotis and big brown bat, and the acoustic detection of bats belonging to the 40 kHz Myotis group, which includes long-legged myotis, little brown bat, and small-footed myotis. Of these, only the long-legged myotis is a special-status species. Recorded sonograms also suggest the presence of either silver-haired bat or big brown bat, whose echolocation characteristics overlap, making exact species determination difficult.

During June and July of 2004, PG&E conducted bat surveys throughout the Chili Bar Project area. These surveys confirmed the presence of four bat species, Yuma myotis, big brown bat, silver-haired bat, and western pipestrelle and indicated the likely presence of two additional species, Mexican free-tailed bat and pallid bat within the Project area (see table 3-56). Of these, the Yuma myotis (*Myotis yumanensis*) is a special status bat species (a federal species of concern and a BLM sensitive species).

Special Status Wildlife

Eighty-eight of the wildlife species that may occur in the UARP and Chili Bar Project areas are special-status species (table 3-57). Two of these species, valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and California red-legged frog (*Rana aurora draytonii*), are federally listed species that are discussed in section 3.3.5, *Threatened and Endangered Species*. The western pond turtle (*Clemmys marmorata)* and Yuma myotis (*Myotis yumaensis)* are the only special status species located during relicensing studies conducted by PG&E within the Chili Bar Project boundary.

Bald Eagle—Bald eagles require habitat near large lakes, reservoirs, major rivers, or coastal areas that have adequate food, perching sites, and nesting or wintering habitat. Resident populations of suitably sized fish (>200 mm total length) are often required. In California, nest-sites are typically at or near the tops of ponderosa pines or sugar pines within 1 mile of key foraging habitat. Bald eagles tend to prefer secluded

Table 3-57. Special-status wildlife species known or with the potential to occur within the UARP and Chili Bar Project areas. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Common Name (*Scientific Name*)	**Status Designations**[a]
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT
California horned lizard (*Phrynosoma coronatum frontale*)	CSC, CP
Sage brush lizard (*Sceloperus graciolus)*	BLMS
Mountain yellow-legged frog (*Rana muscosa*)	FC, CSC, CP, FSS
California red-legged frog (*Rana aurora draytonii*)	FT, CSC, CP
Foothill yellow-legged frog (*Rana boylii*)[b]	CSC, CP, FSS
Western pond turtle (*Clemmys marmorata)*[b]	FSS, CSC, CP
Common loon (*Gavia immer*)[b]	CSC, MNBMC
American white pelican (*Pelecanus erythrorhynchos*)[b]	CSC
Double-crested cormorant (*Plalacrocorax auritus*) [b]	CSC
Great egret (*Ardea alba*)[b]	CDFS
Snowy egret (*Egretta thula*)	USBC
Great blue heron (*Ardea herodias*)[b]	CDFS
Black-crowned night heron (*Nyctiorax nycticorax)*	BLMS
Harlequin duck (*Histrionicus histrionicus*)	CSC, BLMS
Barrow's goldeneye (*Bucephala islandica*)	CSC
Osprey (*Pandion haliaetus*)[b]	CSC, CDFS
White-tailed kite (*Elanus leucurus*)[b]	FP, MNBMC
Bald eagle (*Haliaeetus leucocephalus*)[b]	FD, CE, MIS, FP, CDFS
Northern harrier (*Circus cyaneus*[b]	CSC
Sharp-shinned hawk (*Accipiter striatus*)[b]	CSC
Cooper's hawk (*Accipiter cooperi*)[b]	CSC
Northern goshawk (*Accipiter gentilis*)[b]	CSC, FSS, MIS, CDFS, MNBMC
Swainson's hawk (*Buteo swainsoni*)	CT, FSS, USBC, Audubon-Y

Common Name (*Scientific Name*)	Status Designations[a]
Ferruginous hawk (*Buteo regalis*)	CSC, MNBMC, BLMS, Audubon-Y
Golden eagle (*Aquila chrysaetos*)[b]	CSC, FP, BLMS, CDFS
Merlin (*Falco columbarius*)	CSC
American peregrine falcon (*Falco peregrinus anatum*)	FD, CE, FP, MNBMC, MIS, FSS, CDFS
Prairie falcon (*Falco mexicanus*)[b]	CSC
Mountain quail (*Oreortyx pictus*)[b]	MIS, Audubon-Y
Blue grouse (*Dendragapus obscurus*)[b]	Audubon-Y
Greater sandhill crane (*Grus canadensis tabida*)[b]	CT, FP, FSS
Mountain plover (*Charadrius montanus*)	CSC, MNBMC, USBC, Audubon-R
Long-billed curlew (*Numenius americanus*)	CSC, MNBMC, USBC, Audubon-R
California gull (*Larus californicus*)[b]	CSC
Black tern (*Chlidonias niger*)	CSC, MNBMC
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FC, CE, FSS, MNBMC
Band-tailed pigeon (*Columba fasciata*)[b]	Audubon-Y
Burrowing owl (*Athene cunicularia*)	CSC, BLMS, MNBMC
California spotted owl (*Strix occidentalis occidentalis*)[b]	CSC, FSS, MIS, MNBMC, BLMS, USBC, Audubon-R
Great gray owl (*Strix nebulosa*)	CE, FSS, CDFS
Flammulated owl (*Otus flammeolus*)[b]	Audubon-Y
Long-eared owl (*Asio otus*)	CSC
Short-eared owl (*Asio flammeus*)	CSC, MNBMC, USBC, Audubon-Y
Black swift (*Cypseloides niger*)	CSC, MNBMC, USBC, Audubon-Y
Vaux's swift (*Chaetura vauxi*)	CSC, MNBMC
White-throated swift (*Aeronautes saxatalis*)[b]	Audubon-Y
Rufous hummingbird (*Selasphorus rufus*)	MNBMC, Audubon-Y
Allen's hummingbird (*Selasphorus sasin*)	MNBMC, USBC, Audubon-Y
Calliope hummingbird (*Stellula calliope*)[b]	Audubon-Y
Lewis' woodpecker (*Melanerpes lewis*)[b]	USBC, MNBMC, Audubon-Y

Common Name (*Scientific Name*)	**Status Designations[a]**
Nuttal's woodpecker (*Picoides nuttallii*)[b]	Audubon-R
White-headed woodpecker (*Picoides alborlarvatus*)[b]	Audubon-Y
Red-breasted sapsucker (*Sphyrapicus rubber*)[b]	MNBMC
Williamson's sapsucker (*Sphyrapicus thyroides)*	BCC
Pileated woodpecker (*Dryocopus pileatus* [b]	MIS
Olive-sided flycatcher (*Contopus cooperi*)[b]	MNBMC, USBC, Audubon-Y
Little willow flycatcher (*Empidonax traillii brewsteri*)	CE, FSS, MIS, USBC, Audubon-Y
Pacific-slope flycatcher (*Empidonax difficilis*)[b]	MNBMC
Yellow-billed magpie (*Pica nuttalli*)[b]	Audubon-Y
Loggerhead shrike (*Lanius ludovicianus*)	CSC, MNBMC
Oak titmouse (*Baeolophus inornatus*)[b]	Audubon-Y
Wrentit (*Chamaea fasciata*)	Audubon-Y
California thrasher (*Toxostoma redivivum*)	Audubon-Y
California horned lark (*Eremophila alpestris actia*)[b]	CSC
Common yellowthroat (*Geothlypis trichas*)	CSC
Spotted towhee (*Pipilio maculates*)	CSC
Purple martin (*Progne subis*)	CSC
Bank swallow (*Riparia riparia*)	CT
Yellow warbler (*Dendroica petechia brewsteri*)	CSC
Hermit warbler (*Dendroica occidentalis*)[b]	Audubon-Y
Yellow-breasted chat (*Icteria virens*)	CSC, MNBMC
Tricolored blackbird (*Agelaius tricolor*)	CSC, MNBMC, USBC, BLMS, Audubon-Y
Lawrence's goldfinch (*Carduelis lawrencei*)	USBC, MNBMC, Audubon-R
Fringed Myotis (*Myotis thysanodes*)[b]	BLMS, WBWG
Yuma myotis (*Myotis yumaensis*)[b]	BLMS
Long-eared myotis (*Myotis evotis*)	BLMS
Long-legged myotis (*Myotis volans*)	BLMS, WBWG

Common Name (*Scientific Name*)	**Status Designations**[a]
Western small-footed myotis (*Myotis ciliolabrum*)	BLMS
Western red bat (*Lasiurus blossevillii*)	FSS, WBWG
Spotted bat (*Euderma maculatum*)	CSC, BLMS, WBWG,
Townsend's big-eared bat (*Corynorhinus townsendii*)	CSC, FSS, BLMS, WBWG
Pallid bat (*Antrozous pallidus*)	CSC, FSS, BLMS, WBWG
Western mastiff bat (*Eumops perotis*)	CSC, BLMS, WBWG
Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*)[b]	CSC
Sierra Nevada mountain beaver (*Aplodontia rufa californica*)	CSC
Sierra Nevada red fox (*Vulpes vulpes necator*)	CT, FSS
Ringtail (*Bassariscus astutus*)	FP
Black bear (*Ursus americanus*)[b]	MIS
California wolverine (*Gulo gulo luteus*)	CT, FSS, FP
American marten (*Martes americana*)[b]	FSS
Fisher (*Martes pennanti*)	FC, CSC, FSS, BLMS
Mountain lion (*Felis concolor*)[b]	CSPM
Mule deer (*Odocoileus hemionus*)[b]	MIS
Northern flying squirrel (*Glaucomys sabrinus*)	CSC

[a] Status: Audubon = Audubon Watch List species (R = Red List: Declining rapidly, have very small populations and face major conservation threats; Y = Yellow List: Declining but a slower rate than Red List species)

BLMS = U.S. Bureau of Land Management Sensitive Species

CDFS = California Division of Forestry Sensitive Species

CE = Listed as Endangered under the California Endangered Species Act

CP = Protected under CDFG sport fishing regulations

CSC = California Department of Fish and Game Species of Concern

CSPM = Specially protected mammal under the California Fish and Game Code

CT = Listed as Threatened under the California Endangered Species Act

FD = Federally delisted

FC = Federal Candidate Species

FE = Listed as Endangered under the Federal ESA

FP = Fully protected species under the California Fish and Game Code

FSS = U.S. Forest Service Sensitive Species

FT = Listed as Threatened under Federal ESA

MIS = U.S. Forest Service Management Indicator Species

MNBMC = FWS designated migratory nongame bird of management concern

USBC = United States Bird Conservation Watch List

WBWG = Western Bat Working Group designation for high priority bat species

[b] Species was observed during relicensing studies.

habitat away from human activities. During winter, relatively protected stands near diurnal activity areas are important communal roosting habitat. Within the Project areas, bald eagle nesting has been observed at two reservoirs, Loon Lake and Union Valley. Wintering bald eagles could sporadically be found at any of the Projects' reservoirs or reaches; however, no winter roost concentration areas have been identified. PG&E conducted bald eagle wintering and nesting surveys in 2003 and 2004, respectively; however, no wintering or breeding bald eagles were observed during surveys in the Chili Bar Project area.

Loon Lake Reservoir

During 2003–2004 surveys conducted by SMUD, adult, sub-adult, and juvenile bald eagles were seen frequently during both boat and ground-based surveys at Loon Lake reservoir. Eagles were sighted during seven of eight survey days in 2003 and during 20 of 23 survey days in 2004. Adults were the most commonly observed age class of bald eagles observed at Loon Lake reservoir (71.4 percent of all age classes), although no more than two adults were observed on the reservoir during a single survey. Sub-adults comprised a large segment of the population at Loon Lake reservoir (25 percent) relative to the number of subadults observed at Union Valley reservoir (8.5 percent). Favored perches at Loon Lake reservoir ranged from dominant trees and snags to saplings and shoreline boulders. Bald eagle nesting had not been observed at Loon Lake reservoir prior to relicensing surveys. In 2004, two eaglets hatched from this nest; however, they both later died. Nesting was not observed in 2005.

Union Valley Reservoir

From November 2002 through July 2005, up to four bald eagles were observed at Union Valley reservoir at one time; on most visits, the territorial pair were the only eagles observed. All age classes of eagles were observed at Union Valley reservoir with an age distribution of 83 percent adults, 8.5 percent sub-adults, and 8.5 percent juveniles. Numbers of sub-adult and juvenile eagles were highest in winter and fall months, corresponding with the expected seasonal influx of wintering bald eagles into the Crystal Basin. Table 3-58 shows the breeding productivity of bald eagles at Union Valley reservoir.

Table 3-58. Productivity summary for bald eagles nesting at Union Valley reservoir, 1986–2005. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

Year	Status	Young Fledged	Location
1986	Successful	1	Wench Creek
1987	Successful	1	Wench Creek
1988	Occupied/Success Unknown	Unknown	Wench Creek
1989	Occupied/Unsuccessful	0	West Point
1990	Occupied/Unsuccessful	0	Wench Creek
1991	Occupied/Unsuccessful	0	Wench Creek
1992	Successful	2	Granlees Point nest #1
1993	Successful	2	Granlees Point nest #1
1994	Successful	2	Granlees Point nest #1
1995	Occupied/Unsuccessful	0	Granlees Point nest #1
1996	Occupied Unsuccessful	0	Granlees Point nest #1
1997	Successful	2	Granlees Point nest #1
1998	Occupied/Unsuccessful	0	Granlees Point nest #1
1999	Occupied/Unsuccessful	0	Granlees Point nest #1
2000	Successful	Unknown	Granlees Point nest #1
2001	Occupied/Unsuccessful	0	Granlees Point nest #1
2002	Occupied/Unsuccessful	0	Granlees Point nest #1
2003	Occupied/Unsuccessful	0	Granlees Point nest #2
2004	Successful	1	Granlees Point nest #1
Summary	Nesting attempts of known outcome (young fledged) at Union Valley reservoir = 18		
	Known young produced at Union Valley reservoir = 11		
	Young/known outcome at Union Valley reservoir = 0.61		

Perch structures commonly used at Union Valley reservoir included dominant and sub-dominant sugar pines, lodgepole pines, incense cedar, white fir, Jeffrey pine, ponderosa pine and various snags that border the reservoir, and occasionally in saplings and shoreline boulders. Most perch sites were on the south and east perimeter of the reservoir with only two observations of perched birds occurring on the north side of the reservoir between Yellowjacket and Wolf Creek campgrounds. Most habitually used foraging perches were located less than 20 meters from the shoreline along the west and south shores of the reservoir, in the forest stands adjacent to Union Valley dam, and in the stands on the Sunset/Fashoda Peninsula and Granlees Point. Night roosts of the territorial pair were primarily located on or near Granlees Point and occasionally on the Sunset/Fashoda Peninsula.

Osprey—SMUD determined during relicensing studies that ospreys are common in suitable habitat throughout the UARP area from early spring through late summer. The earliest calendar-year observation of an osprey during relicensing studies was a single bird flying over Big Hill on March 26, 2003. Seven active osprey nests with undetermined outcome were recorded in the study area in 2002 and four active nests were recorded in 2003. At Union Valley reservoir, these nests were located at the top of dominant snags, primarily along the south shore within the area burned by the Cleveland Fire in 1992, and in the SFSC arm of Junction reservoir. Several of these snags fell during the winter of 2002–2003, likely because of rotting combined with high winds and snow loading. Nesting was also confirmed at Ice House reservoir and suspected but not confirmed at Loon Lake reservoir.

Northern Goshawk—On the west slope of the Sierra Nevada, the northern goshawk breeds from about 2,500 feet in elevation in the ponderosa pine/mixed-conifer vegetation types up to approximately 10,000 feet in the red fir and lodgepole pine types. They are generally year-round residents in suitable habitat but some limited seasonal altitudinal movements may occur. Relicensing studies conducted by SMUD and monitoring conducted by the Eldorado National Forest indicate that northern goshawks nest in the vicinity of the Project and spatial analysis determined that three Protected Activity Centers (PACs) (G11_04; G11_06; and G22_12) are within 0.25-mile of existing Project facilities. PACs were assumed to be occupied and were excluded from the area surveyed during protocol surveys of the UARP. Broadcast calling surveys at 83 call points near existing Project facilities failed to elicit a response from any goshawks. However, goshawks were observed incidentally at two locations near Jaybird Springs Road and these birds may have been associated with PAC G22_09. In 2004-–2005, broadcast calling surveys at 78 call points associated with the Iowa Hill development failed to elicit any responses from goshawks. The nearest designated PAC to the development is G23_03, located approximately 0.93-mile southeast of the eastern end of the proposed transmission line that will service the development.

California Spotted Owl—The California spotted owl ranges from south of the Pit River in Shasta County, throughout the entire Sierra Nevada, and the south and central Coast Range as far north as Monterey. Relicensing studies conducted by SMUD and monitoring conducted by the Eldorado National Forest indicate that California spotted owl nests in the vicinity of the UARP and spatial analysis determined that 14 PACs have been designated within 0.25-mile of existing UARP facilities. PACs were assumed to be occupied and were excluded from the area surveyed during protocol surveys of the UARP. Broadcast calling surveys in 2002 yielded responses from two adults and one juvenile in the vicinity of Long Canyon, southeast of Slab Creek reservoir. In 2003, responses were obtained from two adults and two juveniles near

Union Valley dam. Also in 2003, four responses were obtained from adult owls presumed to be the pair recorded in 2002 in Long Canyon. All responding birds appear to be associated with known PACs. In 2004-2005, broadcast calling surveys at 27 call points within 1.5 miles of the Iowa Hill development elicited responses from two adults and one juvenile in the vicinity of Long Canyon near the eastern end of the proposed transmission line for the Iowa Hill development. This pair is presumed to be associated with PAC ED_034. Additional responses were obtained from adult owls (breeding status undetermined). One PAC is located within 0.25-mile of the Iowa Hill development footprint but no PACs have been designated within 0.25-mile of the proposed transmission line.

Bats—Yuma myotis were captured at the most locations and in the greatest number. A large night roost, used primarily by Brazilian free-tailed bats, was discovered at White Rock powerhouse. Smaller roosts were found under non-project bridges along Ice House Road at the crossings of Tells Creek, Big Silver Creek, and Jones Fork Silver Creek, which are located 0.26 to 0.48 mile upstream of the maximum surface elevation (high water line) of Union Valley reservoir. A fourth roost was found under the Ice House Road Bridge crossing of SFSC, approximately 0.82 mile downstream from Ice House reservoir.

Bat trapping and acoustic sampling was performed at the proposed Iowa Hill development in 2004. Acoustic detection identified bats belonging to the 40 kHz myotis group, which includes the long-legged myotis, as well as several other bat species without special status.

Black Bear—The black bear is widespread and relatively common throughout the Sierra Nevada, from foothill habitats to alpine zones. They generally occur in fairly dense, mature stands of many forest habitats, valley foothill riparian habitat, and wet meadow. The black bear is a legally hunted species in California with an estimated more than 2,200 animals taken in 1999. Suitable habitat for this species is distributed throughout most of the Project area and bears are known to be common and increasing in number in the region.

Mule Deer—Mule deer in the vicinity of the Project are considered to be part of the Pacific Deer Herd, with the exception of those deer in the westernmost portion of the Project area. The herd occupies approximately 353 square miles of public and private lands within El Dorado County and that portion of Placer County south of the Rubicon River. The Pacific Deer Herd has four significant habitat designations: critical summer range, fawning habitat, holding areas, and winter range. Based on the existing information provided by CDFG and the Eldorado National Forest, the critical summer ranges, fawning habitat, and holding areas of the herd occur from the mid to upper elevations of the Crystal Basin within the Eldorado National Forest, usually above 4,000 feet in elevation. These critical areas are found east of Ice House reservoir, north and east of Union Valley reservoir and north of Loon Lake reservoir. The known winter range of the herd lies mainly on south-facing slopes between 2,000 and 4,500 feet elevation and between the SFAR and Peavine Ridge Road from the town of Kyburz and westward to Highway 49. The Pacific Deer Herd uses the major east-west trending ridges (Poho, Telephone, and Peavine) of the Eldorado National Forest as primary migration corridors between high- and low-elevation habitats. The winter range lies mainly on south-facing slopes between 2,000 and 4,500 feet elevation. Intermediate range generally extends from 4,000 to about 6,000 feet elevation, and is used primarily during spring and fall migration. Most of this intermediate range consists of east-west parallel ridges used as migration routes, especially Peavine, Poho, and Telephone ridges. The summer range lies mainly above 5,000 feet.

Mountain Yellow-legged Frog—Mountain yellow-legged frogs are generally found from elevations of 4,500 feet to over 12,000 feet. In the Sierra Nevada, mountain yellow-legged frogs have been documented to occur in ponds, lakes, and small streams. Reproduction begins soon after water bodies are free of ice. Breeding and oviposition generally occurs in ponds or lakes from April through July, depending upon the elevation. Streams may be important to mountain yellow-legged frogs as dispersal corridors. Mountain yellow-legged frog tadpoles are likely to be present from June through September and adults can be found from June through October. Since water temperatures at higher elevations in the Sierra Nevada remain relatively cold throughout the year, mountain yellow-legged frog tadpoles overwinter 2 to 3 times before metamorphosing. The tadpoles spend the winter beneath the ice and do not metamorphose until their third or fourth year.

The nearest known populations of mountain yellow-legged frogs are in the headwaters of Highland Creek, at Highland Lake (Highland Creek flows into Rockbound Lake), and in Lake Zitella (on a tributary to the Rubicon River), which are about 2 miles from the UARP upper elevation reaches. In addition, large populations of mountain yellow-legged frogs are found in many of the smaller lakes and ponds in Desolation Wilderness, as well as in Lake Aloha (which is located in the higher elevation of the Desolation Wilderness northeast of the UARP).

SMUD and PG&E conducted an overlapping amphibian study within the proposed Project boundaries and stream reaches affected by the proposed Projects. The elevation of the Chili Bar Project is too low to support mountain yellow-legged frogs; therefore, it was not surveyed. SMUD identified 14 stream and 17 pond or reservoir margin sites on the UARP sites as potential mountain yellow-legged frog habitat, which were subsequently surveyed in 2003. No mountain yellow-legged frogs were found. The highest Project reservoir (Rubicon reservoir) is located at approximately 6,500-foot elevation, which is at the lower end of the mountain yellow-legged frog range, and may explain why no mountain yellow-legged frogs are found within Project reaches and reservoirs. The nearest known populations of mountain yellow-legged frogs are at elevations greater than 7,500 feet. Project reaches and reservoirs do support some habitat suitable for the mountain yellow-legged frog. However, most of the UARP reservoirs are too large, with much of the nearshore habitat comprised of bedrock. Because of this, suitable habitat is patchy in distribution. Mountain yellow-legged frog populations are typically found in water bodies (lakes or streams) that provide deep pools for overwintering, preferably without tadpole predators, such as trout. Although all of the reservoirs in the study area have deep pools, trout are present in all three of the upper elevation reservoirs (Rubicon, Rockbound, and Buck Island). Project stream reaches with high quality habitat occur within this elevation range, for example, in the upper reaches of Gerle Creek downstream of Loon Lake dam. This particular reach does not currently support mountain yellow-legged frog populations, which may be due, in part, to the presence of predatory brown trout in Gerle Creek.

Foothill Yellow-legged Frog—Foothill yellow-legged frogs occur in the Coast Ranges from the Oregon border south to the Transverse Mountains in Los Angeles County and in most of central and northern California along the west slopes of the Sierra Cascade crest. The elevation range of the foothill yellow-legged frog extends from sea level to 5,000 ft (1,525 m) in the Sierra Nevada Mountains. Egg deposition is generally initiated on the descending limb of the spring hydrograph when temperatures reach 12-15^{o}C. Metamorphosis generally occurs within 3 to 4 months. Once breeding has occurred, adults and juveniles move upstream into nearby tributaries or to cooler microhabitats.

Foothill yellow-legged frogs have been found along the Upper American River, both on the SFAR and Silver Creek. Sightings along the mainstem SFAR extend as far upstream as Riverton, and downstream below Slab Creek reservoir.

SMUD and PG&E conducted an overlapping study within the proposed Project boundaries and stream reaches affected by Project operations. Studies identified a total of 22 stream sites within the UARP boundary with potentially suitable habitat for foothill yellow-legged frogs. SMUD conducted surveys at these sites in 2003 and 2004. Foothill yellow-legged frogs were documented at 4 sites in 2 reaches of the UARP: in the Camino dam reach, approximately 2 miles downstream of Camino dam and at the confluence of Silver Creek with SFAR; and in the SFAR reach, near Akin powerhouse (part of the El Dorado Project) and near Camino powerhouse. Foothill yellow-legged frogs were not found in three reaches (Ice House, Junction, and Slab Creek dam reaches) despite the availability of potentially suitable habitat, although there was a single foothill yellow-legged frog sighting in the Slab Creek dam reach by the Forest Service. Ice House dam reach is at the upper elevation limit of the foothill yellow-legged frog.

SMUD and PG&E surveyed the upper 2 miles and the lower 1 mile of Junction dam reach in mid-summer 2004. Water temperatures in the upper reaches were too cold (~8°C) for breeding. Although temperatures in the lower portion of Junction dam reach were suitable for breeding, large algal mats covering suitable egg attachment substrates may have prevented successful breeding. No adult frogs were observed in this reach. The Slab Creek dam reach is within the elevation range of the species, and water temperatures are suitable throughout the reach. Although the Forest Service has observed a single foothill yellow-legged frog in this reach, the presence of potential competitors and predators (e.g., bullfrogs, crayfish, bass) in this reach may limit foothill yellow-legged frog establishment.

Habitat associations of the foothill yellow-legged frog were similar at the four locations where foothill yellow-legged frogs were found. Based on site observations, bedrock seeps likely provide important refugia for adults, juveniles, and subadults. Evidence of foothill yellow-legged frog breeding was documented at all four sites. Successful breeding and subsequent life history stages were documented in Camino dam reach and the SFAR reach of UARP, which suggests habitat conditions currently exist in these reaches to support eggs, tadpoles, and adults of this species. An analysis of suitable habitat for egg deposition and tadpole rearing conducted by the applicants confirmed that suitable habitat for egg deposition and tadpole rearing occurs at both sites. The study found that egg deposition and tadpole rearing habitat were of moderate to high quality at flows of 20 and 50 cfs, but at 100 cfs the habitat had decreased to low quality habitat. Under current UARP operation, mean daily flows fall within typical reach values of approximately 40 cfs during breeding and rearing periods of May–July.

Eighteen sites were surveyed for the foothill yellow-legged frog in the reach downstream of Chili Bar dam, 15 of which were on a tributary of the SFAR or on the SFAR near a tributary. No foothill yellow-legged frogs were observed. Subsequent surveys conducted by PG&E in 2004 documented approximately 14 foothill yellow-legged frog tadpoles and one adult on Indian Creek, a tributary to SFAR near the town of Coloma, approximately 0.5 mile upstream from its confluence with SFAR.

Western Pond Turtle—Historically, the western pond turtle had a relatively continuous distribution throughout California. It is currently found throughout much of its historical range, principally west of the Sierra-Cascade crest, from western Washington south to northwest Baja California, though in population numbers that are a fraction of historical levels.

The western pond turtle inhabits a wide range of fresh or brackish water habitats including ponds, lakes, backwater and low flow regions of streams and rivers, ditches, pools remaining in intermittent streams. Sites for basking are an important element. Basking substrate includes rocks, logs, banks, emergent vegetation, root masses, and tree limbs. Although primarily an aquatic reptile, western pond turtles often spend time on land. Terrestrial activities include basking, overwintering, nesting, and moving between ephemeral sources of water.

Breeding activity peaks from June to July, but may occur year-round, when females begin to search for suitable nesting sites upslope from water. Egg-laying sites vary from sandy shoreline to forest soil types. Females excavate a nesting site at least four inches (10 cm) deep, and lay from three to eleven eggs. Incubation takes 73 to 80 days. Along major rivers western pond turtles are often concentrated in areas of optimal habitat, often in side channel and backwater areas. Turtles may move to off-channel habitats, such as oxbows, during periods of high flows.

Many of the stream sites surveyed by the applicants in the UARP for the California red-legged frog and the foothill yellow-legged frog contained suitable habitat for western pond turtle, including undercut banks, emergent vegetation, and basking sites, as well as suitable adjacent upslope areas for breeding. Western pond turtles were documented in the Slab Creek dam reach, approximately 0.5 mile upstream of White Rock powerhouse.

Within the Chili Bar Project area, western pond turtles were observed in 2003 along the west bank of Greenwood Creek, near the confluence with SFAR and in emergent vegetation in the side channel adjacent to a mid-channel island on the SFAR. Additionally, the western pond turtle was observed at two sties along the eastern edge of the Chili Bar reservoir in 2004.

3.3.4.2 Environmental Effects

Riparian Vegetation and Wetlands

Riparian vegetation and wetlands are subject to flow alterations and large water level fluctuations as a result of the proposed Projects' operations. Diverting flow and reducing the intensity of peak flows in Project reaches could potentially alter riparian vegetation composition, cause encroachment, or cause a decrease in riparian cover. Reservoir water fluctuations could potentially reduce wetland abundance and species diversity.

Under Proposed Articles 1-1 and 2-1, *Minimum Streamflows*, SMUD and PG&E would provide minimum streamflows to Project reaches. Additionally, under Proposed Article 1-2, *Pulse Flows*, SMUD would provide pulse flows in three river reaches. In order to maximize recreational resources, SMUD would operate the UARP to maintain the reservoir levels as described in Proposed Article 1-23, *Reservoir Levels*. These flows and reservoir levels are described in sections 3.3.2, *Water Resources*, and 3.3.3, *Aquatic Resources*. Under the Proposed Action, minimum flows would be released partly to provide benefits to riparian vegetation during spring flows. SMUD would release pulse flows in the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and in SFSC below Ice House dam partly to maintain a properly functioning riparian community.

Under Proposed Articles 1-5 and 2-4, *Monitoring Program,* SMUD and PG&E would conduct a riparian vegetation monitoring program. They would develop and implement a riparian vegetation monitoring plan in consultation with the Agencies with monitoring beginning 5 years after license issuance and continuing in years 10, 15, and every 10 years thereafter for the length of the licenses. This monitoring program is intended to provide an index of changes in riparian conditions over that period of modified streamflow, to determine if riparian conditions are in proper functioning condition, and to determine if riparian areas are being maintained or are in need of restoration.

Our Analysis

Maintaining the health of riparian vegetation is important for a number of reasons, including promoting streambank stability, reducing erosion, preventing the establishment and spread of noxious weeds, improving water quality, and providing foraging, hiding, nesting, and denning habitat for a number of wildlife species. Wetlands, which are often concurrent with riparian vegetation, especially within Project reaches, provide many of the same functions. Under natural hydrologic conditions, high spring flows seasonally inundate stream margin habitats and floodplains. Additionally, peak storm flows would naturally occur at a frequency great enough to scour floodplain soils and redeposit sediment, which is needed to rejuvenate habitat for many riparian species. The Projects alter the natural hydrograph by diverting flows, reducing the frequency and magnitude of naturally occurring pulse flow events, and causing large fluctuations in reservoir water levels. Additionally, the locations and species diversity of reservoir wetlands are partially determined by reservoir fluctuations.

The overlapping applicants' study, *Riparian Vegetation and Wetlands Technical Report* (DTA, 2004a) found that riparian vegetation in the Project reaches meets the characteristics of "proper functioning condition". This is defined as having: a diverse age structure of vegetation; diverse composition of vegetation; species composition indicating maintenance of riparian soil moisture characteristics; streambank vegetation comprised of plants or plant communities that have root masses capable of withstanding high stream flow events; riparian plants with high vigor; adequate vegetative cover to protect banks and dissipate energy during high flows; and, plant communities in the riparian area providing an adequate source of coarse and/or large woody debris. Although the riparian vegetation in Project reaches meets the requirements to be characterized as being in proper functioning condition, there is evidence that Project operations have reduced the quality. Several UARP and Chile Bar Project reaches show signs of encroachment and reduced bank stability, including, within the UARP, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, SFAR below Slab Creek dam, and within the Chili Bar Project, SFAR below Chili Bar dam (CDFG, 2007).

Within the Gerle Creek reach below Loon Lake dam, the upland species lodgepole pine has increased over historic conditions. Additionally, the banks through much of the reach are exposed and undercut and there is a high level of fine sediment bedload. Within Gerle Creek downstream of Gerle dam, riparian vegetation on the upper banks is narrow and dependent upon seasonal seepage. Within the SFRR downstream of Robbs Peak dam, during the riparian vegetation study, dense woody vegetation colonizing alluvial bars occurred on both sides of the stream and herbaceous vegetation was rooted underwater, suggesting an absence of recent high scouring flows. In SFSC downstream of Ice House dam, signs of bank erosion were observed. In Silver Creek downstream of both Junction and Camino dams and in Brush Creek below Brush Creek dam, riparian vegetation is limited by natural geology and topography. In SFAR downstream of Slab Creek dam, riparian vegetation is narrow in the upper portion of the reach, even in areas of low-gradient banks.

Although spring flows are not being managed purely for the benefit of riparian vegetation in all reaches, the proposed minimum flows and pulse flows would be beneficial to the health of the riparian vegetation in all reaches by returning to a more natural hydrograph. The minimum flows would inundate the stream margins and upper streambanks, providing longer duration saturation than under existing conditions. Species that favor upland conditions, such as lodgepole pine, would likely die off in favor of hydrophytic species that are specially adapted to emerge with high spring flows. Additionally, in many cases, low banks would overflow, saturating floodplains and expanding the riparian species into a wider channel. In the reaches where SMUD proposes pulse flows (the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam), the pluse flows would mimic naturally occurring spring storm events, scouring floodplain soils, redistributing sediment, and reducing encroachment.

Because the effects of the proposed minimum flows and pulse flows on riparian vegetation are not definitively known, the proposed riparian monitoring program would monitor the changes in riparian condition, including species composition, percent cover, and length and width of riparian communities, to compare changes with the baseline established in the riparian vegetation study. Monitoring every 5 years for the first 15 years of a new license, followed by subsequent monitoring every 10 years, would allow enough time for riparian vegetation to respond to the proposed flow regimes without being confused by short-term changes based on one-time events. If the results of this monitoring identify on-going or new adverse effects on riparian functions, this information would be used in the proposed *Adaptive Management Program* (Proposed Article 1-6) to provide needed changes or restoration.

The largest areas of wetlands within the UARP boundary are located at Union Valley and Loon Lake reservoirs with smaller areas of wetland located Ice House, Gerle Creek, Rockbound, and Rubicon reservoirs. Wetlands at all Project reservoirs are influenced by Project operations; however, reservoir fluctuations are greatest at Loon Lake, Union Valley, and Ice House reservoirs. Wetlands at Loon Lake reservoir are located in and around shallow bays that are influenced by reservoir fluctuations. At Union Valley reservoir, wetland hydrology is influenced by reservoir water level from the point of annual high water to the point of annual low water. In 2003, the water level declined almost 34 feet during the growing season (DTA, 2004a). As reservoir elevations decline, wetland areas are exposed and become vegetated except at areas exposed during maximum drawdown, which tend to remain unvegetated. According to the overlapping applicants' riparian vegetation and wetland study (DTA, 2004a), species richness of wetlands seasonally inundated by the reservoirs was much lower than in wetlands that are never inundated.

Under Proposed Article 1-23, *Reservoir Levels*, SMUD would maintain reservoir levels during the summer months to maximize recreational use. Although reservoir fluctuations would continue under the Proposed Action, they would be reduced during portions of the growing season in Rubicon, Buck, Loon, Gerle Creek, Ice House, and Union reservoirs. We expect that the increased time of inundation in these locations could result in increased species diversity in the wetlands within this zone. Daily reservoir fluctuations at the Slab Creek reservoir would increase due to operation of the proposed Iowa Hill development but would be within the current weekly range of fluctuation (see section 3.5.3, *Water Resources*). Slab Creek reservoir has steep slopes that greatly limit wetland and riparian vegetation from developing. As a result, we conclude that increased reservoir fluctuations would have minimal effects on wetlands.

Like the UARP reaches, the conditions of the reach below Chili Bar dam meet the criteria for proper functioning condition (DTA, 2004a). The Freemont cottonwood population in the Coloma sub-reach, however, contains large, older trees only on high banks 8 to 10 feet above the river, with infrequent saplings and seedlings. This is indicates germination or recruitment is impaired by flow fluctuations because seedlings are cued to germinate too high on the banks when flows are high and then face moisture stress (and mortality) when flows recede (DTA, 2004a). Under existing conditions, flows within the Chili Bar reach fluctuate daily by up to 1,000 cfs because flows at the Chili Bar Project are dependant upon the upstream operation of SMUD's Slab Creek reservoir and White Rock powerhouse. PG&E proposes to increase the minimum streamflow, which would reduce daily fluctuations. Because large fluctuations would continue under the Proposed Action, the proposed riparian monitoring program would monitor any changes in riparian health and identify on-going or new adverse effects on riparian functions. This information would be used in the proposed adaptive management program (Proposed Article 1-6, *Adaptive Management Program*) to provide needed changes or restoration.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. With the exception of the Slab Creek reservoir, Project operations at all reaches and reservoirs would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on riparian vegetation and wetlands would be the same as those described under the Proposed Action except for Slab Creek.

Wildlife and Plant Protection Measures

Several special status plant and wildlife species occur within the UARP boundary, including several special status plants, northern goshawk, osprey, California spotted owl, special status bats, black bear, mountain quail, cavity nesting birds, and mule deer. Yuma myotis is also known to occur near the Chili Bar Project boundary. Project operations and maintenance could potentially affect these species, and other special status species that may be listed during the term of the license. SMUD and PG&E propose a number of measures designed to protect wildlife and plants in the Project areas.

The applicants propose to provide wildlife and sensitive plant protection measures in Proposed Articles 1-12 and 2-9, *Wildlife and Plant Protection Measures*. Under Proposed Article 1-12, SMUD would:

1. maintain and operate in working condition all devices and measures for wildlife along Project canals deemed necessary by the Forest Service, FWS, and CDFG. SMUD would provide the Agencies annual reports describing the date, location, and species found in Project canals. If annual wildlife mortality during any 3-year period exceeds three individuals, SMUD would develop and implement a Wildlife Exclusion Plan that is approved by the Forest Service, FWS, and CDFG;
2. complete a biological evaluation before commencing any new construction or maintenance (including new recreational developments) authorized by any new license on Forest Service lands if it may affect a Forest Service, FWS, or CDFG sensitive plant or wildlife species or its habitat. The biological evaluation would be approved by the Forest Service and mitigation measures developed in consultation with the Commission, the Forest Service, FWS, and CDFG may be required for the protection of the species;
3. immediately notify the Forest Service, FWS, and CDFG if any Forest Service, FWS, or CDFG sensitive plant or wildlife species is detected prior to or during ongoing Project construction, operation, or maintenance. If the agencies determine that the Project activities are adversely affecting the sensitive species, SMUD would develop and implement appropriate protection measures in consultation with the agencies;
4. review the current list of special status plant and wildlife species annually, in consultation with the Forest Service, FWS, and CDFG, that may occur on Forest Service lands in the Project area directly affected by Project operations. For each new species added to the list, SMUD would determine, in consultation with the agencies, if the species or its habitat is likely to occur on Forest Service lands in the Project area, and if so, develop and implement a study plan in consultation with the same agencies to assess the effects of the Project on the species. SMUD would then prepare and file a report on the study including recommended resource measures and an implementation schedule. The report would be reviewed and approved by the Forest Service, FWS, and CDFG and then filed with the Commission;

5. not undertake maintenance under transmission lines within the Pine Hill Rare Plant Preserve until consultation with BLM, FWS, and CDFG has been completed; and

6. develop an Avian Protection Plan within 1 year of license issuance, approved by FWS, that addresses retrofitting the problem Project transmission lines, to meet the design and siting standards established by APLIC standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994).

In addition, SMUD proposes, as part of Proposed Article 1-5, *Monitoring Program*, to develop and implement a bear management monitoring plan in consultation with the Agencies to monitor the effectiveness of measures relating to managing bear populations to keep them away from recreational sites, as described in section 3.3.6, *Recreational Resources*.

In Proposed Article 2-9, *Wildlife and Plant Protection Measures*, PG&E proposes measures similar to items 2, 3, and 4 above, except the BLM would be a consulting and approving agency for BLM lands instead of the Forest Service on Forest Service lands.

Our Analysis

Project canals and penstocks could potentially affect wildlife migration and cause drowning, particularly for mule deer. No deer mortalities have ever been recorded within the Gerle Canal, however. The canal walls are gradually sloped, with gunnite or natural rock walls and several shallow areas that can act as escape ramps. The vast majority of the Project penstocks are greater than 24 inches above ground, which is the height identified in the *Mule Deer Technical Report* (DTA, 2004b) as adequate for mule deer passage. Although it appears that Project facilities are not causing deer mortality or impeding migration, the proposed measure would monitor wildlife mortality and ensure that any fencing or crossing structures required by the Forest Service, FWS, or CDFG meet design requirements and are functional.

Proposed and future maintenance activities have the potential to adversely affect special-status plant species, particularly within the Pine Hill Preserve. The Pine Hill Preserve contains a high concentration of rare plant species because of the serpentine and/or gabbro soil formations. Three of these species, Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort, are federally listed species that are discussed in section 3.3.5, *Threatened and Endangered Species*. Project transmission lines, which require occasional maintenance clearing, cross through sections of the Pine Hill Preserve. Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with the BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species.

Additionally, the proposed measures to consult with the Forest Service, FWS, and CDFG prior to any new construction or maintenance, notify the agencies if any sensitive plant species are identified, and review the current list of sensitive species annually, while subsequently assessing the potential for Project effects on the species, would protect any special status species that occur either within the Pine Hill Preserve or elsewhere within the Project boundary. Special status wildlife species, such as special status bats, California spotted owls, and northern goshawk, which could be affected by Project powerhouse maintenance activities, road maintenance, or vegetation management, would also be protected by these proposed measures.

The Bird-Powerline Associations Technical Report (DTA, 2004c) identified several transmission lines that do not meet the design and siting standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994): (1) the Jones Fork-Union Valley 69 kV line has several structures having less than 36 inches of clearance between energized jumper wires and grounded cross-arms; (2) the Brush Creek 12-kV tap line has inadequate phase-to-phase and phase-to-ground spacing; and (3) high elevation segments of the transmission line from Loon Lake powerhouse to just west of Camino powerhouse, including the Jones Fork-Union Valley transmission line segment and an isolated segment near White Rock powerhouse, have overhead groundwires. The risk of bird electrocution increases when transmission lines do not have adequate spacing between conductors or between the lines and the ground. This is especially true for highly susceptible raptors such as the special status osprey and northern goshawk and bald eagle. Additionally, these species are at risk for collision with transmission lines with overhead groundwires because their small diameter makes them less visible to birds. The proposed measure to prepare an avian protection plan would address retrofitting transmission lines to have them meet APLIC standards. Once all transmission lines meet these standards, the potential for avian electrocution or collision would be minimized.

Although the Black Bear Technical Report (DTA, 2004d) determined that the Project is not affecting black bear denning or harvest, it did identify a concern relating to human-bear interactions at recreational sites. As a result, SMUD Proposed Article 1-19, *Specific Recreation Measures,* includes improvements at several recreational areas to provide bear proof food lockers and bear proof trash bins (see section 3.3.6, *Recreation Resources,* for further discussion). In Proposed Article 1-5, *Monitoring Program*, SMUD proposes a bear management monitoring plan. This plan would determine if the proposed human-bear interaction measures are successfully keeping bears away from campgrounds or if additional measures would be needed.

Iowa Hill Development

A biological evaluation has been completed to assess effects of the proposed Iowa Hill development on Forest Service sensitive terrestrial species (Lipton, 2007a).

Although no rare plants are known to exist in the Iowa Hill development area, due to the anticipated length of the time between the rare plant surveys and the actual undertaking of construction on the Iowa Hill development, it is possible rare plants could become established in the construction areas. Additionally, Forest Service survey guidelines require Project areas to be resurveyed after a 5-year period. If new surveys for sensitive plants are completed prior to the beginning of construction, the surveys would locate any new populations of rare plants or any new rare plants species that may be added to the current rare plant lists by the time construction begins. If any new rare plant locations or habitat information changes as a result of these surveys, the Forest Service's biological evaluation may be amended prior to the beginning of construction (Taylor, 2007).

The proposed Iowa Hill development could directly affect California spotted owls through removal of habitat. The Project would eliminate up to 141 acres of suitable habitat, a portion of which occurs on National Forest System lands. The habitat that would be removed is approximately 1 mile from the nearest known spotted owl activity center; however, the incomplete survey visits conducted in 2004 indicated that an additional spotted owl nest or roost site may occur closer to the Project, since an individual spotted owl was detected within 0.25 mile of the Project boundary.

If spotted owl nesting is occurring near the Project (within 0.25 mile), noise associated with construction activities could cause abandonment of a spotted owl nest site or could affect nesting success. Removal of vegetation could eliminate occupied or potential nesting habitat and would reduce foraging habitat for two spotted owl sites (PACs ED 123 and ED034) with activity centers within about 1.5 miles of the Project area.

At present, the spotted owl population on the Eldorado National Forest is estimated to be stationary (FWS, 2006). Given this fact and the findings of the FWS on the magnitude of threats to the species (FWS, 2006), the biological evaluation contains a determination that the direct and cumulative effects of the Project may affect spotted owl individuals but are not expected to result in a loss of viability or lead to a trend toward federal listing for the California spotted owl (Lipton, 2007a).

The proposed Iowa Hill development could directly affect northern goshawks through removal of habitat. The Project would eliminate up to 141 acres of suitable habitat, about half of which occurs on National Forest System lands. The habitat that would be removed is not known to be used for nesting but protocol-level surveys have not been completed. If goshawks are nesting near the Project (within 0.25 mile), noise associated with construction activities could cause abandonment of a nest site or affect nesting success. Loss of habitat could also eliminate use of the area by a goshawk pair.

In a status review conducted in 1998, FWS concluded that goshawks remain widely distributed throughout their historic range in the western United States and found no evidence that goshawk habitat is limiting the population, or that a significant curtailment of the species' habitat is occurring. For this reason, the biological evaluation contains a determination that the magnitude of effects associated with the Iowa Hill development may affect goshawk individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk (Lipton, 2007a).

The proposed Iowa Hill development would directly affect sensitive bat species through removal of potential roosts on 141 acres of land proposed to be cleared for Project developments. Project construction noise would be likely to affect roosting bats over a larger area. Open water created by the upper reservoir could improve foraging opportunities for bats along the forested edge of this habitat. Based on the information above, the biological evaluation contains a determination that the Iowa Hill development may affect individual pallid bats, Western red bats, and/or Townsend's big-eared bats, but is not likely to result in a trend toward federal listing or loss of viability for these species (Lipton, 2007a).

The proposed Iowa Hill development would directly affect unoccupied but potentially suitable Pacific fisher habitat through removal of 141 acres of land proposed to be cleared for Project developments. This would have no direct or indirect effect upon the species unless it was to recolonize habitat on the Eldorado National Forest. Based on this information, the biological evaluation contains a determination that the Iowa Hill development would have no effect upon the Pacific fisher, though updating the biological evaluation is recommended prior to construction to ensure this determination is still valid (Lipton, 2007a).

Proposed Article 1-12, *Wildlife and Plant Protection Measures*, would require SMUD to complete a biological evaluation before commencing any new construction or maintenance authorized by a new license. This requirement is necessary for evaluating the effects of the Iowa Hill development on California spotted owls, northern goshawks, sensitive bats, and Pacific fisher. Because the existing spotted owl and northern goshawk surveys do not meet survey protocols and because these surveys would also be out of date by the time construction of the Iowa Hill development begins, additional spotted owl and goshawk surveys would be necessary prior to project construction in order to fully evaluate potential Project effects. If new spotted owl nest or daytime roost locations or new goshawk nest locations are identified within 0.25 mile of Project activities prior to the beginning of construction, SMUD would develop appropriate mitigation measures under the proposed measure.

Proposed Article 1-41, *Terrestrial Resources*, requires that prior to initiating construction of Iowa Hill, SMUD would purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license to mitigate the loss of wildlife habitat associated with the Iowa Hill development. The Forest Service and CDFG would determine the in-kind value of lands proposed for this purpose. The purchase of an equivalent acreage of land may help to offset effects on California spotted owl, northern goshawk, sensitive bats, and Pacific fisher habitat if the acquired lands provide similar habitat and/or are occupied by these species. This cannot be evaluated further, however, without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals would be applied to the property.

An MIS analysis has been completed to assess the effects of the Iowa Hill development on Eldorado National Forest MIS (Lipton, 2007b). The analysis contains the following conclusions with respect to mule deer, black bear, mountain quail, California spotted owl, northern goshawk, and cavity nesting birds.

Mule Deer—Deer foraging habitat on the Eldorado National Forest is estimated to have increased between 1991 and 1997. Project-level effects would contribute to a decline in the amount of deer habitat unless habitat acquired by SMUD as mitigation replaces habitat lost through Project effects. Project-level effects are not expected to alter deer population trends because the Project area is not identified as important winter or summer range for migratory deer and the area represents a very small portion of available deer habitat (Lipton, 2007b).

Black Bear—The amount of black bear denning/cover habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to the declining habitat trend on the Forest. The black bear data imply an increasing trend for black bear on the Eldorado National Forest, based on CDFG population estimates (CDFG, 2004). Project-level effects are unlikely to influence the black bear population trend (Lipton, 2007b).

Mountain Quail—The amount of mountain quail habitat on the Eldorado National Forest increased between 1991 and 1997. Project-level effects would not contribute to the increasing habitat trend on the Eldorado National Forest. From mountain quail survey data, a stable population trend has been estimated for the Sierra Nevada bioregion (Forest Service, 2007). Project-level effects are unlikely to affect mountain quail population trends (Lipton, 2007b).

California Spotted Owl—As discussed above, the amount of spotted owl habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to declining habitat trends on the Forest. The spotted owl population trend on the Eldorado National Forest is estimated to be stable. Project-level effects would reduce nesting and foraging habitat that may contribute habitat for one or two spotted owl sites (Lipton, 2007b).

Northern Goshawk—As discussed above, the amount of northern goshawk habitat on the Eldorado National Forest declined between 1991 and 1997. Project-level effects would contribute to declining habitat trends on the Forest. Goshawk population trends on the Eldorado National Forest remain unknown (Lipton, 2007b).

Cavity Nesting Birds—Population status and trend is monitored within the Sierra Nevada Bioregion for the following four cavity nesting bird species: Pileated woodpecker, red-breasted sapsucker, Williamson's sapsucker, and hairy woodpecker. Project-level effects would contribute to decreasing snag habitat trends on the Eldorado National Forest (Lipton, 2007b).

The only special status plant or wildlife species that is known to occur near the Chili Bar Project boundary is the Yuma myotis. The Yuma myotis has a night roost within the UARP White Rock powerhouse, but is expected to occur within the Chili Bar Project boundary. Although no special status plant or wildlife would be affected by the proposed Project, the measures proposed by PG&E would protect any special status plant or wildlife species that either currently occur or could occur in the future within the Project boundary from Project maintenance activities on powerhouses, road maintenance, vegetation management, or any new ground-breaking activities.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The effects of the proposed Project without the Iowa Hill development would be the same as with the Iowa Hill development because no special-status plant species are known to occur within the Iowa Hill development, no Project canals or penstocks that would adversely affect wildlife are proposed for the Iowa Hill development, and the proposed Iowa Hill transmission line, if constructed, would be built to meet APLIC standards.

Vegetation and Noxious Weed Management

Noxious weeds occur throughout the Project boundaries. Project operations and maintenance activities create dispersal pathways and conditions that are favorable to the spread of noxious weeds. Vegetation management and noxious weed control methods could control existing populations and prevent new populations from forming.

SMUD proposes, as specified in Proposed Article 1-13, *Vegetation and Invasive Weed Management Plan*, to file with the Commission, within 2 years of license issuance, an Invasive Weed Management Plan developed in consultation with the Forest Service, FWS, the appropriate County Agricultural Commissioner, and the California Department of Food and Agriculture. Invasive weeds would be those weeds defined in the California Food and Agriculture code, and other species identified by the Forest Service. The plan would address both aquatic and terrestrial weeds and vegetation within the UARP boundary and adjacent to UARP features directly affecting National Forest System lands including roads and distribution and transmission lines. Monitoring as part of the plan will be done in conjunction with other UARP maintenance and resource surveys, so as not to require separate travel and personnel. SMUD would conduct monitoring as part of the plan in conjunction with other UARP maintenance and resource surveys, so as not to require separate travel and personnel. SMUD would provide monitoring information to the Forest Service as part of the annual consultation on affected Forest Service resources described in Proposed Article 1-14, *Annual Review of Ecological Conditions*. To assist with this monitoring requirement, training in invasive plant identification would be provided to UARP employees and contractors by the Forest Service. SMUD also proposes, as specified in the same article to file with the Commission and thereafter implement a Vegetation

Management Plan. The plan would include, among other elements, hazard tree removal and trimming, revegetation of disturbed sites, and soil protection and erosion control.

PG&E proposes similar invasive weed and vegetation management plans, as specified in Proposed Article 2-10, *Invasive Weed and Vegetation Management Plans*. The difference in the PG&E proposed plan is that it is intended for BLM lands, with consultation with the BLM, instead of Forest Service lands and consultation with the Forest Service, as proposed by SMUD.

Our Analysis

Ten species of noxious weeds occur within the UARP boundary, five of which are in close proximity to UARP facilities. Noxious weeds have the potential to out-compete special status plant species, if they move into special status plant habitat. Project maintenance and operations can aid the proliferation of noxious weeds. Project roads can act as a method of seed dispersal into areas previously not infested and vegetation management within transmission lines can cause disturbance which allows noxious weeds to move in. The construction of the Iowa Hill development would also act as new disturbance that would create conditions favorable to the establishment of noxious weeds if appropriate control measures are not implemented. Finally, Project-related recreation acts both as a means of dispersal from one Project area to another and as a source of disturbance, which creates conditions favorable to noxious weed establishment.

Implementing the proposed invasive weed and vegetation management plans would control current populations and future infestations of noxious weeds within the Project boundary on Forest Service lands. We interpret the proposed Invasive Weed Management Plan to be intended for lands within the Project boundary that are adjacent to Project features directly affecting National Forest System lands. Because not all Project-related noxious weed infestations occur on Project lands that affect National Forest System lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary that are affected by Project operations or maintenance would result in more complete control of noxious weeds that are affected by the proposed Project. Currently, there are only small areas of noxious weeds located on the proposed Iowa Hill development site, concentrated on currently disturbed areas. Construction of the proposed upper reservoir and transmission line would create disturbance that would create conditions favorable to the establishment of noxious weeds. The proposed vegetation management plan would ensure the areas of disturbance that are not permanently lost to Project facilities would be revegetated with native species and noxious weeds would be controlled.

Within the Chili Bar Project, significant populations of the noxious weeds Scotch broom and Himalayan blackberry occur on the Chili Bar reservoir shoreline and along roadsides. Project operations and maintenance activities create conditions that are favorable to the existence of noxious weeds. Implementing the proposed invasive weed and vegetation management plans would control current populations and future infestations of noxious weeds within the Project boundary on BLM lands. Because not all Project-related noxious weed infestations occur on BLM lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary would result in more complete control of noxious weeds that are affected by Project operations and maintenance. The proposed vegetation management plan would establish practices that would minimize conditions favorable to the establishment of noxious weeds.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed. The Project effects on noxious weed proliferation would remain the same as for the Proposed Action, except the Iowa Hill development sites would remain undisturbed and conditions favorable for noxious weed establishment would not occur.

Special Status Amphibians and Reptiles

Minimum Flows

Foothill yellow-legged frog habitat is found in several Project reaches. The mountain yellow-legged frog has not been found in Project-affected reaches or reservoirs during recent surveys, although suitable habitat may be available in higher elevations. Western pond turtle occur in the Slab Creek and Chili Bar dam reaches. Minimum flows have the potential to affect foothill yellow-legged frog, MLYF, and western pond turtle habitat. There is a tradeoff between the potential benefits of higher minimum flows creating more foothill yellow-legged frog habitat and the negative effects of cooler water during May through September delaying breeding, egg development, and tadpole metamorphosis (Kupferberg, 2006). Maintaining the water temperatures below 20°C during the summer months (to benefit coldwater fisheries) could potentially slow down foothill yellow-legged frog egg and tadpole development because it is outside the range of natural conditions for the foothill yellow-legged frog. Mountain yellow-legged frogs require stable, coldwater habitats as tadpoles develop over a period of 2 to 3years. Additionally, Project operations potentially create warm edgewater conditions favorable to bullfrogs, a predator of foothill yellow-legged frogs and young western pond turtles.

The applicants propose to provide minimum streamflows to Project reaches as specified in Proposed Articles 1-1 and 2-1, *Minimum Streamflows*.

Our Analysis

Foothill yellow-legged frogs evolved with wet winters and dry summers, and their life cycle is adapted to these predictable, seasonal cycles of peak flow and base flow (Mount et al., 2006). Studies from other Sierran rivers have demonstrated that foothill yellow-legged frog egg masses may be negatively affected by flow fluctuations associated with spills, channel maintenance pulse flows, ramping rates, whitewater recreational flows, and other operations. Flow fluctuations during the foothill yellow-legged frog breeding season can desiccate egg masses if they are laid during prolonged spills and then water levels drop quickly prior to hatching (Mount et al., 2006; Kupferberg, 2006). Additionally, egg masses can be scoured by high flows. Tadpole stranding, particularly during the late summer-early fall, is also a concern related to flow fluctuations. Stable, increased minimum flows may benefit tadpoles during the low-flow summer months by providing additional habitat.

Continuity and connectivity of foothill yellow-legged frog habitat is critical to long-term survival of frog populations. Foothill yellow-legged frogs could be adversely affected by thermal conditions that create barriers to migration and result in small, isolated breeding populations with low resiliency to perturbations. Project-affected reaches that are too cold or too warm and Project reservoirs may represent dispersal barriers and create reproductive isolation. Minimum flows in Project reaches affect instream temperatures. SMUD proposes minimum flows in the Camino dam reach, SFAR reach, Ice House reach, Junction dam reach, and Slab Creek dam reach that could decrease instream temperatures, affecting foothill yellow-legged frog populations. Additionally, altered flow regimes may also create aquatic habitat conditions that favor introduced coldwater species such as brown trout or warmwater species such as smallmouth bass and bullfrog that prey on foothill yellow-legged frogs, western pond turtles, and/or mountain yellow-legged frogs.

Although there are no known populations of mountain yellow-legged frogs within the Project reaches, suitable habitat may be available in higher elevations (e.g., upper reaches of Gerle Creek below Loon Lake dam). Mountain yellow-legged frogs occur mostly within ponds or lakes, but could potentially breed and disperse in coldwater Project reaches. Trout prey on mountain yellow-legged frog tadpoles, therefore managing high-elevation reaches with potential mountain yellow-legged frog habitat (Rubicon dam reach, Buck Island dam reach, Loon Lake dam reach, Gerle Creek dam reach, and Robbs Peak dam reach) for trout population growth would reduce the likelihood of successful mountain yellow-legged frog breeding. Higher minimum flows in these reaches, however, are expected to maintain coldwater conditions, which is favorable to mountain yellow-legged frog habitat.

Rubicon and Buck Island Dam Reaches—The mountain yellow-legged frog has not been found in these reaches, although Rubicon reservoir is within the range of the mountain yellow-legged frog (6,500-foot elevation), and there is potential habitat. The nearest known populations of mountain yellow-legged frogs are at elevations greater than 7,500 feet, in Highland Creek that flows into Rockbound Lake.

Under the Settlement Agreement, the primary objectives for the Rubicon dam reach and the Buck Island dam reach are to provide cold freshwater habitat for healthy rainbow trout and mountain yellow-legged frog populations, and less conducive conditions for California roach, speckled dace, and golden shiners. Increased minimum streamflow releases in both reaches would slightly lower May and June water temperatures in both reaches providing cooler and more stable conditions and increasing potential habitat for mountain yellow-legged frogs.

Loon Lake Dam Reach—All of Loon Lake dam reach (8.5 miles) is currently considered coldwater habitat. The mountain yellow-legged frog has not been found in the Loon Lake dam reach, although the upper end of the reach is within the elevational range and there is potential habitat. The absence of mountain yellow-legged frogs may be due, in part, to the predatory brown trout population.

Under the Settlement Agreement, the primary objectives for the Loon Lake dam reach are to provide cold freshwater habitat for healthy rainbow trout, non-native brown trout, and mountain yellow-legged frog populations, and make the flows more closely resemble the natural hydrograph. Increased minimum streamflows during May through September, with the largest increases occurring in May and June, would slightly lower May and August water temperatures, and moderately lower water temperatures during June and July (see section 3.3.2.2, *Water Resources*), providing cooler and more stable conditions and increasing potential habitat for mountain yellow-legged frogs, but also for predatory trout.

Gerle Creek Dam and Robbs Peak Dam Reaches—Mountain yellow-legged frogs and foothill yellow-legged frogs have not been found in these reaches, although there is potential habitat (CDFG, 2007). Predatory brown trout occur in Gerle Creek dam and Robbs Peak dam reaches because the upstream Loon Lake dam reach is managed for this non-native sportfish.

Under the Settlement Agreement, the objectives include providing cold freshwater habitat for healthy mountain yellow-legged frog populations in the Gerle Creek dam reach, and providing cold freshwater habitat for healthy mountain yellow-legged frog and foothill yellow-legged frog populations in the Robbs Peak dam reach. Increased minimum streamflow releases from both Gerle Creek dam and Robbs Peak dam during May through September, with the largest increases occurring in May and June, would somewhat lower May through mid-August water temperatures, and slightly increase September water temperatures. We anticipate that the largest reduction in temperatures would occur in the Robbs Peak dam reach due to the proposed minimum streamflow releases that are more than four times the current requirements in May and June. Therefore, the proposed minimum flows may provide potential habitat for the mountain yellow-legged frog that is cooler and more stable than current conditions, particularly in upper Robbs Creek dam reach, where optimal temperatures for the mountain yellow-legged frog are currently exceeded in the summer months. The proposed minimum flows may also provide potential habitat for the foothill yellow-legged frog in the lower end of the reaches. However, these reaches are not within the optimal elevation ranges for these species (too low for the mountain yellow-legged frog, too high for the foothill yellow-legged frog), and the proposed minimum flows would also provide more habitat for predatory trout.

Ice House Dam Reach—Ice House dam reach is at the upper elevation range for the foothill yellow-legged frog, and the upper 7 miles of the 11.5-mile long reach is considered coldwater habitat. Extant foothill yellow-legged frog populations were not found in this reach during relicensing surveys. There are no temperature objectives for Ice House dam reach, although under the Settlement Agreement, primary objectives for this reach are to provide temperatures that allow for management of native coldwater fishes and to not preclude foothill yellow-legged frog breeding if they recolonize the reach.

Increased minimum streamflow releases during May through July of all years, and August and September of CD and Dry years (see section 3.3.2.2, *Water Resources*) would further reduce water temperatures and maintain temperatures less than 20°C throughout the reach in BN water years. The proposed minimum flows may create water temperatures that are too cool to provide potential foothill yellow-legged frog breeding and rearing habitat throughout most of the reach. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Junction Dam Reach—The entire 8.3-mile-long Junction dam reach is considered coldwater habitat. Extant populations of the foothill yellow-legged frog were not found in this reach during relicensing surveys. Primary objectives of the Settlement Agreement are to provide temperatures that allow for management of native fishes, provide habitat for healthy foothill yellow-legged frog populations, and provide habitat for healthy macroinvertebrate populations in the entire reach. Water temperatures in upper 2 miles were too cold to support foothill yellow-legged frog reproduction (~8°C) during 2004 amphibian surveys.

Increased minimum streamflows during May through July of all water year types, in August of Dry and CD years, and September of CD years would substantially reduce temperatures in the reach, and the proposed reduction of minimum streamflow releases for August and September of AN and Wet years would increase temperatures in the reach slightly. Mean daily temperatures under the proposed minimum streamflow releases are expected to remain below 20°C and may further decrease the amount of potential foothill yellow-legged frog habitat. Warmer temperatures are expected in low velocity, edgewater habitat that may be used by the foothill yellow-legged frog.

There are no specified temperature objectives for the Junction dam reach except during Wet water years, when SMUD would release water blocks to maintain mean daily temperatures of less than or equal to 20°C, as measured at the lower end of the reach, just upstream from Camino reservoir. In Wet water years, the temperature in the lower end of the reach could also be less than optimal for foothill yellow-legged frogs because of the water block release could further decrease the amount of potential foothill yellow-legged frog habitat. If the water temperature in the Junction dam reach is exceeded prior to release of the Wet year water block, SMUD would monitor for the presence of foothill yellow-legged frogs prior to and after the release of a block of water. The monitoring would allow SMUD and the Agencies to implement adaptive management measures, discussed below, as needed, to protect foothill yellow-legged frogs during water block releases.

Although surveyors found temperatures suitable for foothill yellow-legged frog breeding in lower Junction dam reach in 2004, large algal mats cover the substrate and probably prevent successful reproduction. The algal mats are indicative of elevated water temperature, nitrate, or other water quality issues and their decomposition reduces DO in the water column. The proposed minimum flows may improve water quality in the lower end of the reach, and SMUD would develop an algal species identification and monitoring plan for the Junction dam, Camino dam, Ice House dam, and Slab Creek dam reaches to assess the distribution and possible adverse affects of alga(e) in the Project-affected reaches. Identification of the alga(e) and changing Project operations, as needed, to improved water quality could create potential foothill yellow-legged frog habitat in lower Junction dam reach if water temperatures are suitable (see section 3.3.2.2, *Water Resources*).

We also considered continuity and connectivity of appropriate thermal habitat to potential breeding populations of frogs. An objective of the Settlement Agreement is to provide connectivity of flows in the SFSC below Ice House reservoir dam through Silver Creek below Junction and Camino dams. If the upper reaches are too cold, this may increase the migratory barrier between the two reaches. The reservoirs may also be a migratory barrier to foothill yellow-legged frog dispersal. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Camino Dam and SFAR Reaches—The 6.2-mile-long Camino dam reach and the 2.6-mile-long SFAR reach down to Camino powerhouse would be potentially affected by the increased flows. The upper 3 miles of the Camino dam reach is currently coldwater habitat; all of the SFAR reach is currently warmwater habitat. SMUD surveys in 2003 and 2004 documented breeding populations of foothill yellow-legged frog in the Camino dam reach and the SFAR reach.

Primary objectives of Proposed Article 1-1, *Minimum Streamflows*, are to increase minimum flows in the Camino dam reach to benefit native fishes, improve habitat conditions for healthy foothill yellow-legged frog populations, and provide habitat for healthy macroinvertebrate populations in the entire reach. There are no specified water temperature objectives for the SFAR reach except during Wet water years. Within 2 years of license issuance, a telemetry system would be installed to provide hourly temperature monitoring data (see section 3.3.2.2, *Water Resources*). Micro-thermographs would be used to monitor the stream margin, edgewater habitats that are known or suitable foothill yellow-legged frog breeding sites.

Increased minimum streamflows during May through July of all water year types, in August of Dry and CD years, and September of CD years would reduce mean daily temperatures in Silver Creek upstream of the confluence with the SFAR May through July, but still remain above 12°C from mid-May through September. It appears that mean daily temperatures at the lower end of the Camino dam reach would seldom exceed 20°C in May though July of BN years, and would occasionally exceed 20°C in August. In Dry years, the increased minimum streamflow releases would reduce temperatures in lower Camino dam reach although it is not evident whether these reductions would lower temperatures to less than 20°C, particularly in July and August (see section 3.3.2.2, *Water Resources*). Therefore, it appears there may be less warmwater habitat for foothill yellow-legged frogs in lower Camino dam reach during some water years (e.g., BN) after implementation of the new minimum flow, than under the current conditions. The SFAR reach would continue to provide warmwater habitat for the foothill yellow-legged frog during all water year types because implementation of the Camino dam reach minimum flows would have little influence on water temperature in this reach due to the relatively large contributions of inflow from the SFAR (see section 3.3.2.2, *Water Resources).*

The proposed minimum flows in the Camino dam reach during the foothill yellow-legged frog reproductive season (May through September) would generally be less than 50 cfs, except in May of BN, AN, and Wet years (68 cfs) and June of AN and Wet years (59 cfs). DTA and Stillwater (2004c) concluded that flows of 20 to 50 cfs provided moderate to high quality habitat for foothill yellow-legged frog egg deposition and tadpole rearing in the Camino dam and SFAR reaches. They also concluded foothill yellow-legged frog breeding and rearing habitat in these reaches decreased to low quality at 100 cfs; however, further monitoring may be needed to definitively reach this conclusion. For example, in the North Fork Feather River, initial studies (2003–2004) lead to conclusions that optimal foothill yellow-legged frog breeding and tadpole rearing habitat would decrease as instream flows increased above 150 cfs, and that 150 cfs provided the greatest amount of suitable habitat (GANDA, 2004). Later monitoring results (2005–2006) indicated that initial conclusions regarding the relationship of foothill yellow-legged frog habitat and flow were not correct, and that at current (depressed) population levels habitat did not appear to be a limiting factor at higher flows. Foothill yellow-legged frog populations are also depressed in the Camino dam reach, and the proposed minimum flows would be expected to provide more foothill yellow-legged frog breeding and rearing habitat during all water year types than current conditions as long as water temperatures are suitable.

Low flows have the potential to be over-topped by spill events, turbine trips, or fluctuations caused by upstream projects. Higher minimum flows would reduce the difference between operational flow fluctuations and normal operating conditions and reduce the risk of egg mass desiccation and tadpole stranding from any flow perturbations. The proposed minimum flows would also provide a more natural hydrograph to initiate timely foothill yellow-legged frog breeding triggers.

During Wet water years, SMUD would also be required to release blocks of water into Camino dam reach during July, August, and/or September to maintain temperatures less than or equal to 20°C below Camino dam. The water block releases may create unseasonal temperature and flow fluctuations that could adversely affect developing tadpoles and metamorphs (tadpoles becoming frogs) in both reaches during Wet water year types. If the water temperature in the Camino dam reach is exceeded prior to release of the Wet year water block, SMUD may be required to monitor for the presence of foothill yellow-legged frogs prior to and after the release of a block of water. The monitoring would allow SMUD and the agencies to implement adaptive management measures, discussed below, as needed, to protect foothill yellow-legged frogs during water block releases.

Brush Creek Dam Reach—All of the Brush Creek dam reach (2.2 miles) is considered coldwater habitat. There is potential foothill yellow-legged frog habitat in the reach. The primary Settlement Agreement objectives for the reach include providing habitat for healthy foothill yellow-legged frogs and macroinvertebrates. Under Proposed Article 1-1, *Minimum Streamflows*, minimum streamflow releases would be increased to a range of 3 to 9 cfs or natural flow, or 1 cfs if natural inflow is less than 1 cfs. The proposed minimum streamflows would provide more cool water at the upper end of the bypassed reach, and are expected to result in somewhat cooler temperatures throughout the reach. Providing minimum streamflow releases of 1 cfs when the natural flow is less than 1 cfs is expected to somewhat reduce temperatures, at least in the uppermost part of the upper bypassed reach (see section 3.3.2.2, *Water Resources*). The proposed minimum flows would provide more stable flows for foothill yellow-legged frogs during the reproductive season, if water temperatures are suitable. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for foothill yellow-legged frogs.

Slab Creek Dam Reach—Currently, the upper 4 miles of the 8-mile-long Slab Creek dam reach are considered coldwater habitat. This reach has the most extreme temperature fluctuations of all the reaches in the Project, and does not provide appropriate magnitude or timing of flows to trigger foothill yellow-legged frog breeding (CDFG, 2007). Slab Creek dam reach is designated both cold and warm freshwater beneficial uses and should support a transitional community between cold and warm water species. Regarding western pond turtle sightings, two young western pond turtles were seen in 2003 by Forest Service surveyors downstream from Slab Creek reservoir in the SFAR between Rock Creek and Chili Bar reservoir. There is also an unconfirmed report of a single foothill yellow-legged frog in Slab Creek dam reach. Additionally, the Forest Service observed western pond turtle approximately 0.5 mile upstream of the White Rock powerhouse.

There are no specified temperature objectives for the Slab Creek dam reach; however, primary objectives for the reach include providing temperatures that improve habitat conditions for healthy populations of foothill yellow-legged frogs and hardhead; allow management of native fish; and reduce non-native species such as bullfrogs and bass. Micro-thermographs would be used to monitor the stream margin, edgewater habitats that are known or suitable foothill yellow-legged frog breeding sites. As discussed below under *Monitoring and Adaptive Management Programs*, under Proposed Article 1-6(9), *Adaptive Management Program*, the Agencies would have the opportunity to use the temperature monitoring results to determine whether the water temperature that is currently used is an indicator of breeding initiation (12°C mean daily temperature for a 7-day running average), should be increased or decreased.

Proposed Article 1-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Slab Creek dam during May through September of all water year types. Modeling indicates that the proposed minimum flows would substantially reduce mean daily temperatures at the lower end of the Slab Creek dam reach in BN water years to approximately 10-15°C in May, 14-21°C in June, 19-22°C in July, 17-21°C in August, and 13-19°C in September. These simulations suggest that mean daily temperatures could exceed 20°C in the lower one-third of the reach in June and July, and the lowest mile in August during BN water years. The proposed minimum streamflow releases would probably reduce warming in other water year types although there is insufficient information to quantify these reductions or determine the areas where mean daily temperatures would still exceed 20°C (see section 3.3.2.2, *Water Resources*).

The proposed minimum flows would provide a more natural hydrograph and would reduce the difference between operational flow fluctuations and normal operating conditions. Therefore, the proposed minimum flows during the foothill yellow-legged frog reproductive season would reduce the risk of egg mass desiccation and tadpole stranding from any flow perturbations and maintain suitable temperatures in the lower reach to provide potential foothill yellow-legged frog habitat.

Current conditions in lower Slab Creek dam reach, including warmwater and perennial flow during the summer and early fall favor potential competitors and predators such as bullfrogs, crayfish, and bass that prey on foothill yellow-legged frog and western pond turtle hatchlings. Increased minimum streamflows in the spring could benefit foothill yellow-legged frogs and western pond turtles by dislodging second year bullfrog tadpoles from pools. If higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

We also considered continuity and connectivity of appropriate thermal habitat to potential breeding populations of frogs. An objective of the Settlement Agreement is to provide connectivity of flows in the SFAR above Slab Creek reservoir and below the Slab Creek dam. It currently appears that the foothill yellow-legged frog population is more robust upstream in the Camino dam reach where July maximum water temperatures were approximately 24ºC in 2001, 22ºC in 2002, and 21ºC in 2003. If the upper portion of the Slab Creek dam reach is too cold after implementation of the proposed minimum flows, this would increase the migratory barrier between the two reaches (Kupferberg, 2006). Slab Creek reservoir may also be a migratory barrier to foothill yellow-legged frog dispersal. SMUD would conduct monitoring, as discussed below under *Monitoring and Adaptive Management Programs*, to determine optimal temperature requirements for the foothill yellow-legged frog.

Operation of the proposed Iowa Hill development has the potential to affect the water temperature of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam. Simulated mean water column temperatures for Slab Creek reservoir near the dam were as much as 0.87°C cooler and averaged 0.39°C cooler, and streamflow releases from Slab Creek dam also were slightly cooler for the heavy use scenario than the without Iowa Hill development scenario (see section 3.3.2.2, *Water Resources*). It is unlikely that these small changes would affect the quality of potential foothill yellow-legged frog habitat.

Iowa Hill Development—Downstream of Slab Creek reservoir only one foothill yellow-legged frog was observed in the SFAR in 2004, at a distance of 6 miles downstream of Slab Creek dam. Effects on foothill yellow-legged frogs would occur primarily in their habitat downstream because the reservoir itself is not habitat for foothill yellow-legged frogs, but acts as a barrier to habitat connectivity. Operation of the proposed Iowa Hill development has the potential to affect the water temperature of Slab Creek reservoir and the SFAR directly downstream of the Slab Creek dam, although simulated flows from modeling show these water temperature changes are minor. Article 140 proposes protective measures that ensure fluctuating flows would not dislodge egg masses or tadpoles of any reproductive foothill yellow-legged frogs occurring below Mosquito Bridge, and water temperatures would not affect foothill yellow-legged frogs by being too cool for their normal development. Implementing best management practices, obtaining all necessary permits and authorizations, and implementing a storm water pollution prevention plan would provide reasonable assurances that SMUD would protect water quality for foothill yellow-legged frogs. Assuming all of these measures are implemented, there should not be adverse effects to any possible foothill yellow-legged frog populations downstream, although it is unknown whether these measures would be effective since the Iowa Hill development has not been implemented. Based on this information, the biological evaluation prepared by the Forest Service contains a determination that the Iowa Hill development may affect individual foothill yellow-legged frogs but is not likely to result in a trend toward federal listing or a loss of viability for the foothill yellow-legged frog (Williams, 2007b).

Due to the anticipated length of time between the existing foothill yellow-legged frog surveys and the actual undertaking of construction on the Iowa Hill development, conducting new surveys for foothill yellow-legged frogs prior to beginning of construction would provide up-to-date foothill yellow-legged frog location information. If information analyzed in the biological evaluation changes as a result of these surveys, the Forest Service may amend the biological evaluation prior to the beginning of construction (Williams, 2007b).

Chili Bar Dam Reach—PG&E surveys in 2004 documented tadpoles and an adult frog on Indian Creek, a tributary to SFAR downstream of Chili Bar dam. Western pond turtles were found on the mainstem SFAR near Coloma and in Greenwood Creek, a tributary. There are no specific water temperature objectives set for the Chili Bar reach; however, the primary objectives in the Settlement Agreement include providing habitat for healthy foothill yellow-legged frog, western pond turtle, and hardhead populations; increasing wetted perimeter to provide more suitable habitat for benthic invertebrates; and reducing or eliminating water quality conditions that encourage algae growth.

Proposed Article 2-1, *Minimum Streamflows*, would substantially increase minimum streamflow releases from Chili Bar dam during May through September of all water year types. The proposed minimum streamflows would slightly lower water temperatures in the Chili Bar dam reach in May through September. We anticipate that this would reduce mean daily temperatures so that they no longer exceed 20°C and may decrease the amount of potential foothill yellow-legged frog habitat (see section 3.3.2.2, *Water Resources*).

Currently, flow fluctuations in the Chili Bar dam reach reduce habitat stability and consistency, which is necessary for foothill yellow-legged frog egg and tadpole development. In the span of 24-hours, flow fluctuations can inundate habitat creating depths and flows that are too deep and fast for foothill yellow-legged frogs or suitable habitat that is present at high flows becomes dewatered as flows recede. Although flow fluctuations under the proposed minimum flows would continue, providing higher minimum flows would reduce the difference between daily base and peak flows, which would result in more stable foothill yellow-legged frog habitat conditions and a lower probability that egg mass desiccation or tadpole stranding would occur.

During amphibian and reptile surveys, bullfrogs were observed at 7 of the 21 sites surveyed, including the Chili Bar dam reach near Scott Road. Current conditions in the reach, including warmwater and perennial flow during the summer and early fall, favors potential competitors and predators such as bullfrogs, crayfish, and bass that may prevent the successful establishment of the foothill yellow-legged frog and western pond turtle. Increased minimum streamflows in the spring could benefit the foothill yellow-legged frog and western pond turtle by dislodging second year bullfrog tadpoles from pools. If higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. With the exception of Slab Creek reservoir, Project operations at all reaches and reservoirs would remain unchanged from those described in the Proposed Action. No special status amphibians or reptiles occur within the Iowa Hill site. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Pulse Flows

Immobile foothill yellow-legged frog egg masses and developing tadpoles and metamorphs with limited mobility are particularly vulnerable to changes in flow. Proposed Article 1-2, *Pulse Flows*, would require SMUD to provide annual channel maintenance pulse flows in the Rubicon dam, Loon Lake dam, and Ice House dam reaches within three months after license issuance but not prior to implementation of the new minimum flows. Pulse flows would not be implemented in water years when natural spills provide flows of equivalent magnitude and duration during spring snowmelt runoff or a natural storm that occurs in the months of January through May in the specified watershed (for more specific information see sections 3.3.2, *Water Resources*, and 3.3.3, *Aquatic Resources*.

Our Analysis

The Ice House dam reach is the only reach with potential foothill yellow-legged frog habitat that may be affected by the proposed channel maintenance pulse flows. Studies in other California rivers have found that foothill yellow-legged frogs spend the winter months on smaller tributary streams, and migrate to large rivers during the spring-fall reproductive season. If in fact foothill yellow-legged frogs occupy this section of SFSC, we assume they would not be in the river when the pulse flows are scheduled to coincide with winter storms (December 15 to April 10) because foothill yellow-legged frogs occupy tributary stream habitat during the winter months.

Pulse flows that are scheduled to coincide with spring snowmelt runoff after April 10 could occur during the foothill yellow-legged frog reproductive migration, breeding, and egg laying periods. However, the proposed pulse flows are within the range of natural conditions (450 to 780 cfs; duration 5 days), and to date, the foothill yellow-legged frog has not been found in the Ice House dam reach. Foothill yellow-legged frog monitoring would be implemented, and if foothill yellow-legged frogs are found in the reach, adaptive management measures would be implemented in consultation with the agencies.

The mountain yellow-legged frog is not known to occur in the Rubicon dam, Loon Lake dam, and Ice House dam reaches. Therefore, the proposed pulse flows would have no effect on the mountain yellow-legged frog.

There are no pulse flows proposed in the Chili Bar dam reach.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Pulse flows at all reaches would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Ramping Rates

Immobile foothill yellow-legged frog egg masses and developing tadpoles and metamorphs with limited mobility are particularly vulnerable to changes in flow. Under Proposed Articles 1-3 and 2-2, *Ramping Rates*, SMUD and PG&E would implement the ramping rates described in section 3.3.3.2, *Aquatic Resources, Ramping Rates*.

Our Analysis

The proposed ramping rates for pulse flows, minimum instream flow releases, and/or whitewater recreational releases have the potential to affect foothill yellow-legged frogs or their potential habitat in the Ice House dam, Junction dam, Camino dam, and Slab Creek dam reaches. The proposed minimum flows in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in these reaches to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal, to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. Successful implementation of the ramping rates would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement.

The mountain yellow-legged frog is not known to occur within the Project-affected reaches. Therefore, the proposed ramping rates would have no effect on mountain yellow-legged frogs.

The proposed minimum flows in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in the Chili Bar dam reach to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal, to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. When the controlled ramping rates are successfully implemented, they would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Ramping rates at all reaches would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action.

Recreational Streamflows

The whitewater recreation streamflow releases proposed in Slab Creek dam reach and Ice House dam reach (Proposed Article 1-24, *Recreation Streamflows*) and Chili Bar dam reach (Proposed Article 2-15, *Recreational Streamflows*) may affect foothill yellow-legged frogs or their potential habitat. The mountain yellow-legged frog is not known to occur in the Project reaches. Therefore, the proposed recreational streamflows would have no effect on mountain yellow-legged frogs. The proposed recreational streamflows below Slab Creek dam and Ice House dam are described in section 3.3.6.2, *Recreational Resources.*

Our Analysis

Other studies in northern California rivers have found foothill yellow-legged frog egg masses are deposited on the declining limb of the hydrograph (GANDA, 2006). This is a natural adaptation to California river systems that experienced predictable cycles of high spring run-off followed by low summer base flows prior to hydropower developments (Mount et al., 2006). Therefore, uncontrollable and/or untimely whitewater recreation streamflows may initiate foothill yellow-legged frog egg deposition or site selection that may result in desiccation when the flows recede, or detachment of existing egg masses. Developing tadpoles and metamorphs with limited mobility are also vulnerable to changes in flow.

Preliminary research in experimental conditions indicates that the critical velocity that tadpoles are flushed out of the substrate is probably between 20 to 40 centimeters/second (Mount et al., 2006). During the experiments, less than 50 percent of the tadpoles that were flushed into higher velocity habitat (10 to 15 centimeters/second) were able to find low-flow refugia in the substrate or swim cross-current to lower velocity areas. Tadpoles that have been flushed out of the substrate or stranded in isolated pools are at higher risk of predation from aquatic and terrestrial predators, as well as desiccation as isolated pools recede.

The magnitude of the recreational flow releases proposed for mid-March through May 31 are within the range of natural conditions; however, the short-durations of these flows are outside the range of natural conditions and may adversely affect foothill yellow-legged frog egg masses. Effective implementation of the proposed ramping rates when the recreational flow releases occur would be essential to the protection of egg masses. If foothill yellow-legged frogs are found in the SFSC and water temperatures at SFSC 1 rise above 12°C mean daily temperature for a 7-day running average at USGS gage 11441500 (the temperature assumed to initiate foothill yellow-legged frog breeding), or if water temperatures in the Slab Creek dam reach rise above 12°C mean daily temperature for a 7-day running average at SFAR 6, SMUD would cancel the recreational flows unless the Agencies determine that such events are compatible with protection of foothill yellow-legged frogs and other biological resources. SMUD would provide notice to the Commission, the Forest Service, the

Water Board, and CDFG within 10 days of determining that the above temperature trigger has been met in either of these scenarios, causing cancellation of the recreational streamflows in either of these reaches. SMUD would provide notice to the Commission if the Forest Service, the Water Board, and CDFG approve a modification to the water temperature trigger.

SMUD would attempt to avoid spilling at Slab Creek dam and Camino dam once foothill yellow-legged frog breeding has been initiated. If a spill does occur, the licensee would make a good faith effort to manage the spill to minimize flow fluctuations in the SFAR. If the Agencies determine that spills below Slab Creek dam and/or Camino dam are resulting in unacceptable environmental impacts based on aquatic species and temperature monitoring, appropriate mitigation measures would be developed and implemented upon approval of the Agencies.

Larger/later developmental stage tadpoles appear less able to withstand increasing water velocities than mid-developmental stage tadpoles, and late summer pulse flows may have greater negative effects than previously expected (Mount et. al, 2006). No recreational flow releases are proposed from June 1 through September 30 to protect foothill yellow-legged frog tadpoles and metamorphs.

Studies also indicate that fall recreational flow releases may cause large numbers of benthic macroinvertebrates to enter the drift and be exported downstream (Kupferberg, 2006). As a result, less insect food may be available for foothill yellow-legged frog metamorphs in the fall, prior to the on-set of winter. If the Agencies determine that unacceptable environmental impacts are occurring in the Slab Creek dam reach due to October recreational streamflows based on amphibian monitoring, adaptive management measures may include but are not limited to cancellation of the October recreational streamflows.

Therefore, implementation of the proposed timelines, ramping rates, monitoring, and adaptive management measures would be important to determine if any adverse impacts on foothill yellow-legged frogs are occurring as a result of recreational flow releases.

Recreational streamflows within the reach downstream of Chili Bar dam have the potential to affect foothill yellow-legged frog egg masses, tadpoles, and metamorphs, as described above. No foothill yellow-legged frogs were located during relicensing surveys on the mainstem SFAR within this reach and habitat was classified as low to moderate. If foothill yellow-legged frogs inhabit this reach in the future, amphibian monitoring discussed below would identify any adverse effects occurring as the result of streamflow modifications. Subsequently, the adaptive management program proposed in Proposed Article 2-5, *Adaptive Management Program*, would provide a mechanism to alter recreational flows in the future if it's determined to be necessary.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Therefore, recreational streamflows would not increase after year 15, and the potential recreational streamflow effects of the UARP-only Alternative on the foothill yellow-legged frog and mountain yellow-legged frog would be the same as those described under the Proposed Action up until year 15.

Monitoring and Adaptive Management Programs

The effects of the proposed minimum flows, decreased water temperature, pulse flows, ramping rates, and recreational streamflows on all life history stages of the foothill yellow-legged frog, mountain yellow-legged frog, and western pond turtle are unknown. Therefore, monitoring the response of all life stages of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles over time would be necessary to evaluate potential effects of the proposed flow changes, along with effective adaptive management changes, as needed.

Within 1 year of license issuance SMUD proposes to develop an amphibian and reptile habitat evaluation and species presence monitoring plan in consultation with the Agencies and would implement it following review and approval. SMUD would conduct protocol-level surveys for the foothill yellow-legged frog in a sub-sample of appropriate habitat types to document species presence and distribution and identify amphibian breeding and larval periods in Project-affected reaches. The first year of the surveys would determine the timing and success of egg laying, tadpole rearing, metamorphosis, and size/condition of metamorphs. SMUD would also place micro-hydrothermographs for future monitoring within the stream margins in the Camino and Slab Creek dam reaches. Monitoring sites would include: (1) Junction dam reach; (2) Camino dam reach; (3) Slab Creek dam reach; and, (4) Rock Creek, a SFAR tributary located upstream of the White Rock powerhouse, from the confluence with SFAR to a point 1 mile upstream. Monitoring would occur in the Rock Creek and Camino dam reach during spill flows that happen after water temperatures rise above 12°C mean daily temperature for a 7-day running average in the SFAR. This monitoring would determine effects on amphibians, fish, and aquatic reptiles as soon as possible after the decline of the spill.

SMUD proposes monitoring frequency as follows: (1) years 2, 3, 5, 10, 15 and thereafter for every 5 years for the term of the license in Junction dam reach; (2) as soon as possible after the decline of spill flows in Slab Creek and Camino dam reaches; (3) years 1, 2, 3, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 5 years for the term of the license in the Camino dam reach; (4) years 1, 2, 3, 4, 5, 6, 10, 11, 15, 16 and thereafter for 2 consecutive years during every 5 years for the term of the new license in Slab Creek dam reach; and, (5) years 1, 2, 3 in Rock Creek.

SMUD also proposes to develop, within 1 year of license issuance, an amphibian flow fluctuation monitoring plan in consultation with the Agencies and implement it upon approval in order to determine if flow fluctuations are displacing egg masses or tadpoles. SMUD would conduct visual surveys for the foothill yellow-legged frog in the Camino dam reach at any time between June and September when streamflows are 100 cfs or less and the flows fluctuate more than 40 cfs or more over 1 week's time. SMUD would record water velocities and discharge. If possible, SMUD would provide advance notice to the Agencies if such fluctuations are going to occur and conduct visual surveys before and after the fluctuations. These surveys could be discontinued if the Agencies determine that the flow fluctuations could occur without egg mass or tadpole displacement.

Proposed Article 1-5, *Monitoring Program*, would also require SMUD to develop a mountain yellow-legged frog monitoring plan in consultation with the Agencies within 2 years of license issuance. Protocol surveys for sensitive species, using the procedures of CDFG (2001), would be conducted in a subsample of appropriate habitat types to document the presence/absence and distribution of mountain yellow-legged frogs. Surveys would focus on the presence/absence of larval stages by periodically surveying reaches with known populations during the spring/summer. Rubicon reservoir, Rockbound Lake, and Buck Island reservoir would be monitored for the mountain yellow-legged frog during years 5, 10, 15, and every 10 years thereafter for the term of the license.

SMUD would also implement an *Adaptive Management Program* (Proposed Article 1-6) within 3 months of license issuance. The program would generally consists of: (a) implementation of a monitoring program; and (b) specific adaptive management measures that would be implemented if the Monitoring Program and other information indicate that the applicable resource objectives identified in the Rationale Report (CDFG, 2007) would likely not be met without adjustment of the initial conditions. For purposes of the Adaptive Management and Monitoring Programs, each year is a calendar year, January through December. Year 1 is the first year that all initial streamflows required by the license are implemented by May 1. Specific components of the Adaptive Management Program which are associated with special status amphibians and reptiles include: (1) cancellation of pulse and recreational streamflows in SFSC due to water temperature; (2) cancellation of recreational streamflows in SFAR due to water temperatures; (3) avoiding untimely spill events in the Slab Creek and Camino dam reaches; (4) cancellation of October recreational streamflows in the Slab Creek dam reach if monitoring determines there are unacceptable environmental effects; and (5) alteration of the water temperature used as the trigger for foothill yellow-legged frog breeding.

The Chili Bar Monitoring Program (Proposed Article 2-4, *Monitoring Program*) would require PG&E to consult and coordinate with SMUD and the Agencies to implement a monitoring program through the term of the new license. Within 1 year of license issuance, PG&E proposes to conduct protocol surveys for special status, sensitive (foothill yellow-legged frog and western pond turtle), and listed amphibians (California red-legged frog), to determine the presence and distribution of special status amphibians and reptiles and to evaluate the potential effects resulting from streamflow modifications. The other Chili Bar survey parameters would be the same as the protocol surveys described for the foothill yellow-legged frog, above. The survey area would be both banks of the entire reach downstream of Chili Bar dam (from CB-A15 to Ponderosa Campground). Monitoring would be conducted in years 2, 3, 5, 6, 10, 11, 15, 16, and 2 consecutive years during every 5 years for the term of the license. PG&E also proposes to implement an *Adaptive Management Program* (Proposed Article 2-5) which would implement the monitoring program and specific adaptive management measures if the monitoring program and other information indicate that resource objectives identified in the Rationale Report are not being met.

Our Analysis

Mountain yellow-legged frogs have not been found in the Project-affected reaches or reservoirs despite suitable habitat, perhaps due to populations of predatory fishes and bullfrogs. However, mountain yellow-legged frogs may use Project-affected reaches as migratory corridors. Monitoring would determine the presence/absence and distribution of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles in Project-affected reaches, and help identify potential migration/dispersal barriers. The proposed monitoring would also identify the potential effects of the proposed changes in minimum flows, operational spills, channel maintenance pulse flows, ramping rates, and the recreational streamflow releases on all foothill yellow-legged frog life stages.

Studies on the North Fork Feather River in northern California (GANDA, 2006) concluded that the river water temperatures must meet a strict temperature threshold before foothill yellow-legged frogs initiate breeding, and that the absolute flow level was not as important to the initiation of egg deposition as the location of the flow on the declining hydrograph. Researchers suspect that suitable water temperatures to initiate foothill yellow-legged frog breeding may be site-specific, and water temperatures that initiate breeding on one river cannot be extrapolated to another (Kupferberg, 2006). Monitoring in the stream margin habitats associated with known or suitable breeding sites in the Camino dam reach and the Slab Creek dam reach in years 1 to 5 would establish the mean water temperature trigger for foothill yellow-legged frog breeding in these reaches.

It is difficult to predict how higher minimum flows and lower water temperatures would influence the rate of tadpole development (Kupferberg, 2006). Although cool temperatures are required for foothill yellow-legged frog breeding, foothill yellow-legged frogs evolved in relatively low elevation systems with warm summer temperatures that facilitate the rapid maturation of young of the year. Cooler temperatures during the foothill yellow-legged frog rearing period may slow development of foothill yellow-legged frog eggs, tadpoles, and metamorphs to some unknown degree. Possible effects include increased risk of predation or displacement due to longer periods of immobility or low mobility. The water temperature monitoring data and the visual survey data would be used to determine how the proposed minimum flows would affect other foothill yellow-legged frog life stages.

If the foothill yellow-legged frog or mountain yellow-legged frog populations are negatively affected by changes in flows and ramping rates specified in a new license and subsequent water temperature changes, then monitoring could identify these factors and could provide a timely adaptive management mechanism(s). The adaptive management measures would be implemented as needed, based on monitoring and streamflow gaging results, to protect foothill yellow-legged frogs, mountain yellow-legged frogs, and other amphibians and reptiles from detrimental flow releases in the Project-affected reaches.

To detect the effects of new license conditions on amphibian populations, lag times need to be incorporated into the design and interpretation of monitoring because the response of breeding populations may not be detected for years after the new discharge regimes have changed conditions for spawning and tadpole rearing (Kupferberg, 2006). This is a common problem because many amphibian species have greater than 2 years until sexual maturity. The proposed monitoring would provide an index of long-term changes in amphibian populations, following sufficient response time to streamflow modifications and other potential impacts.

As discussed previously, PG&E proposes changes in Project operations, such as minimum flows and recreational flows which could affect special status reptiles and amphibians in the Chili Bar reach. Monitoring would determine the presence and distribution of these special status species throughout the term of the license. As a result, monitoring would identify the effects of changes in streamflow on various life stages of special status reptile or amphibian and allow changes to take place through the Adaptive Management Program. Because monitoring would occur for 2 years every 5 years, it would provide index of long-term changes in amphibian populations, following sufficient response time to streamflow modifications.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Monitoring and adaptive management requirements would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs, western pond turtles, and mountain yellow-legged frogs would be the same as those described under the Proposed Action.

Large Woody Debris

Large woody debris is a critical component of functional and productive aquatic ecosystems and creates habitat for amphibians and macroinvertebrates. The Project reservoirs trap large woody debris and prevent downstream transport. Currently the large woody debris that accumulates in Project reservoirs is stockpiled and burned.

In Proposed Articles 1-9 and 2-7, *Large Woody Debris*, SMUD and PG&E, respectively, propose to allow mobile instream large woody debris equal to or greater than both 20-centimeters wide by 12-meters long (~8 inches by 39.5 feet) to continue downstream of the dams, provided conditions are safe and there is reasonable access and working conditions to do so. Smaller sizes may also be moved but SMUD would not be required to do so.

In Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes, in cooperation with the Forest Service, CDFG, and the Consultation Group, to identify all the large woody debris that is considered hazardous to boaters. The large woody debris would be relocated within the channel, with the Forest Service approval.

Our Analysis

The measures to pass large woody debris downstream of the dams would benefit foothill yellow-legged frogs and other amphibians and reptiles by providing substrate for macroinvertebrates, trapping organic material and sediment, creating pools, and slowing water velocity during peakflows.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. Large woody debris management would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs and other amphibians would be the same as those described under the Proposed Action.

Secondary Effects of Wildlife and Plant Protection Measures

Project-related construction, operations, and maintenance activities that occur in riparian and aquatic habitats or migratory corridors may directly or indirectly affect foothill yellow-legged frogs and mountain yellow-legged frogs. The following measures to protect wildlife in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, are applicable to foothill yellow-legged frogs and other Forest Service Region 5 sensitive amphibians in Project-affected areas.

SMUD would complete a biological evaluation, including any necessary surveys, prior to new construction or maintenance authorized by the license on National Forest System lands that may affect Forest Service sensitive plant or wildlife species or its habitat. SMUD would include the Forest Service recommendations and ansy mitigation measures for the protection of sensitive species and/or their habitats in the biological evaluation.

If occurrences of Forest Service sensitive plant or wildlife species are detected prior to or during on-going construction, operation, or maintenance of the Project or during Project operations, the licensee(s) would immediately notify the Forest Service and FWS. If the Forest Service determines that the Project-related activities are adversely affecting the sensitive species, SMUD would, in consultation with the Forest Service and FWS, develop and implement appropriate protection measures.

Our Analysis

The wildlife protective measures in Proposed Article 1-12 and 2-9, *Wildlife and Plant Protection Measures*, would protect foothill yellow-legged frogs and other Forest Service sensitive amphibians from Project construction, operation, and maintenance activities that occur on National Forest System lands and have the potential to affect individuals, populations, and/or their habitats. Biological evaluations, surveys, and mitigations to protect these species would be developed in consultation with the FWS.

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The wildlife protection measures would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on foothill yellow-legged frogs and other amphibians would be the same as those described under the Proposed Action.

Secondary Effects of Recreational Measures

Project facilities and modifications proposed for recreational resources have the potential to affect terrestrial resources. Construction, expansion, and improvement of recreational facilities could result in the disturbance and loss of vegetation. Recreational fish stocking may increase the abundance and distribution of foothill yellow-legged frog and mountain yellow-legged frog predators.

The applicants both propose recreational enhancements, as specified in Proposed Articles 1-19, *Specific Recreation Measures* and 2-13, *BLM Recreation Improvements*. The specific recreational measures are described in greater detail in section 3.3.6, *Recreation Resources*. Specific measures proposed by SMUD that would result in vegetation disturbance include: (1) improvement or relocation of an existing trail on the west shoreline of Buck Island reservoir; (2) reconstruction or relocation of two trails in the high country near Rubicon development; (3) expansion of the Northshore Recreational Vehicle campground in the Loon Lake development; (4) construction of a new campground on the south shore of Loon Lake; (5) hardening an additional area of the Airport Flat campground within the Gerle Creek reservoir area; (6) extension of the Angel Creek trail within the Gerle Creek reservoir area; (7) additional parking area near the Azalea Cove campground within the Union Valley reservoir area; (8) expansion the West Point campground within the Union Valley reservoir area; (9) completion the Union Valley bike trail; (10) construction of access trails from North Union Valley Road; (11) construction of access trails from Icehouse Reservoir Lakeshore Road; (12) construction and development of the Highland Point day use area within the Ice

House reservoir area; (13) construction and development of the Upper Silver Creek Ice House day use area; (14) extension of the Ice House Mountain bike trail; (15) construction of boat launch sites at Slab Creek reservoir at Forebay Road; and, (16) construction of boat launch sites near the Slab Creek dam.

Under Proposed Article 1-26, *Fish Stocking*, SMUD would match the amount of fish stocked by CDFG, up to a total of 50,000 pounds for either CDFG or SMUD, of fish per year. SMUD would provide a minimum of 25,000 pounds of fish per year. The stocked fish would be distributed in Loon Lake, Union Valley, and Ice House reservoirs, as directed by CDFG.

Specific measures proposed by PG&E which would result in vegetation disturbance includes a gravel parking area off of Rock Creek Road and a new trail from the parking area to Chili Bar reservoir.

Our Analysis

Construction and improvements on new and existing recreational areas would cause the loss of some vegetation and wildlife habitat and create conditions favorable for the spread of noxious weeds. The special status plant, wooly violet occurs in numerous places around Union Valley reservoir, including near campgrounds. Additionally, increased recreational use could potentially increase human disturbance to wildlife. One of the goals of the proposed recreational improvements, however, would be to minimize dispersed recreation, which can affect vegetation and wildlife susceptible to human disturbance such as California spotted owl and nesting waterfowl. The loss of large areas of vegetation would likely have minor effects on wildlife from loss of habitat and displacement. The vegetation lost at the remaining areas is minimal and would be unlikely to affect wildlife. The proposed wildlife and plant protection measures and the noxious weed and vegetation management plans, discussed above, would limit potential effects of recreational improvements on special status species and the spread of noxious weeds. Recreational fish stocking may adversely affect mountain yellow-legged frogs in Loon Lake (elevation 6,410 feet). Union Valley and Ice House reservoirs are probably too low in the watershed for fish stocking to affect mountain yellow-legged frogs (5,450-foot and 4,870-foot elevation, respectively). Fish stocking may also adversely affect foothill yellow-legged frogs in the reaches downstream of these reservoirs, particularly Ice House dam reach, due to escapement.

The expansion of recreational facilities at the Chili Bar Project would result in the loss of some vegetation and wildlife habitat and create conditions favorable for the spread of noxious weeds. The vegetation lost would be minimal and would be unlikely to affect wildlife. The proposed wildlife and plant protection measures and the noxious weed and vegetation management plans, discussed above, would limit potential effects of recreational improvements on special status species and the spread of noxious weeds. Fish stocking is not proposed for the Chili Bar dam reach.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be built. Because no recreational developments are planned for Iowa Hill, the effects would be the same as for the Proposed Action.

Bald Eagle

The state endangered bald eagle currently nests at Loon Lake and Union Valley reservoirs. In addition to nesting bald eagles at Union Valley and Loon Lake reservoirs, wintering bald eagles can be found throughout the UARP area. No nesting or wintering bald eagles were observed during relicensing surveys within the Chili Bar Project boundary or the Iowa Hill development. Project operations, maintenance, and recreation all have the potential to disturb nesting bald eagles, decreasing their productivity. Additionally, electrocution or collisions with Project transmission lines could injure or kill bald eagles.

SMUD proposes, as specified in Proposed Article 1-5, *Monitoring Program*, to develop and implement a bald eagle monitoring plan within 6 months of license issuance in consultation with the Agencies. The plan would require SMUD to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS to ensure that bald eagle nesting is not being affected by Project-related activities. Additionally, SMUD proposes, as specified in 1-12, *Wildlife and Plant Protection Measures,* to develop an Avian Protection Plan within 1 year of license issuance, approved by FWS, that addresses retrofitting the problem Project transmission lines, to meet the design and siting standards established by APLIC standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994).

Our Analysis

Although bald eagles were federally delisted from the ESA on June 28, 2007, they continue to be federally protected by both the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Bald eagles are sensitive to a variety of human activities, especially during the nesting season. If bald eagles are disturbed during nesting or foraging, they have to expend additional energy and time being flushed from their nest or locating a different foraging area. If the disturbance is great enough, bald eagles may abandon their nests, reducing the productivity of that nest territory. Project activities that could disturb bald eagles include helicopter flights for inspection and maintenance and Project recreation, such as boating, fishing, hiking, camping, etc. Each individual nesting bald eagle pair has a different sensitivity to disturbance, based on such factors as acclimation and nest tree screening.

SMUD uses helicopters to access remote locations, primarily at the Loon Lake, Rubicon, and Buck Island reservoirs, although SMUD may occasionally fly over the Union Valley reservoir. The Loon Lake bald eagle nest was first observed in 2003. Prior to confirmation of bald eagle nesting, helicopter flights often flew near this location; however, since then SMUD observes a 0.5-mile buffer around the nest site. As long as 0.5-mile helicopter flight buffers are maintained around all nest sites, it is unlikely helicopter flights would adversely affect the bald eagle.

Extensive recreational facilities are located on Union Valley reservoir, including 11 campgrounds, three public boat launching ramps, and a paved bike/pedestrian path along the east side of the reservoir that passes directly through the nest area at Granlees Point. The Forest Service also manages a number of recreational facilities at Loon Lake reservoir, including developed and undeveloped campgrounds, boat launches, day use facilities, OHV areas, and numerous hiking trails including the Rubicon hiking trail that passes within 100 meters of the nest tree used in 2004. Several reconstructed, expanded, or new recreational facilities are proposed for both Union Valley and Loon Lake reservoirs (see section 3.3.6, *Recreation Resources*), including: (1) expansion of the Northshore Recreational Vehicle campground in the Loon Lake development; (2) construction of a new campground on the south shore of Loon Lake; (3) additional parking area near the Azalea Cove campground within the Union Valley reservoir area; (4) expansion the West Point campground within the Union Valley reservoir area; (5) completion the Union Valley bike trail; and (6) construction of access trails from North Union Valley Road.

Between 1986 and 2005, the Union Valley bald eagle nest territory produced 0.61 young/active breeding pair, which is below the Pacific Bald Eagle Recovery Plan (FWS, 1986) goal of 1 young/active breeding pair. Successful hatching was only observed in 2004 at the Loon Lake nesting territory; however, both bald eagle hatchlings died when they fell from the nest. The Bald Eagle and Osprey Technical Report (DTA, 2004f) suggests that late spring storms with unseasonable freezing temperatures and precipitation alternating between rain and snow during nesting season is the cause of the low productivity. Although it is likely the nesting bald eagles are accustomed to the current level of recreation at Union Valley and Loon Lake reservoirs, the Proposed Action would increase recreational facilities and therefore use. Although most Project recreation occurs during summer months, winter recreation also occurs with camping, cross-country skiing, snowshoeing, and snowmobiling.

Electrocution and/or collision with Project transmission lines also can adversely affect bald eagles. As discussed in section 3.3.4.2, *Terrestrial Resources*, the Bird-Powerline Associations Technical Report (DTA, 2004c) identified three transmission lines that do not met the design and siting standards for avoidance or minimization of bird electrocutions and collisions (APLIC, 1996, 1994): (1) the Jones Fork-Union Valley 69-kV line; (2) the Brush Creek 12-kV tap line; and (3) high-elevation segments of the transmission line from Loon Lake powerhouse to just west of Camino powerhouse, including the Jones Fork-Union Valley transmission line segment, and an isolated segment near White Rock powerhouse that have overhead groundwires. The risk of bird electrocution increases when transmission lines do not have adequate spacing between conductors or the lines and the ground. This is especially true for highly susceptible raptors with large wing spans, like the bald eagle. Additionally, bald eagles are at risk for collision with transmission lines with overhead groundwires because their small size makes them less visible to birds. The proposed measure to prepare an avian protection plan would address retrofitting transmission lines to have them meet APLIC standards. Once all transmission lines meet these standards, the potential for avian electrocution or collision would be minimized.

SMUD's proposal to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS would allow nest productivity numbers to be assessed to determine if Project recreation is adversely affecting bald eagle fledging success. If monitoring shows Project activities are adversely affecting bald eagles, the adaptive management program proposed in Proposed Article 1-6, *Adaptive Management Program*, would allow Project activities to be changed. The monitoring, combined with making the 0.5-mile helicopter nest buffer official and preparing an avian protection plan, would minimize adverse effects on bald eagles and would be consistent with federal Bald Eagle Management Guidelines (FWS, 2007); however, in all, the UARP would be likely to adversely affect bald eagles.

Bald eagles are not known to occur in the vicinity of the Chili Bar Project. Therefore, the Chili Bar Project would not affect bald eagles.

Habitat Loss and Temporary Disturbance

The habitat within and adjacent to the proposed Iowa Hill development contains habitat for a number of plant and wildlife species, including species such as mule deer, California spotted owls, and myotis bats. Construction of the proposed development would clear approximately 141.5 acres of land. The loss of this habitat, as well as temporary disturbance during construction, could affect wildlife.

SMUD proposes to mitigate for the loss of wildlife habitat, as specified in Proposed Article 1-41, *Terrestrial Resources*, by purchasing lands prior to construction with an equivalent habitat value (or a conservation easement for an equivalent habitat value) to be managed as wildlife habitat over the term of the license. The Forest Service, FWS, and CDFG would determine the in-kind value of lands proposed to be purchased or obtained.

Our Analysis

Iowa Hill Development

Construction of the Iowa Hill development would require the clearing of approximately 141.5 acres of land, including approximately 95.4 acres for the upper reservoir, berm, and switchyard, 22.3 acres for the transmission line, 3.4 acres for the new road, and 20.4 acres of temporary use areas. The upper reservoir, berm, and switchyard would result in the loss of upland mixed-conifer forest and the transmission line would result in the conversion of mixed conifer forest to non-forested montane shrubland habitat. The temporary construction area would be revegetated. No riparian vegetation or wetlands would be affected by construction of the proposed development. The only wetland located within the Iowa Hill development is a small riverine wetland within the proposed transmission line corridor. SMUD would not place structures in this wetland; therefore, construction of the Iowa Hill development would not require wetland fill.

Special status species that would lose habitat as the result of Iowa Hill construction include the mule deer and California spotted owl. Construction of the Iowa Hill development would generally result in the loss of mule deer thermal cover, generally fair hiding cover, and localized areas of good quality forage habitat. However, construction of the proposed transmission line would eventually provide valuable foraging habitat and hiding cover for mule deer. The upper reservoir would cause some habitat fragmentation and hindrance to migrating mule deer. Additionally, during construction, noise and activity associated with site construction would temporarily cause mule deer to avoid the area surrounding construction. Suitable California spotted owl habitat exists within the Iowa Hill development habitat; however, there are no known nests within the development boundary. Construction of the Iowa Hill development would result in the loss of potential foraging and nesting habitat and temporary avoidance of the area during construction due to noise and activity.

Additional species that would lose habitat include the northern goshawk and various bat species. No northern goshawks were located within the Project during relicensing surveys and the closest Protected Activity Center is almost 1 mile away. The site does contain potential nesting and foraging habitat; however, which would be lost as a result of Project construction. Although no special status bats were located during relicensing surveys, habitat is suitable for bats utilizing snags, tree bark and man-made structures as roosts. Tree-roosting bat species would lose foraging habitat, whereas open water foraging species may benefit from the creation of new habitat.

SMUD proposes to mitigate for the loss in habitat by purchasing or acquiring a conservation easement of equivalent habitat value and managing it as wildlife habitat. Although we concur with the proposed measure, we are unable to analyze whether or not the proposed measure would adequately mitigate for the lost habitat without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals would be applied to the property. Once the property is purchased or obtained, we could assess its value at that time and ensure that appropriate wildlife management goals are met to mitigate for the loss of upland mixed-coniferous forest.

In addition to the proposed land purchase, SMUD proposes several other measures that would protect terrestrial resources during Iowa Hill construction. A measure contained within Proposed Article 1-12, *Wildlife and Plant Protection Measures*, discussed above, would require SMUD to conduct a biological evaluation, including necessary surveys prior to any new construction or maintenance on National Forest System lands. Conducting a biological evaluation and nest surveys prior to the proposed construction for rare species such as the California spotted owl and northern goshawk would ensure that breeding spotted owls or goshawks have not begun nesting in close proximity to the Project. The standard Forest Service 4(e) condition no. 3-24 prescribes SMUD to prepare and implement an erosion control plan which includes a requirement to revegetate disturbed areas with native plants. Additionally, SMUD proposes an invasive weed and vegetation management plan which also would implement sediment and erosion control and revegetation efforts, all of which would minimize the effects of Iowa Hill construction on wildlife habitat.

3.3.4.3 Cumulative Effects

Private land development, public land use, and hydropower development have cumulatively affected foothill yellow-legged frogs and mountain yellow-legged frogs in the American River Basin due to construction of roads, multiple land use practices, facilities and operations, and other development that fragment breeding populations.

Flow releases to benefit coldwater fisheries during the summer and early fall, and Project reservoirs may isolate foothill yellow-legged frog breeding populations. For example, it is likely that foothill yellow-legged frogs located in lower Slab Creek dam reach and lower Camino dam reach are reproductively isolated by coldwater water releases in upper Slab Creek dam reach and the Slab Creek reservoir (Kupferberg, 2006). The proposed minimum flow releases would not increase or decrease the current population fragmentation.

Previous management activities on National Forest System lands have reduced the amount and suitability of California spotted owl, northern goshawk, sensitive bat tree roosting, and Pacific fisher habitat in the Iowa Hill area. These include the Independence Cable Timber Sale, vegetation removal for the PG&E transmission line, and the Slab Creek Insect Salvage Sale. These Projects have reduced interior forest habitat and increased fragmentation of existing spotted owl, goshawk, and fisher habitat. These Projects have not substantially altered habitat availability for sensitive bat species, however, and, by increasing edge habitats may have improved foraging opportunities in some areas. Based on the Eldorado National Forest Schedule of Proposed Actions, there are no additional habitat altering activities currently being planned within or adjacent to the analysis area. Timber harvest on intermixed private timber lands within the area have contributed to a reduction of habitat. These effects, combined with the direct and indirect effects of the Iowa Hill development on up to 141 acres of habitat, would cumulatively reduce the ability of the area to support spotted owls, goshawks, and fisher, and would cumulatively affect the amount of foraging habitat available for owl site ED123. These effects also would cumulatively reduce the amount of bat roosting habitat available; however, as previously described, the presence of additional habitat edge and open water could improve foraging conditions for bats. Assuming that the Project is unlikely to affect maternal roost sites for pallid bats or Townsend's big-eared bats, the Project is unlikely to result in substantial cumulative effects on sensitive bat species.

3.3.4.4 Unavoidable Adverse Effects

The construction of the Iowa Hill development would result in the permanent alteration of 121.5 acres of wildlife habitat, of which 94.5 acres would be permanently lost to Project facilities.

3.3.5 Threatened and Endangered Species

3.3.5.1 Affected Environment

Five plant and animal species federally listed as threatened or endangered could be affected by the proposed Projects. These include the endangered Pine Hill ceanothus (*Ceanothus roderickii*) and Pine Hill flannelbush (*Fremontodendron decumbens*) and the threatened Layne’s butterweed (*Seneco layneae*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and California red-legged frog (*Rana aurora draytonii*).

Pine Hill Endemic Plants

The Pine Hill formation, located in the western-most part of the UARP area, occurs on a formation of gabbro soils which support a number of rare plants, including three federally listed plants: Pine Hill ceanothus, Pine Hill flannelbush, and Layne’s butterweed. Two additional species, the endangered El Dorado bedstraw (*Galium californicum*) and Stebbin’s morning glory (*Calystegia stebbinsii*) have the potential to occur within the Pine Hill formation; however, they were not located during special-status plant surveys conducted by SMUD, and therefore are assumed to not occur within the Project boundary. A UARP transmission line crosses the Pine Hill Preserve, which comprises the Pine Hill and Penny Lane preserve units identified in the 2002 FWS recovery plan for gabbro soil endemics in the Central Sierra Nevada foothills.

Pine Hill ceanothus is a low-statured shrub that flowers during May–June. It is restricted to chaparral in open rocky areas on gabbroic soils of the Pine Hill formation. Potential habitat in the UARP area totals approximately 247.5 acres. It occurs primarily as a low shrub layer underneath taller native chaparral vegetation, but dense, tall stands of older chaparral appear to be less suitable for the species. Pine Hill ceanothus also occurs at the edges of road corridors and other periodically disturbed areas, including the middle of infrequently used transmission line access roads, and under transmission towers. However, it does not appear to tolerate frequently recurring or severe disturbance (e.g., OHV use or development). All known occurrences are within the bounds of the Pine Hill formation of El Dorado County; they are distributed among the northern, central, and southern parts of the formation.

SMUD conducted a detailed study of special-status plants within the Project boundary, including comprehensive field surveys during 2003 along the UARP transmission line near the Pine Hill Preserve. Survey methods followed California Native Plant Society guidelines for rare plant surveys. The UARP transmission line corridor runs approximately northeast-southwest, traversing private lands proposed for inclusion in the Pine Hill and Penny Lane units of the Pine Hill Preserve, but not currently protected. One large occurrence of Pine Hill ceanothus, consisting of thousands of stems, was located in the transmission line corridor within and near the proposed Pine Hill Unit. The plants form a vigorous understory in sparse to dense chaparral within the transmission line corridor, and also occur near roads and in clearings, including those created for transmission towers and associated vehicular access. Because Pine Hill ceanothus is a multi-stemmed plant and roots at the nodes (a form of asexual reproduction), it is unclear how many individual plants are present in this occurrence.

Pine Hill flannelbush is a perennial shrub that flowers from late April to early July. It is restricted to gabbroic soils of the Pine Hill formation in El Dorado County, California. It occurs in chaparral and cismontane woodland communities at elevations ranging from approximately 1,400 to 2,500 feet. Potential habitat identified in the UARP area totals approximately 247.5 acres. Of these, less than 1 acre is currently occupied by Pine Hill flannelbush. It most often occurs at the edges of road corridors or other periodically disturbed areas.

The special-status plant surveys located four populations of Pine Hill flannelbush within the Pine Hill Unit; these populations appear to be comprised of fewer than 15 plants, although the number of genetically distinct plants was unclear because the species often reproduces asexually. The plants were clustered near roads or in clearings, including clearings created for transmission line towers and access roads, and the occurrences had not been previously reported in the California Natural Diversity DataBase.

Layne's butterweed is a perennial herb that flowers from April to July. It occurs in chaparral in open rocky areas on gabbroic soils, including disturbed areas, or less frequently on serpentine. Potential habitat identified in the UARP area totals approximately 247.5 acres. The species most often occurs at the edges of road corridors or other periodically disturbed areas, although it does not tolerate frequently recurring or severe disturbance (e.g., OHV use or development). Most known occurrences occur within and adjacent to the Pine Hill formation of El Dorado County; there are occurrences in the northern, central, and southern parts of the formation. There are also a small number of records from elsewhere in El Dorado County, Tuolumne County, and Yuba County. Known occurrences range in elevation from approximately 650 to 3,300 feet and primarily occur on privately owned lands.

The special-status plant surveys located two large, diffuse occurrences of Layne's butterweed within the transmission line corridor, estimated to support several hundred to several thousand plants. The plants were clustered near roads and clearings, including those created for transmission towers and associated access roads.

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetle habitat consists of elderberry thickets located in riparian woodlands, oak woodlands, or grasslands within the Central Valley watershed below 3,000 feet elevation. Adult valley elderberry longhorn beetles deposit their eggs in the bark of living elderberry plants and larvae bore into the pith of stems. The beetles' use of elderberries is not readily apparent; often the only exterior evidence is an exit-hole created by the larva just prior to pupation. A variety of branch sizes are used for larval development and pupation; although, stems 2-4 inches in diameter at the exit hole have been reported to be used most often. Infrequently, exit holes have been found in smaller branches less than 1.5 inches in diameter, but generally not in branches less than 1.0 inch in diameter. Thus, larvae appear to be distributed primarily in large, mature plants with stems greater than 1.0 inch in diameter near ground level.

SMUD conducted searches for elderberry plants (not valley elderberry longhorn beetle presence or exit holes) in the Project area via helicopter, automobiles, and on foot and included all areas where SMUD had legal access (e.g., ownership/easement rights, public lands) within 100 feet (as per FWS protocols for buffer zones) of Project features below 3,000 feet elevation where valley elderberry longhorn beetles could be directly or indirectly affected by Project construction (e.g., facility development or expansion, road construction), operation (e.g., recreational developments), and maintenance (e.g., vegetation clearing). The search area along the transmission line corridor included the area within approximately 200 feet of the transmission line centerline (i.e., 400-foot total width; this includes the 200-foot defined right-of-way plus the 100-foot-wide buffer on each side of the right-of-way). Elderberry shrubs or clumps were located at eight sites within the 400-foot-wide search area along the Project transmission line corridor during 2002 and 2003 surveys. Plants found at these locations were located directly beneath the transmission line or immediately adjacent to the line, and in one location a large plant was growing entirely within the steel lattice cage of the support tower.

With the exception of the plants found along the UARP transmission line corridor, no elderberry plants were found adjacent to existing Project facilities (i.e., dams, powerhouses, switchyards, appurtenant facilities) below 3,000 feet. Similarly, no elderberry plants were found at the site of the proposed Iowa Hill development or within the Chili Bar Project boundary. Stream reaches below UARP facilities were not included in the study area because elderberry plants growing along foothill streams generally occur above the high water mark unlike willow and cottonwood. As a result, elderberry plants that support the valley elderberry longhorn beetle are not likely to occur in stream fluctuation zones.

California Red-legged Frog

The historical range of the California red-legged frog extended through Pacific slope drainages from at least as far north as Sonoma County, California along the coast (possibly as far north as Mendocino County, if analyses by Shaffer et al. 2004 are valid) and inland from the vicinity of Redding, Shasta County south to Baja California, Mexico, including the Coast Range, Transverse Ranges, Central Valley, and west slope of the Sierra Nevada Range. Nearly all occurrences were at elevations below 3,500 feet. Biologists estimate that the California red-legged frog has been extirpated from at least 70 percent of its historical range, including an estimated 99 percent of known occurrences in the western foothills of the Sierra Nevada. Most of the known remaining populations are located in coastal counties from Ventura County north. In the Sierra Nevada foothills, very few populations are known to be extant, but there are recent records from each of the following counties: El Dorado, Placer, Nevada, Yuba, and Butte.

The California red-legged frog lays eggs from late November to late April in quiet water of stream pools, backwaters, ponds, and marshes. Emergent vegetation (often cattails or bulrushes) serves as attachment sites or braces for the egg masses. Larvae remain in these aquatic habitats until metamorphosis, which typically occurs between July and September, although over-wintering larvae have been found at some sites. The California red-legged frog requires still or slow-moving water for breeding and tends to remain in proximity (within 200 feet) of aquatic habitats except when dispersing. Occupied sites typically have dense riparian or shoreline vegetation, presumably because these are good foraging habitats and afford hiding cover from predators. The types of vegetation that seem to provide the most suitable structure are willows, cattails, and bulrushes. Hiding cover may also be afforded by partially submerged woody debris and undercut banks. Occupied sites also usually include areas of deep water (greater than 2.3 feet) and generally do not support populations of introduced fishes (such as sunfish, bass, or trout) or bullfrogs.

Seasonal dispersal of the California red-legged frog may occur upstream, downstream, or upslope of breeding habitats. Seasonal movements as far as 1 mile between aquatic habitats have been documented, and California red-legged frogs have been found in streams more than 2 miles from any possible breeding site. At various times, including during summer drought, frogs may use perennial seeps, springs, or deep pools in intermittent streams when other aquatic habitat are dry, or may seek shelter in existing burrows or the cracks at the bottoms of dry pools.

SMUD, in collaboration with PG&E, conducted a detailed study identifying potential California red-legged frog habitat within 1 mile of the proposed Projects' reservoirs and reaches, up to 5,000 feet in elevation. Potential habitat was initially identified at 12 sites (see table 3-59); however, field examinations further refined the areas of potential habitat. Following the potential habitat identification, Stillwater Sciences conducted protocol-level visual encounter surveys (VES) in areas identified as high or moderate habitat quality. No California red-legged frogs were located during these surveys within either the UARP or Chili Bar Project area; however, two areas of potential habitat were not surveyed due to lack of access.

Table 3-59. Description of sites and survey results at sites with potential habitat for California red-legged frog.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
UARP					
GC-8: SF Rubicon River	4,987	5 (3 day, 2 night)	High	Mainly pool with some low-gradient riffle and a minimal amount of run/glide. Boulder substrate with some silt, cobble, sand, gravel and bedrock. Ample margin vegetation and a large amount of aquatic and terrestrial cover.	No frogs of any species were found.
UV-1: Jones Fork Silver Creek	4,902	5 (3 day, 2 night)	High	Mainly run/glide with some pool. Sand substrate with small amounts of gravel. Several side/split channels, multiple lateral/point sand bars, and a small tributary that entered on the left bank near the top of the site. Margin vegetation (mostly grasses) in a majority of the reach	No frogs of any species were found.
UV-2: Big Silver Creek at Ice House Road	4,919	None	Moderate	Some side channel pool habitat. Large boulders in channel. Water velocity high near margins of channel	Site exhibited less habitat complexity than UV-1, and water velocity was unfavorably high.
UV-3: Tells Creek downstream of Ice House Road	5,065	None	High	Step-pool, moderate to high gradient morphology. Large boulders, some backwater pools. Downed wood	Lower suitability then UV-1
SC-3: SFAR at Mosquito Road Bridge	1,352	None	Moderate	Large substrates, shallow pools. High Gradient. Little vegetation along margin of channel	Site exhibits lower suitability than expected because of high stream gradient and limited vegetation cover.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
Chili Bar					
CB-2: Weber Creek	522	4 (2 day, 2 night)	Moderate	Perennial creek. Primarily pool and low-gradient riffle. The substrate was mainly bedrock, boulder and cobble. Abundant margin vegetation, grasses and overhanging vegetation. Aquatic vegetation (especially algae) was very thick in some parts.	California red-legged frogs not found. Bullfrogs abundant.
CB-4.1: Stock Ponds (A)	900	4 (2 day, 2 night)	Moderate	The larger of the two ponds, substrate is primarily silt with some sand. Some margin vegetation and grasses, some overhanging vegetation. Maximum water depth is 15 feet; water is very turbid and discolored.	California red-legged frogs not found. Bullfrogs present.
CB-4.2: Stock Ponds (B)	900	4(2 day, 2 night)	Moderate	The smaller of the two ponds. Substrate is predominantly silt with some sand. Abundant margin vegetation, mostly forbs, some emergent and submerged vegetation, ample aquatic vegetation and large woody debris. Shallower than Pond A.	California red-legged frogs not found. Bullfrogs present.
CB-7B: Hastings Creek	650	5 (3 day, 2 night)	Moderate	Small, perennial creek with split channels. Primarily run/glide with some low gradient riffle and pool. Substrates are mainly cobble and gravel. Margin grasses and forbs present in all of reach, ample willow and alder canopying stream.	California red-legged frogs not found. Bullfrogs present.

Site Location	Elevation (ft)	Number of VES Site Visits	Original Suitability Rating[a]	Site Characteristics	Conclusions
CB-8B Greenwood Creek	672	5 (3 day, 2 night)	Low	Small, perennial creek with split channels. Mainly pool, run/glide and low-gradient riffle. Substrates are mainly cobble, gravel, and boulder. Margin vegetation, terrestrial cover, and overhanging vegetation are prominent. Willow and grasses appear dominant.	California red-legged frogs not found. Bullfrogs present.
CB11: Stock Ponds	824	None	Moderate	Stock ponds with emergent vegetation around the edges.	VES were planned but access was not granted.
CB13: Five Stock Ponds	832	None	Moderate	Stock ponds with emergent vegetation (cattails) around the edges.	The site is on private property and was not accessible.

Note: Visual encounter survey.

[a] Original habitat suitability rating of stream sites also reflected suitability for other target species: the foothill yellow-legged frog and/or mountain yellow-legged frog.

3.3.5.2 Environmental Effects

Pine Hill Endemic Plants

SMUD proposes, as specified in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, to not undertake maintenance under transmission lines within the Pine Hill Rare Plant Preserve until consultation with the BLM, FWS, and CDFG has been completed. Additionally, they propose to ensure a biological assessment is prepared prior to beginning any activities to construct, operate, or maintain, the UARP that may affect a species proposed for listing or listed under the federal ESA or its critical habitat to evaluate potential effects of the action on the species or its habitat, in consultation with the appropriate federal agency.

Our Analysis

The Pine Hill Preserve contains a high concentration of rare plant species because of the serpentine and/or gabbro soil formations. Three of these species, Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort are federally listed species. Project transmission lines cross through sections of the Pine Hill Preserve. SMUD maintenance on Project transmission line right-of-ways includes vehicle use to access towers on existing roads, mechanical removal of trees, and other vegetation clearing for fire control and to facilitate access. According to SMUD (letter from D. Hanson, Project Manager, Hydro Relicensing, SMUD, Sacramento, CA, to Kimberly D. Bose, Secretary, FERC, Washington, D.C., dated November 30, 2007), within the BLM land in the Pine Hill Preserve, SMUD consults with agency representatives prior to conducting vegetation maintenance. The last time SMUD performed vegetation management in the preserve was in 2002 when select pine trees were pruned or removed to avoid contact with the transmission line wires. Outside of the preserve, SMUD removes pine trees and some oak trees roughly every 3 years. Within the gabbro soils area, SMUD does not use heavy equipment, mowing, or herbicides to manage vegetation.

Vegetation clearing could result in the direct loss of the listed plants. Additionally, transmission line right-of-way maintenance that facilitates access to the right-of-way could increase noxious weed dispersal within the rare plant habitat by providing a vector. Noxious weeds could outcompete the rare plants, decreasing their available habitat. All three of the federally listed species located within the Pine Hill Preserve, however, are currently found in open habitats such as transmission lines and road clearings within the UARP area. Transmission line right-of-way maintenance maintains this habitat, which could be beneficial to the three plant species.

Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with the BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species. Additionally, SMUD proposes vegetation and invasive weed management plans, in Proposed Article 1-13, *Vegetation and Invasive Weed Management* Plan, which are described in detail in section 3.3.4.2, *Vegetation and Invasive Weed Management*. The invasive weed management plan would attempt to control current populations of noxious weeds and prevent future populations from being established. The vegetation management plan would address transmission line right-of-way-clearing. Although SMUD's proposal only includes Forest Service land influenced by Project activities, as discussed in section 3.3.4, *Terrestrial Resources*, expanding this plan to cover all land within the Project boundary affected by Project activities would be appropriate. As a result, this plan would protect the Pine Hill endemic plants from noxious weed infestation. The consultation proposed in Proposed Article 1-12, *Wildlife and Plant Protection Measures*, would establish agency-approved maintenance activities to maintain the preferred habitat minimizing effects on the federally listed plants. Although the Proposed Action would minimize possible effects on these species, maintenance activities could still result in the occasional loss of individual plants. As such, the UARP is likely to adversely affect the Pine Hill ceanothus, Pine Hill flannelbush, and Layne's ragwort.

The Chili Bar Project would have no effect on the Pine Hill endemic plants because they do not occur within the Project boundary.

UARP-Only Alternative

Because these species are endemic to the Pine Hill Preserve area which, is outside the Iowa Hill development area, relicensing the Project without the Iowa Hill development would have the same effect on Pine Hill endemic plants as discussed for the Proposed Action.

Valley Elderberry Longhorn Beetle

The federally threatened valley elderberry longhorn beetle's host plant, elderberry, is found within the UARP transmission line. If the valley elderberry longhorn beetle occurs within these shrubs, it could be affected by right-of-way maintenance. SMUD does not proposed any measures specifically designed for the valley elderberry longhorn beetle; however, it does propose, as specified in Proposed Article 1-12, *Wildlife and Plant Protection Measures,* to ensure a biological assessment is prepared prior to beginning any activities to construct, operate, or maintain, the UARP that may affect a species proposed for listing or listed under the federal ESA or its critical habitat to evaluate potential effects of the action on the species or its habitat, in consultation with the appropriate federal agency.

Our Analysis

SMUD observed elderberry, the host species for the valley elderberry longhorn beetle, at 8 locations during 2002–2003 surveys within the UARP area (DTA, 2004e), all either directly underneath or immediately adjacent to the UARP transmission line. Although full protocol valley elderberry longhorn beetle surveys were not conducted, UARP assumed that the elderberry shrubs found within the Project boundary are occupied by valley elderberry longhorn beetles. Maintenance activities on the UARP transmission line and its right-of-way include tree and vegetation clearing, facility inspections, facility replacement, and access road maintenance. All of these activities could potentially result in disturbance to elderberry bushes within the right-of-way, and, therefore, the valley elderberry longhorn beetle. Vegetation management typically does not need to clear low-growing trees or shrubs if they are not a safety hazard to the line.

As part of its draft biological assessment, SMUD proposed to comply with FWS's Valley Elderberry Longhorn Beetle Conservation Guidelines (FWS, 1999), prior to conducting any ground or vegetation disturbing activities within the proposed Project boundary. These guidelines call for protocol level surveys of the area to be disturbed for the presence of the valley elderberry longhorn beetle and its elderberry host plant, protection measures such as fencing and otherwise identifying elderberry plants, and compensation requirements for elderberry plants with one or more stems measuring 1.0 inch or greater in diameter at ground level that may be directly or indirectly affected. Additionally they proposed to provide annual employee environmental awareness program workshops to educate employees and key personnel about the known locations of special status species and habitats. Although these measures were not included in the Proposed Action, implementing them as part of the vegetation management plan proposed in Proposed Article 1-13, *Vegetation and Invasive Weed Management Plan*, would effectively protect elderberry shrubs and any valley elderberry longhorn beetles located within them within the Project boundary from any transmission line maintenance activities by clearly delineating them as areas to be excluded from maintenance. Additionally, valley elderberry longhorn beetle surveys prior to vegetation disturbing activities that comply with the conservation guidelines would further protect the valley elderberry longhorn beetle. Even with implementation of the compliance with conservation guidelines and employee training, adverse effects could still occur. Therefore, the UARP would be likely to adversely affect the valley elderberry longhorn beetle.

The Chili Bar Project would have no effect on the valley elderberry longhorn beetle because elderberry shrubs do not occur within the Project boundary.

UARP-Only Alternative

Because no elderberry plants are found in the Iowa Hill development area, relicensing the Project without the Iowa Hill development would have the same effect on valley elderberry longhorn beetles as discussed for the Proposed Action.

California Red-legged Frog

The Proposed Actions that would affect the foothill yellow-legged frog and the mountain yellow-legged frog described in section 3.3.4.2, *Terrestrial Resources,* also have the potential to affect the California red-legged frog.

Our Analysis

A recovery plan for the California red-legged frog was issued by FWS in 2002. Eight recovery units and core areas in the recovery units were identified for focused recovery actions. The Action Area is within the largest recovery unit, the Sierra Nevada Foothills and Central Valley Recovery Unit, and is between two core areas: Cosumnes River to the south, and Traverse Creek/Middle Fork American River/Rubicon River to the north. FWS designated critical habitat on April 13, 2006. The nearest designated critical habitat is located at Spivey Pond, south of Highway 50, in El Dorado County approximately 3.5 miles from the nearest Project facility.

Much of the Project area is located at elevations above that which is typical for the California red-legged frog and probably not within the historical range of the species. At lower elevations suitable habitat exists, but is limited in extent and is almost entirely associated with tributaries of Project-affected stream reaches, not mainstem reaches, and stock ponds outside of the Project boundary. None of the UARP reservoirs contain suitable habitat for the California red-legged frog.

The closest known extant occurrence is at Spivey Pond, southwest of the town of Pollock Pines, which is approximately 3.5 miles from the nearest Project facility or affected stream reach, none of which contain suitable habitat for the California red-legged frog. Spivey Pond and other historical occurrences in the Weber Creek drainage are also separated from these Project facilities and reaches by a highway (U.S. 50) and by urban and agricultural areas that may constitute barriers to California red-legged frog dispersal. South-north dispersal may also be unlikely because the SFAR lies within a relatively deep, steep-sided valley. The mainstem SFAR reach does not constitute suitable habitat for the California red-legged frog, although three tributaries of the reach might be suitable if bullfrogs were not present. Bullfrogs are also well established in stock ponds that were surveyed within the evaluation area.

The UARP transmission lines span Weber Creek more than 14 miles downstream of Spivey Pond. The towers for the lines are located high on the steep valley slopes on either side of the creek (more than 200 vertical feet above the creek). Therefore, the transmission line has no foreseeable effect on aquatic or riparian habitats along Weber Creek. Areas with extant, documented California red-legged frog occurrences north of the Project on Skunk Canyon Creek, and Brushy Canyon Creek are located more than 25 miles from the action area where Project operations have no effect on hydrology or habitats.

As previously discussed in section 3.3.4.2, predators such as bullfrogs have the potential to keep the California red-legged frog from becoming established. Flow regulation may benefit introduced predatory fishes and bullfrogs, by maintaining flow in areas that would otherwise dry up seasonally. The California red-legged frog is known to persist in areas where ponds or streams dry up seasonally by dispersing to springs or other sources of water, or by aestivating in burrows or in cracks at the bottom of dried pools. Minimum streamflows would ensure that naturally intermittent or ephemeral streams do not dry in summer and could thus benefit predatory species that are unable to survive dry periods (fish and bullfrogs). Predatory bass, crayfish, and bullfrogs were found in lower Slab Creek dam reach and are well established in off-channel stock ponds and tributaries in the Chili Bar Project area, downstream of UARP. The Slab Creek reach is unlikely to dry up even without regulated minimum flows and higher proposed minimum flows in the spring could potentially reduce bullfrog populations by washing the tadpoles downstream.

Although California red-legged frogs are not currently known to occur within the UARP boundary, if they do become established the proposed amphibian monitoring and adaptive management plans (see section 3.3.4.2) would minimize any potential adverse effects on California red-legged frogs, and a biological assessment would be required prior to any ground-disturbing activities that would potentially affect California red-legged frogs. Therefore, because the California red-legged frog is not known to occur within the Project boundary, suitable habitat is limited, and monitoring and adaptive management would minimize any potential effects should it become established, we conclude that the UARP is not likely to adversely affect California red-legged frogs.

No California red-legged frogs were found within the Chili Bar Project area, including tributaries and side stock ponds, during relicensing surveys. The Chili Bar dam reach does not contain suitable for California red-legged frog breeding habitat. Bullfrogs, a California red-legged frog predator, were found to be abundant in potential California red-legged frog habitat (tributaries and stock ponds) during surveys. Flow regulation may benefit introduced predatory fishes and bullfrogs, by maintaining flow in areas that would otherwise dry up seasonally. The Chili Bar reach, however, is a relatively large reach that is unlikely to dry up even without regulated minimum flows and tributaries and stock ponds are not subject to Project-regulated flows. Additionally bullfrogs are well established in off-channel stock ponds and in tributaries. Higher proposed minimum flows in the spring could potentially reduce bullfrog populations by washing the tadpoles downstream. Therefore, it is unlikely the proposed Project would contribute to the proliferation of California red-legged frog predators.

Although California red-legged frogs are not currently known to occur within the Chili Bar Project boundary, if they do become established the proposed amphibian monitoring and adaptive management plans (see section 3.3.4.2) would minimize any potential adverse effects on California red-legged frogs and a biological assessment would be required prior to any ground disturbing activities that would potentially affect California red-legged frogs. Therefore, because the California red-legged frog is not known to occur within the Project boundary, suitable habitat is limited, and monitoring and adaptive management would minimize any potential effects should it become established, the Proposed Action is not likely to adversely affect the California red-legged frog.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed or operated. The Settlement Agreement Articles and other measures that would potentially affect California red-legged frogs would remain unchanged from those described in the Proposed Action. As a result, effects of the UARP-only Alternative on the California red-legged frog would be the same as those described under the Proposed Action.

3.3.5.3 Cumulative Effects

Private land development, public land use, and hydropower development have cumulatively affected the California red-legged frog in the American River Basin due to roading, multiple land use practices, facilities and operations, and other development that fragment breeding populations.

Flow releases to benefit coldwater fisheries during the summer and early fall, and Project reservoirs may isolate California red-legged frog breeding populations. The proposed minimum flow releases would not increase or decrease the current population fragmentation.

3.3.5.4 Unavoidable Adverse Effects

None.

3.3.6 Recreational Resources

3.3.6.1 Affected Environment

Regional Setting

Recreational resources in the region provide for a full range of activities, from tourist-based recreation associated with the historical mining towns in the region, to rural and wilderness activities, such as hiking, fishing and boating. The primary recreational sites in the American River drainage include the Forest Service lands, the towns of Coloma and Placerville, and Folsom Lake.

The numerous lakes and reservoirs in the eastern part of the region, which includes the Project reservoirs, provide a variety of recreational opportunities and varying levels of developed facilities for camping and day-use activities. Paved roads and boat launches at the larger water bodies in the area provide opportunities for motorized boating use. Off-highway vehicle (OHV) use is also popular in the region. There are 12 designated routes or areas for OHV use in the region, most of which are on National Forest System lands or state lands.

Whitewater recreation is another popular recreational activity in the region. Within the American and Rubicon river drainages alone, there are at least 20 whitewater boating runs, most of which are rated class IV and V and provide high quality whitewater recreational opportunities in the spring. The most important whitewater recreation resource in the region occurs on the 19.1-mile reach of the SFAR downstream of the Chili Bar dam. This section of river is the most popular whitewater recreational run in California, with approximately 3,000 to 4,000 visitors per day on summer weekends.

Recreational Resources within the Projects' Boundaries

Recreation at the Projects can be separated into three geographic areas: High Country, Crystal Basin, and Canyonlands. The High Country consists of the area north and east of Loon Lake reservoir. The Crystal Basin includes the area bounded by Loon Lake reservoir on the north to Highway 50 on the south, and Union Valley dam to the west and Wrights Lake on the east. The Canyonlands geographical area extends along the Silver Creek and SFAR drainages from Union Valley dam on the east to Chili Bar Project boundary on the west.

Nearly all shoreline lands surrounding the Project reservoirs within the Project boundary are federal lands managed by the Forest Service and are available for public use. Figures 3-32 to 3-35 show the locations of these facilities.

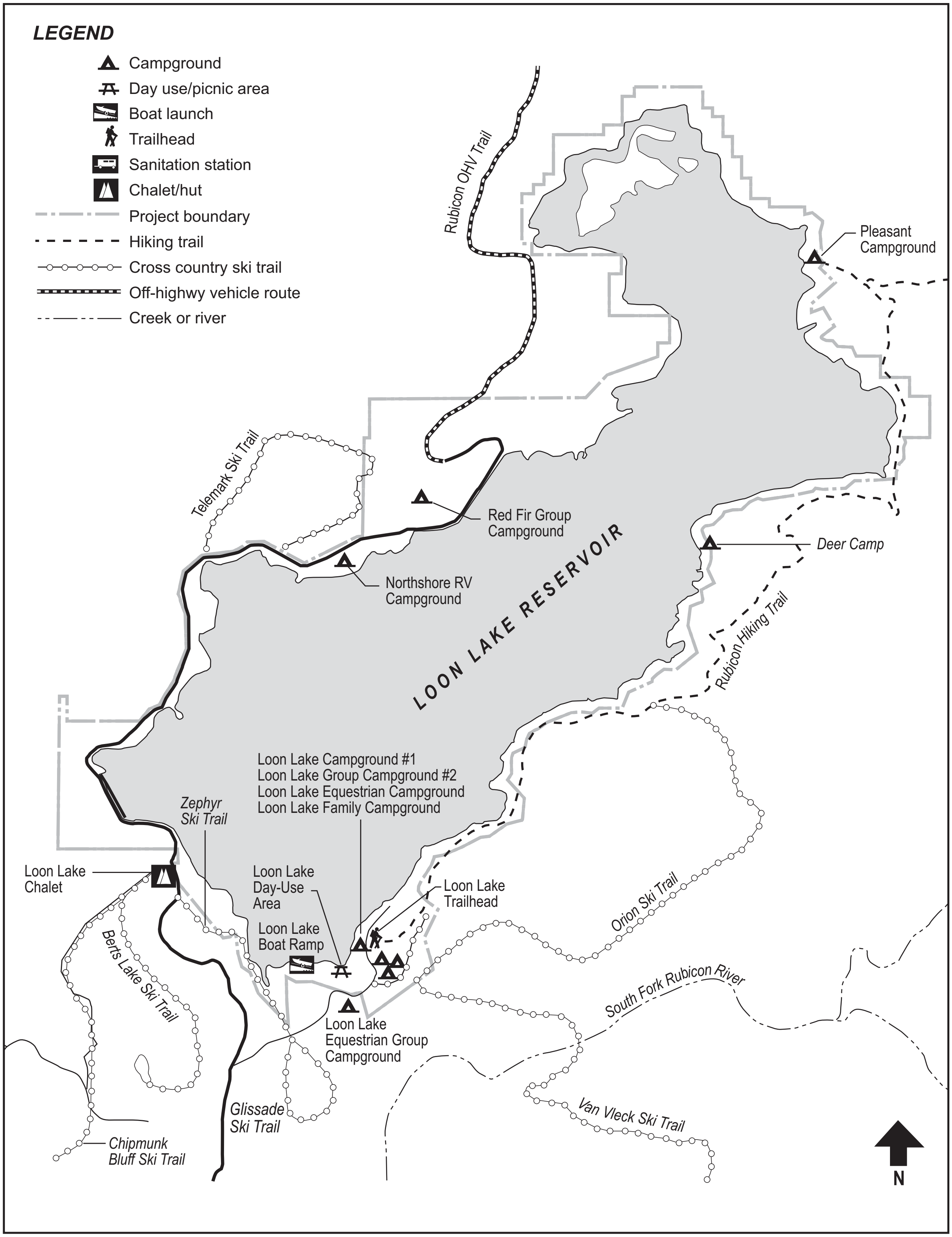

Figure 3-32. Recreational facilities at Loon Lake reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

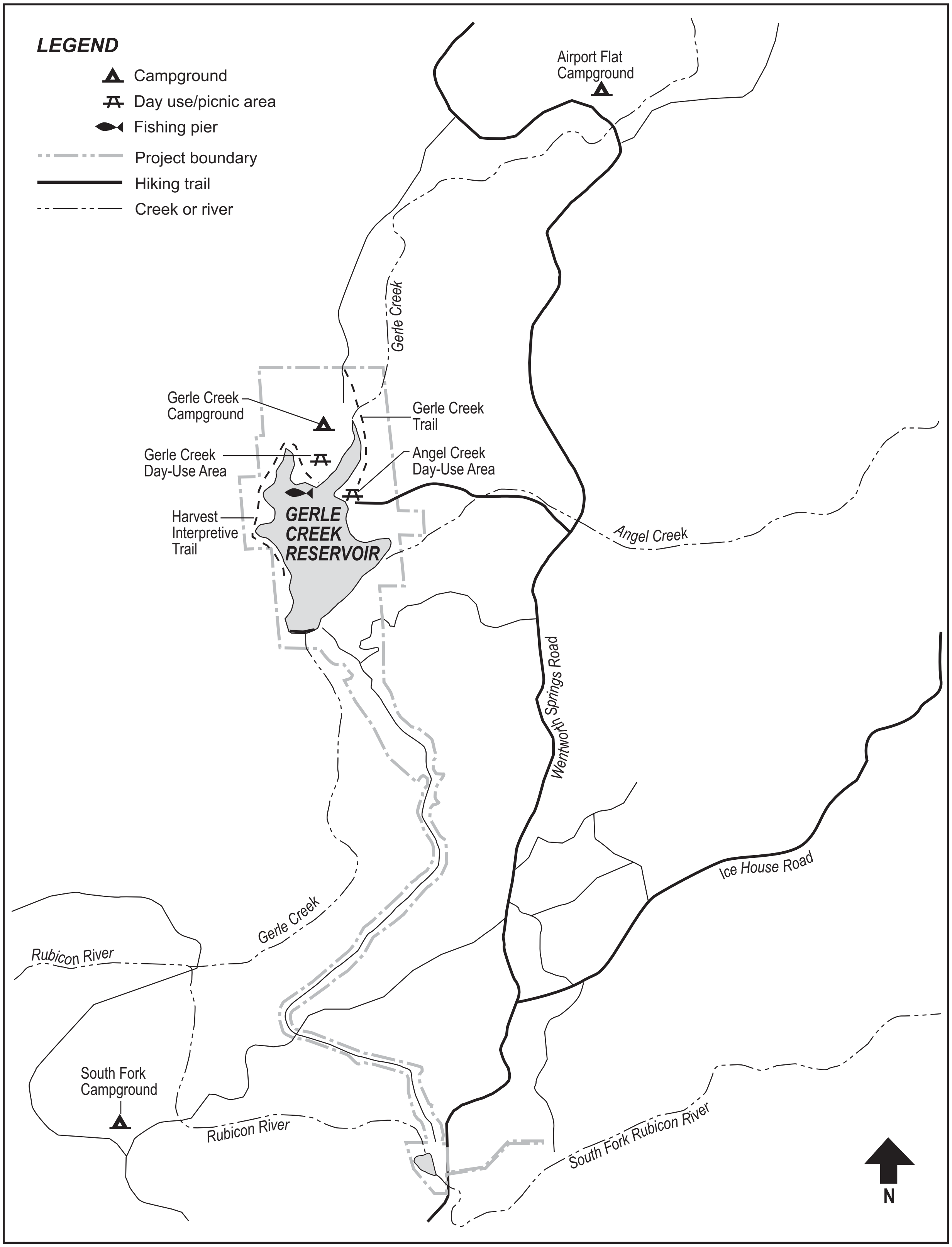

Figure 3-33. Recreational facilities at Gerle Creek reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

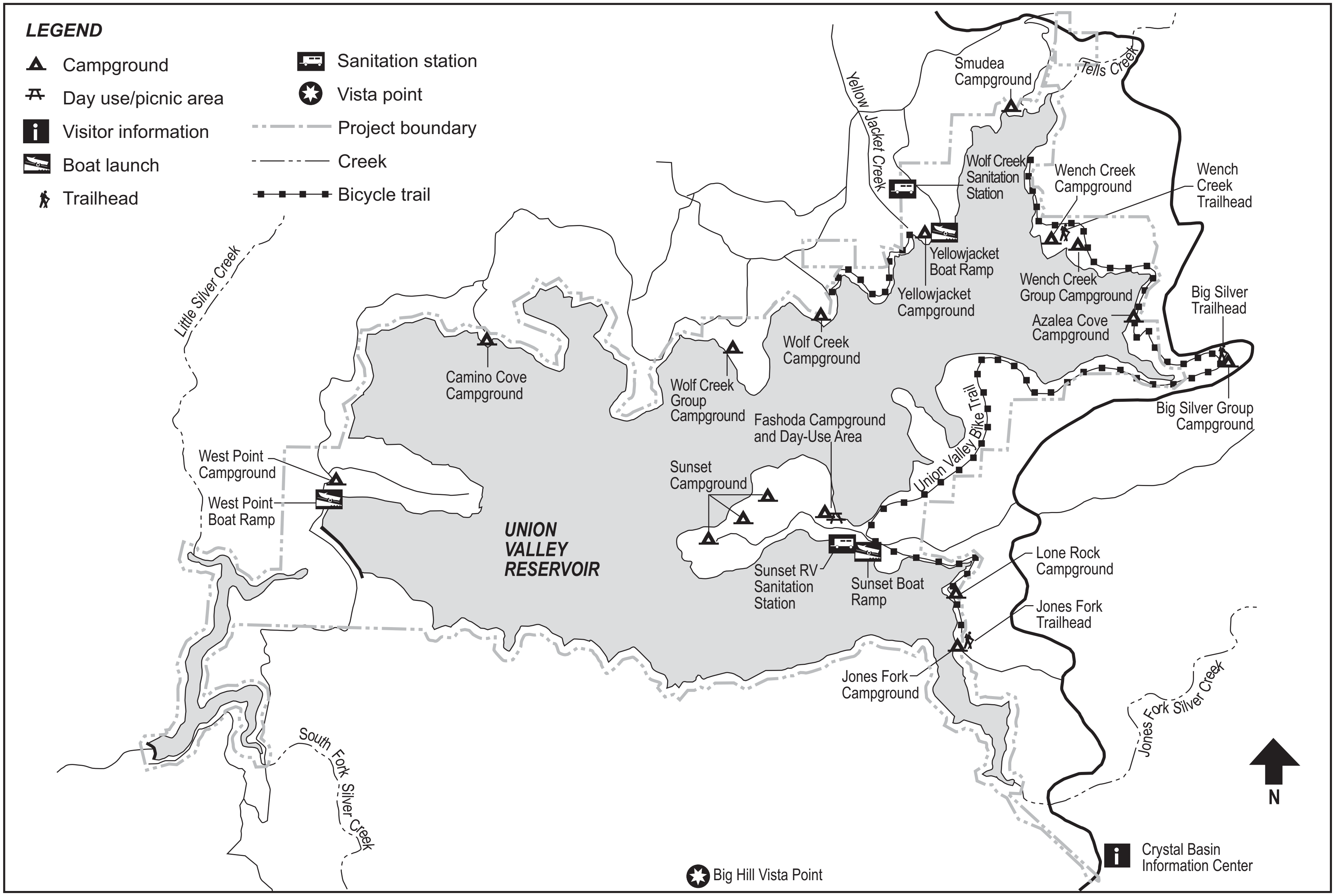

Figure 3-34. Recreational facilities at Union Valley reservoir. (Source: SMUD, 2005; PG&E, 2005, as modified by staff)

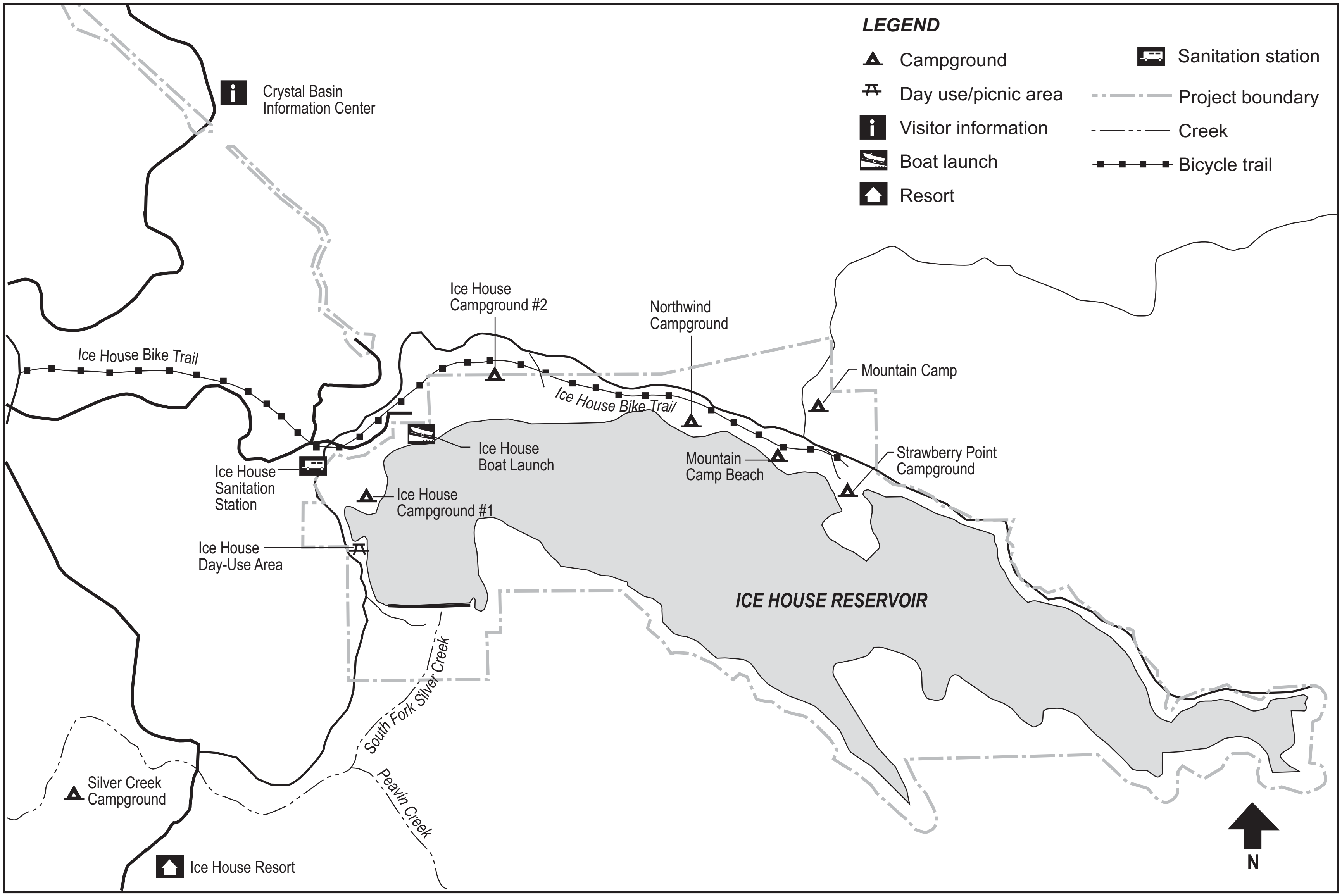

Figure 3-35. Recreational facilities at Ice House reservoir. (Source: SMUD, 2005, PG&E, 2005, as modified by staff)

High Country

The High Country geographical area (elevation 6,400 feet and above) includes Buck Island and Rubicon reservoirs. There are no developed recreational facilities at either reservoir because these are remote, hike-in reservoirs. Depending on the timing of snowfall and snowmelt, this area is usually accessible to hiking between Memorial Day and November 1.

At Rubicon reservoir, which is located within the Desolation Wilderness boundary, motorized public access and campfires are not allowed. The main route of access is by way of the Rubicon Hiking Trail from the Loon Lake. Overnight use requires a wilderness permit and there are quotas on the number of permits issued. At least nine dispersed campsites are present at Rubicon reservoir.

Buck Island reservoir is located adjacent to and outside of the Desolation Wilderness. The Rubicon OHV Route passes through the Project boundary. Many OHV visitors camp overnight along the Buck Island reservoir shoreline; there are as many as 17 user developed campsites, most of which are close to the water's edge or riparian areas.

Crystal Basin

The Crystal Basin area is in the mid-elevation range of the Project at approximately 4,800 to 6,400 feet. Routes of access to the Crystal Basin include Ice House Road from Highway 50 and Wentworth Springs Road from Georgetown, both county roads. Crystal Basin includes four Project reservoirs, which collectively provide most of the reservoir-based recreational use and opportunities at the Projects. Three of these four are the primary storage reservoirs of the UARP, including Loon Lake, Union Valley and Ice House; the fourth is Gerle Creek reservoir.

There are 47 Project recreational facilities in Crystal Basin, including campgrounds, day use areas, boat launches, trails (biking, hiking, and interpretive), a scenic overlook, and a chalet. These facilities provide a full spectrum of recreational opportunities for overnight and day use activities. All of these facilities are on Forest Service-managed lands adjacent to or within the Project. The total developed overnight capacity in the Crystal Basin is 5,325 people-at-one-time (PAOT).

The Loon Lake Chalet is the only Project recreational facility available for rental year-round. The chalet is heavily used, to near-capacity, in winter by visitors who hunt, ski, camp and hike in Crystal Basin during the winter.

Dispersed recreation occurs throughout Crystal Basin. Dispersed day use activities typically include hiking swimming, fishing, and some whitewater boating, all of which are allowed by the Forest Service. Dispersed overnight camping outside of designated areas is generally prohibited immediately along the Project reservoirs, but occurs throughout the Crystal Basin. The Forest Service has closed some unauthorized roads in the area in an attempt to discourage prohibited use where it is causing resource damage. Visitors continue to access the shoreline areas, such as at the southern shoreline of Ice House Reservoir, through locked gates, to gain access and camp along the shoreline.

Canyonlands

The Canyonlands area includes five reservoirs: Junction, Camino, Brush Creek, and Slab Creek and Chili Bar. The Canyonlands area is in the lowest elevation range of the Project at approximately 1,800 to 4,400 feet. The terrain in this geographical area above PG&E's Chili Bar reservoir is typically steep which makes access difficult and there are few roads. The shorelines of the Project reservoirs are also typically steep and not well suited for recreational use; however, the reservoirs provide angling and some boating opportunities. The Canyonlands reservoirs are generally accessible year-round.

There are no developed recreational facilities at the Canyonlands reservoirs. However, small, informal boat launch sites exist at all but Camino reservoir. These sites consist of single-lane paved and unpaved routes leading to the reservoir.

Recreational Use within the Project Boundary

SMUD estimates that summer use at the Project recreational facilities in the Crystal Basin is between 206,500 and 235,000 recreation-days (table 3-60). There are approximately 24,000 recreation-days at the Project recreational facilities during the shoulder season.

Table 3-60. Estimated recreation days at dispersed recreational sites, 2002–2003. (Source: DTA and Louis Berger, 2004a)

	Summer			Winter		
Location	**Day Use**	**Overnight Use**	**Total**	**Day Use**	**Overnight Use**	**Total**
Ice House	2,329	0	2,329			
Union Valley	2,760	2,226	4,986			
Gerle Creek	377	2,416	2,793			
Loon Lake	1,648	15,217	16,865			
Crystal Basin				11,403	2,908	14,311
SMUD Canyonlands reservoir	4,785	938	5,723	1,911	7,29	2,640
Chili Bar reservoir	1,313		1,313			

SMUD estimates the annual dispersed use that occurred generally within 0.25 mile of Project reservoirs between April 1, 2002, and March 31, 2003, in the Crystal Basin was 43,406 recreation-days. Approximately one-third of this dispersed use occurred at Loon Lake reservoir during the summer months, and about one-third of the total use in the Crystal Basin occurred during the winter season.

Campgrounds, day-use areas, boat launches, and trailhead parking areas are usually filled to capacity during peak times on holidays and some weekends during the summer; during the weekdays, occupancy at the recreational facilities is low.

The reservoirs in the Canyonlands and the High Country are either small in size or difficult to access. The visitation to several of the Canyonlands and High Country reservoirs is substantial, though less than the reservoirs in the Crystal Basin.

At Project recreational facilities, between 49 and 61 percent of the visitors surveyed in 2002–2003 identified changes or improvements they would like to see at the facility where they were interviewed. The most common suggestion by far was related to restrooms or the need for showers (47 percent). There were also several comments from visitors regarding bears raiding campsites and damaging vehicles.

Recreational Facilities Management

SMUD operates the Project to maintain water surfaces in Project reservoirs at as high an elevation as practicable and with a minimum of fluctuation, from May 1 to September 10 of each year, as is consistent with power generation needs. Priority is given to water retention in Rubicon and Buck Island reservoirs. In addition, SMUD removes and disposes of floating debris in the Project reservoirs prior to July 15 of each year and removes any trees that may die along the shorelines of the reservoirs.

UARP boat ramps are available for use at each of the three storage reservoirs between Memorial Day and Labor Day under most water year types. During low water years or extraordinary circumstances, the storage reservoir levels may render some of the boat launches unusable at certain times.

The Forest Service operates and maintains some of the UARP-related recreational facilities through a Special Use Permit issued to a third party (concessionaire). Under the terms of the permit, the concessionaire agrees to collect fees for operating and maintaining government-owned facilities and returns a portion of the gross receipts to the federal government. The concessionaire is responsible for all tenant types of maintenance, such as broken infrastructure, utilities, grounds maintenance, and enforcing campground/facility rules. In effect, the cost of daily operation and maintenance of the facilities is an operating expense borne by the concessionaire. The concessionaire can either pay the fees due to the federal government under the permit or the concessionaire can provide work-in-lieu of fees. Under the latter, the Forest Service coordinates with the concessionaire to accomplish facility replacement or improvements at facilities operated under the permit, e.g., modifications necessary to comply with the ADA. This allows a portion of the fees collected at the site to be used for replacement of and improvements to the facilities, though these fees cover only a portion of the costs for replacement and improvements needed to the facilities.

The Forest Service operates the remaining recreational facilities under the Fee Demonstration Project. Under this program, the Forest Service collects the fees at the facilities, performs operation and maintenance, and uses the fees to offset its costs for operation, maintenance and replacement of the facilities.

PG&E owns most of the land around Chili Bar reservoir, with the exception of a few small private parcels and a large tract of BLM-managed by lands. PG&E manages the informal public boat ramp at the Chili Bar dam, which is the only site on the reservoir that is easily accessible. BLM allows public use of its lands and visitors access the reservoir along two steep trails from the north.

Angling

All Project reservoirs are available to the public for angling. The CDFG carries out a stocking program at the UARP storage reservoirs, including Loon Lake, Ice House, and Union Valley. The survey data collected by SMUD indicates a high level of participation in reservoir angling. The boat launches provide access for boating so anglers have access to the reservoir surfaces as well as the shorelines. Winter access provided by SMUD's snow removal allows access to boat launches at Ice House and Union Valley reservoirs.

The reaches below Project dams do not receive much angling use, due to the steep and rugged terrain, which limits access. The river sections downstream of the Canyonlands reservoirs, with the exception of Chili Bar reservoir, lie in deep canyons. Access to the river in the canyons is limited to roads leading to Project facilities (e.g., Jaybird powerhouse) or to a few hiking trails. Access is also restricted along the river by the presence of large boulders, steep bedrock banks, or cliffs. Access to the upper Project reach streams is also limited due to the lack of roads, although a popular OHV road (the Rubicon Trail) and a system of trails leading into the Desolation Wilderness area provide a greater degree of access than the Canyonland Project reaches.

In general, stream angling in the Sierra Nevada is constrained on unregulated reaches by flows that are too high for angling during snowmelt runoff and too low (or even dry streambeds) during the late summer. This general condition exists in the Project area streams where many of the background stream segments upstream of Project reaches experience very low flows (less than 1 cfs) or dry up during late summer/early fall.

Whitewater Boating

There are considerable opportunities for class III-V whitewater boating[38] in the region, as shown in table 3-61, including the SFAR, one of the most popular whitewater runs in the state.

Table 3-61. Regional whitewater recreational opportunities. (Source: DTA and Louis Berger, 2004b)

Name of Run	Put-In & Take Out	Length (miles)	Gradient (feet per mile)	Class	Boating Range and (Optimum Flow)	Boating Season
North Fork American River						
Generation Gap	Tadpole Creek to Colfax-Foresthill Rd.	12.3	75	IV to V 0 portages	600–2,000 (1,200)	Spring
Giant Gap	Euchre Bar to Colfax-Iowa Hill Rd.	14.5	54	IV to V 0 portages	600–2,500 (1,000)	Winter, spring
Chamberlain Falls	Colfax-Iowa Hill Rd. to Colfax-Foresthill Rd.	4.8	44	III to IV+ 0 portages	800–2,500 (1,500)	Winter, spring
Ponderosa Way	Colfax-Foresthill Bridge to Ponderosa Way Bridge	5	21	II+ to III 0 portages	500–1,500 > 1,500 (1,200)	Spring
Middle Fork American River						
No. Middle Fork American River	Last Chance Bridge to Middle Fork American	12.9	129	V 7 portages	600–800 (600)	Winter, spring

[38]The American Whitewater Scale of River Difficulty: Class I, Easy: Fast moving water with riffles and small waves; Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed or very violent rapids which expose a boater to added risk; Class VI, Extreme and Exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

Name of Run	Put-In & Take Out	Length (miles)	Gradient (feet per mile)	Class	Boating Range and (Optimum Flow)	Boating Season
Tunnel Run	Ralston Afterbay to Spring Garden Road	17	23	IV 1 portage	800–1,500 (1,200)	Spring, summer
Rubicon River						
Lower Run	Ellicott Bridge to Ralston Afterbay	20.3	108	V- to V 2 portages	500–1,000 1,000–2,000 (1,200)	Spring
SFAR						
Lovers Leap	Strawberry to Kyburz	9.6	171	V 3 portages	500–1,200 (1,000)	Spring
Dugald Bremner	Upper Bridge to Girard Cr.	3.5	191	V 1 portage	30–800 (500)	Winter, spring
Lower Run	China Flat to South Fork American	3.3	236	V+ 2 portages	350–550 (400)	Spring, summer
Kyburz to Riverton	Kyburz to Route 50 Bridge	9.6	90	III to IV+ IV to V 2 portages	700–1,200 1,200–1,300 (1,200)	Spring
Riverton to Peavine	Route 50 Bridge to Peavine Ridge Rd.	3.5	69	III to IV 0 portages	700–4,000 (1,500)	Spring
Golden Gate	Peavine Ridge Rd. to Forebay Rd.	9.4	117	V+ 5 portages	700–1,500 (1,000)	Spring
Silver Creek	Near Road 12N25 to Ice House reservoir	1.75	481	V	50–3002 (150-200)	Spring
Silver Creek	Camino reservoir to SFAR	9.2	119	V 8 portages	600–800 (600)	Spring
Slab Creek	Slab Cr. dam to White Rock powerhouse	7	89	V 1 portage	500–2,000 (1,500)	Spring
Rock Creek	Near Dutch Canyon to Rock Creek Road	6.3	110	IV+ 2 portages	300–800 (600)	Winter, spring
Chili Bar	Route 193 to Coloma	5.8	31	III+ III to IV 0 portages	700–1,500 1,500–10,000 (2,000)	Year-round

SMUD found that whitewater boating is feasible on the Slab Creek, Camino, and Ice House dam reaches. The other Project reaches have low whitewater recreation potential due to various attributes such as remoteness, physical barriers or excessive or insufficient gradient. During periods when there is sufficient flow resulting from spill events, there are days when flows in the boatable range exist on the Slab Creek and Camino dam reaches, but this rarely occurs on the Ice House Reach. Boating has been documented on the Slab Creek dam reach during past spill events and this dam is known to spill in AN and Wet water year types.

The 19.1-mile reach downstream of Chili Bar dam is the most popular whitewater boating run in California, with use levels of approximately 3,000 to 4,000 users per day on summer weekends. The reach provides a unique whitewater opportunity because of relatively predictable year-round boatable flows and its close proximity to major population centers, including Sacramento and the San Francisco Bay Area. The reach also provides opportunities for other recreational activities, including fishing, swimming, and gold panning and dredging.

Inflow to Chili Bar Project during regulated flow periods is controlled predominantly by the UARP's upstream storage and water use. UARP controls the major storage and water use in the river system upstream of Chili Bar Project, with a storage capacity of more than 425,000 acre-feet. Chili Bar Project encompasses approximately three river-miles of the SFAR and operates on a water-available, peaking basis. Therefore, flows in the reach downstream of Chili Bar dam typically fluctuate on a daily basis.

3.3.6.2 Environmental Effects

Recreation Implementation Plan

The Projects include some of the most important recreational resources in the region, and they act as a gateway to Forest Service managed lands, including designated wilderness. As part of the relicensing process, SMUD and PG&E found that, in general, the quality of existing recreational facilities associated with the Project is good, with some sites showing deterioration as a result of insufficient capital investment, increased use, and deferred maintenance.

As part of the Settlement (Proposed Article 1-15, *Recreation Implementation Plan)*, SMUD would develop and execute a recreation implementation plan for the Project in coordination with the Forest Service within 6 months of license issuance. The implementation plan would include a construction schedule for recreational facilities as defined in Proposed Article 1-19, *Specific Recreation Measures*, as well as other details including, but not limited to, signage and sign placement, public information dissemination and a schedule for design of facilities to be reconstructed.

The implementation plan would be maintained and updated in conjunction with the review of recreational developments as described in Proposed Article 1-18, *Review of Recreation Developments*. SMUD proposes to meet with the Forest Service at least every 6 years to consider the condition and needs of all Project recreational facilities on Forest Service lands, and to agree upon necessary maintenance, rehabilitation, construction, and reconstruction work needed. The criteria for Project selection would depend on the amount and type of use, current recreational facility policy, the condition of facilities, effects on surrounding areas. Following the review, the licensee would develop a 6-year schedule for maintenance, rehabilitation, and reconstruction, in consultation with the Forest Service prior to being filed with the Commission.

Our Analysis

The proposed recreation implementation plan would increase and formalize SMUD's responsibilities to provide and update recreational resources throughout the Project area, including those formal and dispersed recreational sites that provide public access to the Project. The plan would provide a framework for the licensees to implement the recreational site improvements and coordinate management of recreational resources with the land managers that have jurisdiction over Project lands, as well as monitor recreational use and needs over the term of any new license. These measures would provide improvements to the management and delivery of recreational resources and would expand recreational opportunities within the Project.

The proposed plan reflects the unique character and management responsibilities of public recreational sites around the Projects. The plan would recognize that, while SMUD has no legal authority to redevelop public access sites owned or managed by others, they do have some responsibility to ensure reasonable public access to Project lands and waters for those portions of the recreational sites currently within the Project boundary or proposed to be within the Project boundary. The assistance and funding included in the plan would improve delivery of recreational services by streamlining implementation of the improvement measures, while simultaneously minimizing jurisdictional conflicts between the Commission and the various land management agencies, and providing a mechanism for earmarking licensees' funds to specific Project-related improvements.

PG&E does not propose to develop a recreation plan. PG&E proposes a few specific recreational measures (discussed below) to improve recreational access to the Project. In its license application, PG&E contends that recreational use is low, safe public access is best achieved at the upstream end of the reservoir, and Project operations limit recreational opportunities near Chili Bar dam. In subsequent sections, we generally agree with this assessment. However, we expect that recreational use and needs would change over the term of any new license issued for the Chili Bar Project. Development of a recreation plan for the Project, based on periodic monitoring, would help the licensee manage these changes in recreational demand and provide a structure to evaluate the adequacy of Project recreational facilities to meet future recreational demand. Such a plan would be designed to achieve the following objectives: (1) promote public safety and increase public awareness of recreational opportunities at the Chili Bar Project; (2) maintain reasonable health and safety standards through a litter and sanitation management; (3) provide safe and reasonable access to the Project reservoir; (4) address congestion and conflicts among visitors and resources related to recreational activities, if any; (5) provide reasonable recreational facilities for a range of recreational opportunities; (6) reduce recreational effects on cultural, terrestrial, and aquatic resources; and (7) provide a forum for public and agency input into recreational facility needs at the Project.

Specific Recreational Site Improvements

Developed and informal recreational sites provide primary public access to the UARP and Chili Bar Project. Many of the facilities were constructed as part of the current license in the 1960s to meet visitor demand. Much of the infrastructure at these recreational sites is old, some of which is in disrepair from deferred maintenance and some of which has reached its useful life. As visitor demographics and use patterns change over the term of any new license, recreational amenities at these sites may no longer serve the type of recreational uses that visitors expect.

Under Proposed Article 1-19, *Specific Recreation Measures*, SMUD would implement numerous and substantial improvements to many recreational sites, as well as upgrade and expansion of some informal recreational facilities to provide an improved level of service. These proposed measures, summarized in table 3-62, would be developed within or immediately adjacent to the Project boundary on Forest Service lands and all improvements would become Forest Service property upon completion and acceptance by the Forest Service. Proposed Article 1-19 calls for the SMUD to improve recreational sites within the Project boundary including, survey; design; contract preparation and administration; environmental analysis and documentation necessary for construction of proposed facilities, including any permits; and preparation of “as-built” drawings for those facilities on federal lands. SMUD would be responsible for funding the actual capital costs of the improvements, but all capital investment would become the property of the Forest Service when they are completed.

SMUD would also develop a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities due to the lack of such equipment as identified in the recreational use surveys within 2 years of new license issuance. The plan would include a schedule for installing the bear-proof equipment within five years of plan approval by the Forest Service and CDFG.

Proposed Article 1-18, *Review of Recreation Developments*, also calls for SMUD to include the specific recreational facilities listed in Proposed Article 1-19, *Specific Recreation Measures*, within the Project boundary. If these facilities are not currently within the license boundary, the boundary would be adjusted to include them as detail in the Forest Service Preliminary Terms and Conditions, Attachment 1, filed January, 29, 2007.

Table 3-62. SMUD's proposed recreational site improvements. (Source: SMUD and PG&E, 2007, Proposed Article 1-19, *Specific Recreation Measures*)

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
High Country			
Buck Island Reservoir Area: North Shoreline	Inventory areas affected by dispersed recreation to the northwest and northeast of the dam, and develop a dispersed motorized camping area (Development Level 2) in these areas. Also construct new vault toilet, to be maintained by helicopter; identify and mark designated campsites; restrict vehicle access to motorized trail and designated camping areas only through the use of barrier rocks and other natural materials, and restore impacted areas; and reroute a portion of the Rubicon OHV route away from sensitive areas and rehabilitate existing route.		2 years
Rubicon OHV Trail System–Ellis Creek Tie to Rubicon Trail	Provide improvements at the Ellis Creek staging area: trailhead parking, sanitation, and improved information (Loon Lake spillway) where uncontrolled parking currently occurs; implement measures to confine OHVs to this designated route using barrier rocks and other natural materials; and close and restore user-created routes adjacent to Loon Lake shoreline.		2 years
Crystal Basin			
Loon Lake Area	Prepare a Loon Lake Recreation Plan to be approved by the Forest Service that addresses impacts on the lakeshore zone and islands from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in the plan within 5 years of license issuance. Detailed elements required, as well as additional specific areas to be evaluated, are included in Proposed Article 1-19.		2 years
Loon Lake: Pleasant Campground	Redesign and reconstruct the 10-unit boat-in campground, retaining existing capacity on existing footprint.	●	10 years
Loon Lake: Northshore Recreational Vehicle Campground	Upgrade the existing 15-unit campground and expand to the east and west to take in areas heavily affected by dispersed camping. Target capacity will be 35 units.	●	5 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Loon Lake Campground (including Equestrian Loop)	Redesign and reconstruct the 62-unit campground, retaining existing capacity on existing footprint.	●	8 years
Loon Lake (Group) Campgrounds	Upgrade Loon Lake Group Site 1 (30 PAOT) and 2 (50 PAOT). See Proposed Article 1-19 for detailed elements.	●	8 years
Loon Lake Group Equestrian Campground	Redesign and reconstruct 5-unit (30 PAOT) group campground; retain existing capacity on existing footprint.	●	8 years
Loon Lake Boat Launch (and Day Use Area)		●	8 years
Loon Lake: Red Fir Group Campground		●	20 years
Loon Lake Chalet		●	8 years
Loon Lake (Schlein) Sanitation Station	Remove part of the concrete island in front of the water tower to reach the control valve from the turn out. Lower the control valve, and replace it with a lever type control.	●	20 years
Loon Lake Trailhead	Opened in 1992, facility components are in good condition and not in immediate need of replacement.	●	8 years
Loon Lake: South Shore	Develop a new campground (500 PAOT) on the South Shore of Loon Lake between the LL Hiking Trail Facility and Deer Camp. Construct new paved two-lane access road from the existing Loon Lake campground to new campground site, including new trailhead parking for the Loon Lake and Desolation area. This site was previously identified as proposed Red Fir campground in the "Recreation Plan for Crystal Basin, Project 2101, November 1973."		20 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Gerle Creek Reservoir Area	Prepare development plan, to be approved by the Forest Service, that addresses effects on the Gerle Creek and Airport Flat areas from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in this plan within 15 years of license issuance. Address sanitation, user conflicts, carrying capacity, day-use versus overnight camping, vehicle control, boating access, and emergency resource protection measures.		2 years
Gerle Creek Campground	Redesign and reconstruct the 50-unit campground, retaining existing capacity on existing footprint.	●	5 years
Gerle Creek Day Use Area	Site has an accessible fishing pier. See Proposed Article 1-19 for specific elements.	●	5 years
Angel Creek Day Use Area	See Proposed Article 1-19 for specific elements.	●	5 years
Airport Flat Campground	Harden adjacent dispersed area on the south side of Gerle Creek.	●	10 years
Union Valley Reservoir Area	Prepare development plan, to be approved by the Forest Service, that addresses effects on the Union Valley area from unmanaged recreation, and the need for additional day-use opportunities. Develop sites and/or implement measures identified in this plan within 10 years of license issuance.		2 years
Union Valley Reservoir	Develop and implement a plan approved by the Forest Service and CDFG that addresses reservoir surface use and hazards.		2 years
Azalea Cove Campground	Provide paved off-site parking area for 10 vehicles at the intersection of the existing service road and the bike trail; develop a potable water source and distribution system; improve shoreline adjacent to facility to enhance boating access; and provide vegetative screening, and use natural materials to restrict indiscriminate pedestrian and bicycle traffic within and between campsites and use areas.		5 years
Big Silver Group Campground	Upgrade existing facilities offered at this 50 PAOT group campground.		20 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Camino Cove Campground		●	15 years
Fashoda Campground and Day Use Area, Jones Fork and Lone Rock Campgrounds		●	5, 5, 20, and 20 years
Sunset Campground	Redesign and reconstruct the 131-unit campground, retaining existing family unit capacity on existing footprint, and add a group site.	●	5 years
Sunset Boat Launch		●	5 years
Wench Creek Campground and Group Campground	Redesign and reconstruct the 100-unit campground and the two, 50 PAOT group sites, retaining existing capacity on existing footprint.	●	15 years
West Point Campground	Design and construct expansion of the existing family campground by 25 units, and add a group campground (30 PAOT) adjacent to the facility, across the road to meet current Forest Service standards.	●	8 years
West Point Boat Launch and Wolf Creek Campground/ Group Campground		●	5 and 15 years
Yellowjacket Campground	Redesign and reconstruct the 40-unit campground, retaining existing capacity on existing footprint.	●	8 years
Yellowjacket Boat Launch		●	5 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Ice House Reservoir Area	Prepare development plan, to be approved by the Forest Service that addresses impacts on the Ice House area from unmanaged recreation, and the need for additional day-use opportunities. Plan also would address the whitewater recreational opportunities in SFSC, above and below Ice House reservoir. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		2 years
Ice House Campground and Day Use Area	Redesign and reconstruct the 83-unit campground and existing 10-unit day-use area, retaining existing capacity on existing footprint.	●	5 years
Northwind Campground	Upgrade facilities at this existing 9-unit campground, provide potable water, and address needs for lakeshore access.	●	15 years
Strawberry Point Campground	Upgrade facilities at this existing 10-unit campground, provide potable water, and address needs for lakeshore access.	●	15 years
Ice House Boat Launch	Upgrade facilities and repair damage to boat launch parking lot upgrade and pavement.	●	5 years
Ice House Sanitation Station	Redesign and reconstruct the facility, on existing footprint.	●	5 years
Highland Point Day Use Area	Develop Highland Point for fishing access and day use. Land acquisition may be required. Construct new 10-unit picnic area to include detailed elements included in Proposed Article 1-19.		5 years
Upper Silver Creek Ice House Day Use	Develop parking and day-use facilities to accommodate existing unmanaged dispersed day use associated with Ice House reservoir and Silver Creek. Land acquisition and/or easements may be necessary.		5 years
Crystal Basin Work Center and Information Station	Upgrade existing facilities, including existing water storage facilities, and construct EPA approved fueling station.		15 years
Big Hill Vista	Provide visitor amenities including installation of two accessible tables and picnic pads, and purchase or retrofit refuse containers for accessibility and bear resistance.	●	15 years

Geographic Area/ Recreational site	Proposed Plan, Upgrade, or Measure	Upgrade to Forest Service/ ADA?[a]	Within How Many Years of License Issuance?
Silver Creek Campground	When whitewater flows are provided by SMUD, redesign and reconstruct the 12-unit Silver Creek campground, and provide access on adjacent land for whitewater access parking and staging.		
Canyonlands			
Junction Reservoir Boat Launch	Improve boat launch (for day use only).		10 years
Dispersed Area–Bryant Springs Road and SFSC Bridge	Improve access trail (construction road) between Bryant Springs Road and stream. Provide turnouts for parking at take-out site for whitewater boating on SFSC.		10 years
Brush Creek Reservoir Boat Launch	Prepare development plan, approved by the Forest Service, that addresses reservoir access, day use opportunities, and facility needs or improvements. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		5 years
Boat Launch at Slab Creek Reservoir at Forebay Road	Prepare development plan, approved by the Forest Service, that addresses safe and reasonable boating access, impacts from unmanaged recreation, and the need for additional day-use and overnight facilities. Develop sites and/or implement measures identified in this plan within 5 years of license issuance.		2 years
Boat Launch at Slab Creek Reservoir near Dam	Prepare development plan, approved by the Forest Service, that addresses safe and reasonable boating access, impacts from unmanaged recreation, and the need for additional day-use facilities. Develop sites and/or implement measures identified in this plan within 5 years of license issuance.		2 years
Slab Creek Dam Reach, including Slab Creek Reach Take-Out Upstream of Chili Bar Reservoir	Prepare recreation management plan, approved by the Forest Service and BLM, to address whitewater recreation needs in the Slab Creek dam to Chili Bar reservoir reach. Develop sites and/or implement measures identified in this plan within 8 years of license issuance.		5 years

[a] Site will be redesigned or upgraded to meet current Forest Service design standards and requirements of the ADA.

PG&E proposes facility enhancements that would be downstream and within the Project boundary. Specifically, under Proposed Article 2-13, *BLM Recreation Improvements*, PG&E would construct (1) a gravel parking area for three to four vehicles off Rock Creek Road; (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir; (3) a kiosk sign along the trail near the beginning of the trailing, explaining the rules of the area; and (4) one picnic table of coated wire mesh material in a leveled out area that is outside of the Chili Bar reservoir floodplain.

Our Analysis

Existing recreational facilities within the Project include numerous formal or semi-formal public-access sites that have some level of recreational infrastructure ranging from minor to substantial, including camping areas and boat launches, trails, beaches and many undeveloped, dispersed, or informal sites (see figures 3-33 to 3-35). These facilities provide the primary public access to Projects' land and waters. The current conditions of the Project recreational facilities range from poor to excellent. Examples of poor facility conditions include cracked pavement and broken traffic control barriers, short campsite parking spurs, and worn and dated campsite components and restrooms. Most of the developed facilities are below ADA accessibility standards; however, the more recently constructed facilities have been designed to comply with ADA accessibility guidelines. Although most recreational visitors interviewed expressed general satisfaction with the condition of the sites, they also noted their desire for improvements, such as improved public access when the reservoirs are low, additional facilities along the reservoirs, and site improvements throughout the Projects.

SMUD's proposal to enhance, expand and formalize the sites listed in table 3-62 would substantially improve public access in the Project area. The proposed improvements to recreational facilities within the Project boundary would be site-specific, derived from a recreational needs assessment, prepared in consultation with the Forest Service and stakeholders, and targeted at either improvements to existing facilities or development of informal facilities. In addition, the proposal considers recreational needs from a geographical perspective and recommends site improvement measures based on the overall need in the Project area. This approach would help to ensure that certain areas of the Project or certain facilities are not over-capitalized and that other areas receive appropriate improvements to meet existing and projected needs.

PG&E's proposal to provide a parking area off Rock Creek Road, a trail that leads from the Rock Creek Road to Chili Bar reservoir, an informational kiosk along the trail, and a picnic table at the reservoir would address the demand for day use recreational opportunities identified in the recreation needs study.

The FPA requires the licensee to provide safe public access to Project lands and waters and include those lands necessary for Project operations in the Project boundary. In accordance with this law, the Commission requires that the Project boundary contain the primary recreational facilities used to access Project waters, as well as the lands necessary to ensure access for the term of the license, and the lands necessary to ensure an appropriate buffer between the Project and neighboring lands. As part of any new license, SMUD and PG&E would provide revised exhibit G (Project boundary map) for the Projects that would include a detailed description and maps of the Project boundary.

Most of the recreational facilities proposed to be included in the Project boundary are immediately adjacent to the existing Project boundary and directly associated with recreational sites that provide access to the lands and waters used for hydroelectric operations. There is a clear physical nexus between the Project and these sites, many of which have been developed by SMUD to provide access to reservoir shorelines, boat launches, campgrounds or shoreline trails.

However, two of the proposed recreational site enhancements listed in table 3-62 are well outside the current boundary and we note that the Commission does not have the authority to require site modification beyond the Project boundary. These sites include the Airport Campground and the Big Hill Communication Site. We discuss each of these sites below and their nexus to the Project.

SMUD built Airport Flat Campground in 1996 as part of the exhibit R amendment to the License. It is one of the few licensee-developed facilities away from a main reservoir. This site was developed in lieu of expanding Gerle Creek Campground as a result of concerns that an expanded Gerle Creek Campground would lead to crowding conditions and degradation of the recreational experience. As such, the Airport Flat Campground was developed to handle recreational demand associated with the Project. This relationship appears to establish a nexus between the site and Project operations.

Big Hill Communication Site is primarily used as a communication, fire observation and fire staging area for the Forest Service. The site also includes the Big Hill Vista, which SMUD built under the current license. Recreational visitors to the area often drive to the top of Big Hill to overlook Crystal Basin and the high Sierra Mountains to the east. Although the principal purpose of the site is for Forest Service operations, including those recreational specific facilities within the Project boundary on top of Big Hill would ensure that the site is maintained for public use for the term of any new license issued.

Cleveland Coral Information Center serves as the first public contact facility for visitors to the Crystal Basin, providing public information services to nearly 70,000 visitors annually. The site provides visitors with the best opportunity to find appropriate campgrounds and plan the details of their trip to the basin. In the draft EIS, we also recommended that SMUD include the Cleveland Corral Information Center in the Project Boundary. In comments on the draft EIS, SMUD pointed out that there are no proposed measures relating to physical improvements to this facility in the Settlement Agreement, other than providing informational brochures. Therefore, we revisited our recommendation and now conclude that inclusion of this facility in the Project boundary would not be necessary for Project purposes.

Recreational Access Plan for Slab Creek Reservoir

Slab Creek reservoir is located deep in the SFAR canyon. The site is difficult to access and the parking and staging area at the end of the Project road is steep, narrow and in disrepair. Nonetheless, SMUD's whitewater boating study determined that the reach is Class IV-V and would be boatable by advanced and expert boaters if sufficient flows were available. Under Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes to provide recreational releases below Slab Creek dam, which would attract more recreational use to confined staging area.

Under Proposed Article 1-19, *Specific Recreation Measures,* SMUD proposes to develop a recreation access plan that addresses recreational access to the reservoir. This plan would address recreational access during the time of construction of Iowa Hill reservoir and the tunnel connecting to Slab Creek reservoir, and when Iowa Hill reservoir and associated powerhouse are operational.

Our Analysis

SMUD found public access difficulties associated with the Slab Creek run, including the lack of suitable sites to develop sufficient parking at the put-in and potential take-out locations due to steep terrain, the lack of existing legal public access to potential take-out locations, and limited possibility to achieve public access to potential take-out locations by securing easements from private landowners. Developing an access plan to help provide a reasonable level of public access to these facilities would help ensure that boaters could use recreational releases.

Monitoring and Adaptive Management

Project licenses typically extend from 30 to 50 years. Over such long timeframes, recreational use patterns would likely change, potentially causing impacts to important environmental resources or reducing the adequacy of existing recreational facilities to meet visitors' needs. In addition, many of the environmental measures proposed by the licensee and recommended by the Agencies could alter recreational use patterns or have direct adverse affects on habitats that have been established under existing conditions. For example, the proposed recreational flow releases could directly affect aquatic and terrestrial habitats or could attract an unanticipated number of boaters that have not historically visited these areas.

As part of the Settlement, SMUD proposes a monitoring program (Proposed Article 1-5 *Monitoring Program*) to track changes in important habitats and indicators species associated with recreational use, pulse flows and recreational flows. SMUD also proposes to enter an adaptive management process to change Project operations in response to adverse effects on environmental resources observed through the monitoring program.

The Proposed Action calls for SMUD to implement a monitoring program after license issuance and through the term of the new license and any annual licenses, in coordination with the Agencies. The recreational monitoring component is further defined in Proposed Article 1-16, *Recreation Survey*, under which SMUD would conduct a Recreational Survey and prepare a report on recreational resources every 6 years of the new license. The survey would include, but not be limited to, changes in kinds of use and use patterns, levels of use, user preferences in recreational activities, kinds and sizes of recreational vehicles, preference for day use versus overnight use, carrying capacity information sufficient to indicate changes in capacity, and recreation user trends within the Project area.

In addition, Proposed Article 1-25, *Public Information Services*, calls for SMUD to provide data to support the determination of carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of "desired conditions," user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience. It appears that this information would be collected as part of the surveys discussed above.

SMUD's proposed adaptive management measures (Proposed Article 1-6, *Adaptive Management Program*), which are closely tied to the environmental monitoring and recreational use survey findings, would include changes to Project operations if the monitoring program and other scientific information indicates that the ecological resource objectives would not likely be met without adjustment. SMUD and the consulting agencies would analyze monitoring results and other scientific information to determine the effects on applicable ecological resource objectives identified in the Settlement Rationale Report. Specific recreation-related adaptive management measures that SMUD and the agencies would consider include: cancellation of pulse and recreational releases in SFSC if foothill yellow-legged frogs are found on the creek and water temperatures in the creek become unsustainable for the frogs; cancellation of recreational flows in SFAR below Slab Creek dam if water temperatures below the dam rise above 12°C mean daily temperature for a 7-day running or if October releases adversely affect foothill yellow-legged frogs; implement good-faith effort to avoid untimely spill events below Slab Creek and Camino dams once foothill yellow-legged frog breeding has been Initiated.

Our Analysis

Monitoring recreational use over time would provide environmental and recreational use baseline data from which to change Project operations to protect sensitive environmental resources. As proposed, the recreational measures would provide substantial benefits to recreational visitors and the proposed recreational releases are generally planned to mimic natural conditions and enhance terrestrial and aquatic resources within and downstream of the Project developments. Based on what is known about the Projects, the proposal appears to simultaneously protect and enhance environmental resources while continuing to provide and enhance recreational opportunities.

However, as with any complex system, changes in recreational use patterns or Project operations could have unanticipated adverse effects on aquatic or terrestrial resources. The proposed adaptive management measures would provide a means to address these effects over the term of any new license issued. As proposed, SMUD would file reports with the Commission summarizing monitoring results. If any recreation-related adaptive measures are required during the term of any new license, SMUD would file an amendment to the proposed recreation implementation plan with the Commission for approval.

Recreational Site Operation and Maintenance

Long-term O&M of Project recreational facilities helps ensure that the quality of the recreational sites is maintained for the term of any new license. Under the current license, SMUD has contributed O&M funds annually to the Forest Service and has assisted the Forest Service with new capital improvements at its recreational sites. Overall, the recreational facilities at the Project are generally in fair to good operating condition. However, some formal sites and many of the informal sites have deferred maintenance needs or receive minimal ongoing services.

As part of Proposed Article 1-21, *Recreation Operation, Maintenance, and Administration*, SMUD proposes to contribute annually to the Forest Service up to a maximum of, $1,000,000 (year 2005 cost basis). As part of the Settlement, the Forest Service would use the funds to provide for operation, maintenance, and administration of those developed recreational sites, facilities, or uses that are both within, or near the Project reservoirs and facilities listed in Proposed Articles 1-18, *Review of Recreation Developments*, and 1-19, *Specific Recreation Measures* (either developed as part of the original/amended license or affected by operations). The proposal would include, but not be limited to, managing use within and immediately adjacent to the Project boundary, and performing both regular and annual maintenance. In addition, the Forest Service would use the funds for the special use permit administration required for facilities developed as part of the original/amended license and operated by a concessionaire. Work to be completed within these areas would consist of conducting patrols, picking up litter, providing public information, enforcing rules and regulations, rehabilitating impacted areas, addressing sanitation, maintaining day use sites (such as concentrated use areas), maintaining trails, information signs, and regulatory signs, responding to fires and other emergencies, assisting in search and rescue, addressing resource impacts, and area condition monitoring.

Our Analysis

The provision of recreational facilities in the UARP vicinity has been a collaborative effort since the construction of the UARP with SMUD funding the construction of new facilities over time and the Forest Service managing the day-to-day operations of the facilities assisted by a combination of public funds as well as SMUD support through an annual collection agreement. We find that this arrangement has benefitted the public who use the project recreational facilities at and near the Project.

Project studies (CDFG, 2007) show that the people who visit the Project recreational facilities also use the areas adjacent to and near the Project facilities and frequently need services. For example, visitors may come primarily to camp at or boat on the Project's reservoirs, but then visit other nearby areas. The Forest Service provides services to these visitors if they get injured and require help, start fires, or leave trash. The costs the Forest Service spends on these services in the dispersed areas adjacent to or in the vicinity of the Project are a small part of the total costs associated with the operation and maintenance of project facilities provided under their collection agreement with SMUD.

Fish Stocking

One of the primary recreational activities associated with the Project includes angling in the large storage reservoirs. CDFG currently stocks these reservoirs to improve the recreational fishery, but does not guarantee that stocking would continue through the term of any new license.

Under Proposed Article 1-26, *Fish Stocking*, SMUD proposes to match the amount of fish stocked by CDFG, per direction from CDFG, and distribute the fish among Loon Lake, Union Valley, and Ice House reservoirs. SMUD would provide between 25,000 and 50,000 pounds per year.

Our Analysis

Because reservoir-related angling is one of the most important recreational activities associated with the Project, particularly in the large storage reservoirs, including Loon Lake, Union Valley, and Ice House reservoirs, assisting CDFG in stocking would help ensure that the recreational fishery is maintained for the term of any license issued.

Trails System Management

Hiking and camping along the Forest Service-managed trail systems is an important recreational use, particularly in Crystal Basin and the high-elevation areas. In some cases, the highest reservoirs are in or near wilderness areas with no road access, requiring SMUD to carry in Project-related equipment.

As part of Proposed Article 1-19, *Specific Recreation Measures*, SMUD proposes specific trail enhancements including new trails, trail closings, and rehabilitation of existing trails, as summarized in table 3-63.

Table 3-63. SMUD's proposed trail enhancements. (Source: SMUD and PG&E, 2007, Proposed Article 1-19)

Location	**Proposed Trail Enhancements**	**Within How Many Years of License Issuance?**
Buck Island reservoir Area: West Shoreline	Improve or relocate existing non-motorized trails connecting to the Rubicon Hiking Trail.	2 years
High Country Area Trails	Improve selected connecting trails off Rubicon hiking trail that access Spider Lake.	2 years
Rubicon Hiking Trail	Reconstruct or relocate portions of the trail to meet Forest Service standards and facilitate proper drainage, including improvement of tread on the portion of the trail using the old construction road. Trail width would accommodate quads for SMUD's administrative use only up to the wilderness boundary.	2 years
Trail Connecting Pleasant Boat-In Campground to Rubicon Hiking Trail	Reconstruct trail to standard, including tread, vegetation clearing, drainage, and signage.	2 years
Angel Creek Trail	Extend the trail to tie to the Summer Harvest Trail (making a loop trail around the reservoir).	5 years
Summer Harvest Trail	Upgrade trail surface to a similar standard (aggregate base) as the new trail at Angel Creek Day Use Area. Replace missing or damaged interpretive signs as needed.	5 years
Union Valley Bike Trail	Complete the bicycle trail system around Union Valley reservoir.	
Ice House Reservoir Lakeshore Road	Provide access trails from paved turnouts and/or parking pockets along the road to the shore. Restore damaged sites between road and shoreline.	5 years
Ice House Mountain Bike Trail	Extend the Ice House Mountain Bike Trail (native surface) completely around Ice House reservoir, including stream and spillway crossings. Construct an interconnecting trail between the Ice House mountain bike trail and the Union Valley mountain bike trail.	10 years

As part of Proposed Article 1-31, *Trails System Management*, SMUD proposes to file with the Commission a trails system management plan for the trails that are needed for Project operations and are located on or affect National Forest System lands. The licensee would implement the plan upon approval. At a minimum, the plan would:

(1) include a map showing the location of all trails, both the Forest Service system (classified) trails and Forest Service non-system (unclassified) trails associated with the Project; (2) map trail locations using a global positioning system (GPS), software, pre and post-processing standards, collection standards and data dictionary approved by the Forest Service, to ensure that data collected meet national standards; (3) identify the season(s) of use and the amount of use by the licensee for each trail annually; and (4) identify the condition of the trails described above, including any construction or maintenance needs. SMUD would update the plan every 5 years identifying maintenance and reconstruction needs for trails. The licensee would file the plan with the Commission after approval by the Forest Service.

For the Chili Bar Project, as part of Proposed Article 2-13, *BLM Recreation Improvements*, PG&E proposes to plan, design, and construct a new hiking trail between Rock Creek Road and the Chili Bar reservoir to provide public access and formal, safe travel to the reservoir shoreline as previously described under *Specific Site Improvements*.

Our Analysis

Trails provide important recreational and hunting access to the federal lands adjacent to the Project, as well as access to the Project from surrounding roads, and, in cases, access for SMUD to Project developments in the remote high-county areas. Although many other types of recreational uses are declining on a national level, demand for trail-related activities, such as walking, hiking, and biking appear to be increasing.

Of the numerous recreational and hiking trails that provide access to public lands managed by federal agencies near the Projects, many begin along roads or recreational sites related to the Project. Some of these trails are informal and formed by user groups, including the trail on BLM lands from Rock Creek Road to Chili Bar reservoir, and many of the short spur trails that access SMUD's reservoirs from Forest Service roads in the Crystal Basin.

As proposed by SMUD and PG&E, the trail-specific measures would provide substantial benefits to recreational visitors by extending and formalizing trail access to Project facilities. The trails would continue to provide a variety of recreational opportunities, including walking, hiking, angling, sightseeing and biking access.

SMUD's proposed trail plan would help to ensure that the condition of the trail system is maintained at an adequate level over time. In addition, the plan would help ensure that trail users are educated about permissible and prohibited activities in order to avoid adverse effects on aquatic and terrestrial resources in the area.

PG&E's proposal to develop a trail on BLM lands to access the Chili Bar reservoir would formalize recreational use that already occurs in this area. Currently, anglers, picnickers, and other visitors follow an old logging road part way into the canyon and follow a user-made trail to the water's edge. Formalizing this trail would help ensure that it is designed to follow natural contours and reduces erosion and other impacts that can be associated with informal trials. Based on existing use of the informal trial, PG&E's proposal would also address a clear recreational demand for improve trails to the reservoir. Developing the trail and associated facilities in the context of a recreational plan for the Project, updated periodically with the filing of FERC Form 80, would help ensure that the licensee responds to changing recreational demand and needs over the term of any license issued.

Reservoir Levels

Project operations include substantial drawdown of lake elevations, although most of this drawdown does not occur during the primary recreational season. Such drawdown can interfere with boat access to the reservoirs and reduce the quality of the boating experience.

Proposed Article 1-23, *Reservoir Levels*, calls for SMUD to meet or exceed the end-of-month reservoir elevation targets for Loon Lake, Union Valley, and Ice House reservoirs and attempt to maintain higher levels and reduce daily fluctuations during the primary recreational season. These measures are fully defined and considered from an operational perspective in section 3.3.2 *Water Resources*.

Our Analysis

Recreational use within the Projects is primarily associated with the Project reservoirs. Typically, SMUD operates Loon Lake, Union Valley, and Ice House reservoirs (the large storage reservoirs in the Project) at full pool by mid-June, drops the reservoirs consistently through the summer and reaches full drawdown in October. During this period, and in most years, most of the public boat ramps are accessible.

As proposed, SMUD would ensure that the reservoirs would be maintained at a higher level than those allowed under current conditions during the primary recreational season. This would improve the quality of recreational experience by covering much of the lake bottom when most of the visitors are at the Project and establishing minimum standards for lake levels associated with different water years.

Operation of a pumped-storage facility could create hazardous hydraulic conditions at the intake/outlet structure in Slab Creek reservoir during operations in both the turbining and pumping mode. The minimum operating elevation is 1,800 feet, and the intake is located 80 feet below elevation 1,850 feet or elevation 1,770 feet. The lowest recorded elevation during the period of record we reviewed was 1,807.8 feet in 2005. Using that value as the minimum operating elevation and assuming the intake structure is 15 feet high, the water depth above the intake during pumping operations could be as little as 22 feet. Under the proposed operations, SMUD would release up to 5,200 cfs when the water surface elevation is at the lowest point of the operating range and this release would cause water surface disturbances. The design of the intake for the lower reservoir would need to provide for adequate safety features, including boat restraining barriers, warning signs, and other guidance to the general public. Such designs should use the Commission *Guidelines for Public Safety at Hydropower Projects* to develop adequate protection for the public. The design of such barriers should use either physical modeling or computation fluid dynamics modeling to assess the zone of potential influence and design preventative measures accordingly. Typically, such details[39] are developed during the final design stage and are subject to review by an external engineering board of review and by the Commission.

Coordinated Operations

Currently, boatable flows downstream of the Chili Bar development are primarily controlled by operations of the UARP. The lack of coordination leads to substantial variability in flows and loss of generation capacity when inflow to Chili Bar exceeds the hydraulic capacity of the powerhouse and the Project spills.

Proposed Article 1-4, *Coordination with Chili Bar Licensee*, calls for SMUD to coordinate operations with the licensee of the Chili Bar Hydroelectric Project, in order to comply with the minimum stream flows, pulse flows, ramping rates, and recreational stream flows for both Projects. Proposed Article 2-3 calls for PG&E to coordinate operations with SMUD.

Our Analysis

The whitewater runs between Chili Bar dam and Folsom reservoir are of regional, if not national importance. Theses river sections are the most heavily boated in California, in part because the flows are relatively dependable and extend well into the summer and falls months and in part because of their close proximity to large population centers. Historically, SMUD and PG&E have had limited coordination, where PG&E calls SMUD plant operators shortly before upstream releases in order for PG&E to decide how low to draw down Chili Bar reservoir. Often, this coordination does not work well, causing Chili Bar to spill and providing unpredictable flows in the whitewater runs below the Chili Bar dam. As proposed, coordination would provide substantial improvements to recreational resources by allowing boaters and other recreational users to more closely predict the timing and magnitude of flows and helping PG&E avoid lost generation opportunities.

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[39]Although the location of the intake/outlet structure was provided in exhibit F-160 and shown to be near the east shore of Slab Creek reservoir, we did not find a detailed drawing showing the structure or any boat restraining barriers.

Recreational Streamflows

SMUD determined that Project operations limit whitewater boating opportunities between Slab Creek dam and Chili Bar reservoir, as well as the SFSC downstream of Ice House reservoir. In some years, these developments spill intermittently and unpredictably, or do not spill at all.

As part of Proposed Article 1-24, *Recreation Streamflows*, SMUD proposes to provide recreational streamflows in the SFSC downstream of Ice House reservoir (tables 3-64 and 3-65). The releases would include a range of flows and durations during spring months associated with the water year. The duration and magnitude of the proposed flows would be based on the water year, with shorter flow events at lower magnitudes occurring during dryer years.

Table 3-64. Proposed recreational streamflows in the Ice House dam reach the first 5 years. (Source: SMUD and PG&E, 2007)

Water Year Type	**May**	**June**
CD	300 cfs for 1 weekend day	
Dry	300 cfs for 1 weekend days	
BN	400 cfs for 2 weekend days/holidays plus 500 cfs for 2 weekend days/holidays	
AN	400 cfs for 2 weekend days/holidays plus 500 cfs for 4 weekend days/holidays	
Wet	400 cfs for 4 weekend days/holidays plus 500 cfs for 5 weekend days/holidays	

Table 3-65. Maximum possible recreational streamflows in the Ice House dam reach after year 5. (Source: SMUD and PG&E, 2007)

Water Year Type	**May**	**June**
CD	300 cfs for 2 weekend days	
Dry	300 cfs for 6 weekend days	
BN	400 cfs for 5 weekend days/holidays plus 500 cfs for 2 weekend days/holidays	
AN	400 cfs for 5 weekend days/holidays plus 500 cfs for 5 weekend days/holidays	
Wet	400 cfs for 7 weekend days/holidays or Fridays plus 500 cfs for 9 weekend days/holidays or Fridays	

SMUD proposes to spill water from the Slab Creek dam to provide recreational streamflows between 850 cfs and 1,500 cfs in BN, AN, and wet water years within 3 months of license issuance. These flows would be provided between the hours of 10:00 a.m. and 4:00 p.m. in no fewer than three flow events during the period between March 1 and May 31.

SMUD would monitor the amount and type of boating use for both runs for 5 years. For the Slab Creek run, if the construction of the Iowa Hill development has not commenced, SMUD would prepare a whitewater boating recreation plan at the end of 5 years, in consultation with the Forest Service, the Water Board, BLM, and other interested parties, describing whitewater recreational use and impacts on aquatic species and establishing triggers that would determine if SMUD enhances recreational streamflows to include releases in October. SMUD would continue to provide spring releases through year 10 at which time, if the construction of Iowa Hill has not commenced, SMUD would determine if physical modifications would need to be made to the White Rock tunnel adit to provide the proposed October recreational flow releases. After 15 years SMUD would provide the enhanced recreational streamflow releases shown in table 3-66 if the Iowa Hill development is built or if the Iowa Hill development is not built and the recreational use triggers have been met.

Within 2 years of new license issuance, SMUD would also prepare a plan to provide easement for access and parking in the immediate vicinity of White Rock powerhouse for recreational flow events, as well a management plan to address the whitewater recreation needs in the Slab Creek dam to White Rock powerhouse. SMUD would develop and implement measures identified in this plan. The management plan would address the following elements: use levels and projected future use levels; carrying capacity; sanitation and garbage; user conflicts; resource effects along the river and including effects to private land; necessary put-ins, take-outs and parking for whitewater activities; emergency resource protection measures; public safety, search and rescue needs and other emergency response needs; information and educational signing needs; demand for commercial services or outfitting, including shuttle services and guiding; on-river boat patrol.

For the SFSC run, SMUD would annually, in cooperation with the Forest Service, CDFG, and other interested parties, identify large woody debris that is hazardous to recreation streamflow users. SMUD would relocate the large woody debris within the channel, with approval by the Forest Service.

Under Proposed Article 2-15, PG&E would maintain minimum recreational streamflows below in the SFAR downstream of the Chili Bar dam as shown in table 3-67. If the Water Board, California Department of Parks and Recreation, and BLM determine there should be changes to the times shown in table 3-67, PG&E would adjust the minimum recreational streamflows accordingly provided that inflows to the Chili Bar reservoir and Chili Bar reservoir elevations are sufficient to maintain these flows.

Table 3-66. Proposed recreational streamflows in the Slab Creek dam reach after Iowa Hill development is constructed, or year 15 if criteria are met. (Source: SMUD and PG&E, 2007)

<table>
<tr><th>Water Year Type</th><th>March</th><th>April</th><th>May</th><th>October</th></tr>
<tr><td>CD</td><td></td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 4 weekend days and

1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 2 weekend days</td><td></td><td></td></tr>
<tr><td>Dry</td><td colspan="2">850–950 cfs from 10:00 a.m. to 1:00 p.m. for 4 weekend days
and
1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 6 weekend days</td><td></td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 2 weekend days</td></tr>
<tr><td>BN</td><td></td><td colspan="2">850–950 cfs from 10:00 a.m. to 1:00 p.m. for 3 weekend days/holidays[a]
and
1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 9 weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
<tr><td>AN</td><td></td><td colspan="2">1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 12 weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
<tr><td>Wet</td><td colspan="3">1,400–1,500 cfs from 10:00 a.m. to 1:00 p.m. and 850–950 cfs from 1:30 to 4:00 p.m. for 12 days, weekend days/holidays[a]</td><td>850–950 cfs from 10:00 a.m. to 1:00 p.m. for 6 weekend days</td></tr>
</table>

[a] Priority given to Memorial Day weekend

Table 3-67. South Fork of the American River downstream of Chili Bar reservoir dam minimum recreational flow by water year (cfs). (Source: DTA and Louis Berger, 2004c)

Water Year Type	Period	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		(hours at cfs)						
Super Dry	April–Memorial Day	3 hours at 1,300					3 hours at 1,300	3 hours at 1,300
	Memorial Day–Labor Day	3 hours at 1,300			3 hours at 1,300	3 hours at 1,300	5 hours at 1,300	5 hours at 1,300
	Labor Day–September						3 hours at 1,300	3 hours at 1,300
	October–March						3 hours at 1,300	
Critically Dry	March–Memorial Day	3 hours at 1,300					3 hours at 1,300	3 hours at 1,300
	Memorial Day–Labor Day	3 hours at 1,300			3 hours at 1,300	3 hours at 1,300	5 hours at 1,500	5 hours at 1,500
	Labor Day–September					3 hours at 1,300	3 hours at 1,300	3 hours at 1,300
	October–February						3 hours at 1,300	
Dry	March–Memorial Day	3 hours at 1,300	3 hours at 1,300			3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	Memorial Day–Labor Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	5 hours at 1,500	5 hours at 1,500
	Labor Day–September					3 hours at 1,300	3 hours at 1,300	3 hours at 1,300
	October–February						3 hours at 1,300	3 hours at 1,300
Below Normal	March–Memorial Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	Memorial Day–Labor Day	3 hours at 1,300	3 hours at 1,300		3 hours at 1,300	3 hours at 1,300	6 hours at 1,500	6 hours at 1,500
	Labor Day–September				3 hours at 1,300	3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,300	3 hours at 1,300
Above Normal	March–Memorial Day	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	3 hours at 1,300	4 hours at 1,750	4 hours at 1,750
	Memorial Day–Labor Day	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Labor Day–September				3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,500	3 hours at 1,500

Water Year Type	Period	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		(hours at cfs)						
Wet	March–Memorial Day	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Memorial Day–Labor Day	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	4 hours at 1,500	6 hours at 1,750	6 hours at 1,750
	Labor Day–September				3 hours at 1,500	3 hours at 1,500	3 hours at 1,500	3 hours at 1,500
	October	3 hours at 1,300				3 hours at 1,300	3 hours at 1,500	3 hours at 1,500
	November–February						3 hours at 1,500	3 hours at 1,500

Our Analysis

SMUD's investigation of all of the reaches below Project dams determined that whitewater recreation is feasible on the Slab Creek, Camino, and Ice House dam reaches. The other Project reaches have low whitewater recreation potential due to various attributes such as remoteness, physical barriers or excessive or insufficient gradient. During periods when there is sufficient flow resulting from spill events, there are days when flows in the boatable range exist on the Slab Creek and Camino dam reaches, but this rarely occurs on the Ice House reach. The Slab Creek dam reach has received boating use during past spill events and this dam is known to spill in AN and Wet water year types.

SMUD's proposed spring recreational streamflows releases during years 1 through 15 would provide reliable boating flows of high difficulty that would enhance whitewater boating opportunities at the UARP. SMUD's monitoring for effect of these flows on aquatic species and to determine use would provide SMUD and the Agencies with the information necessary to adjust flows in response to environmental effects and user demand. After 15 years both the spring and fall flows would be provided if the recreational demand and aquatic triggers are met.

As proposed, SMUD's and PG&E's recreational releases would provide substantial recreational benefits for whitewater boaters, especially during dry years when these dams would not typically spill. The proposed flows would occur at a magnitude that would provide high-quality boating opportunities for a variety of skill levels and for a variety of boats and that would be consistent with the results of the recreational use and boating studies.

Streamflow and Reservoir Elevation Gaging

Accurate and timely stream flow and reservoir levels provide important information for recreational visitors planning water-related visits to the Project. Currently, flow information is provided by SMUD on a public Internet site for a number of Project-related waterways. However, the public information is incomplete and does not include flows on many of the Project's creeks and streams.

As part of Proposed Articles 1-10 and 2-8, *Streamflow and Reservoir Elevation Gaging*, SMUD and PG&E propose to develop and file with the Commission for approval a streamflow and reservoir elevation gaging plan within 1 year of license issuance that meets USGS standards. SMUD and PG&E would provide copies of their respective plans and USGS review results to the Forest Service, the Water Board, CDFG, and the Commission. The Chief of the Division of Water Rights would approve the plans prior to filing with the Commission. See section 3.3.2.2, *Water Resources, Water Quantity*, for details of the streamflow and reservoir gaging locations.

The measure also calls for SMUD to install and maintain simple staff gages at the put-ins for the Slab Creek and Ice House recreational boating runs within two years of new license issuance. SMUD would perform an investigation to determine whether telemetry equipment can be installed at Rubicon River below Rubicon dam and Little Rubicon River below Buck Island dam to monitor conditions and/or control operations. If SMUD and the Forest Service concur that such equipment is economically and technologically feasible and can be installed consistent with law, regulations, and policies applicable to Desolation Wilderness, SMUD would seek necessary approvals for such installation and would install this equipment if the necessary approvals are received.

SMUD and PG&E also propose to develop public information services (Proposed Articles 1-25 and 2-15, *Public Information Services*) to provide stream flow and reservoir level information on the Internet.

Elements of SMUD's stream flow and reservoir level measure would include:

1. Publication of flow and reservoir level on the Internet.
2. Notification of recreational streamflow releases at least 7 days in advance of the actual releases.
3. A plan that addresses, at a minimum, information on daily average reservoir stage height for the following reservoirs: Rubicon, Loon Lake Ice House, Union Valley, Gerle Creek, Brush Creek, and Junction. The plan would also address, at a minimum, information on hourly average reservoir stage height and storage for Slab Creek reservoir.
4. A plan that addresses real-time streamflows for the following Project-related stream reaches: Rubicon River below Rubicon dam; Little Rubicon River below Buck Island dam; Gerle Creek below Loon Lake dam; Gerle Creek below Gerle Creek dam; SFRR below Robbs Peak dam; SFSC below Ice House dam; Silver Creek below Junction dam; Silver Creek below Camino dam; Brush Creek below Brush Creek dam; SFAR below Slab Creek dam.
5. The plan would be approved by the Forest Service and the Water Board prior to filing with the Commission. Following approval, the minimum streamflow schedules from appendix a, section 1, and current water year type information would be published on the licensee's website. Within 6 months of completion of the information plan described above, the licensee would implement the elements described in the information plan. The streamflow and reservoir level information plan may be modified upon mutual agreement of the licensee, Forest Service, CDFG, and the Water Board.

PG&E's plan would include: (1) real-time lake stage height and storage information for Chili Bar reservoir; (2) installation of up to two simple staff gages for use by the public; (3) real-time streamflow and reservoir level information that is available to the public year-round via toll-free telephone number or other appropriate technology approved by BLM; and (4) streamflow information collected consistent with the standard USGS gage facilities downstream of the Chili Bar reservoir dam (using USGS gage 11444500) on a web site that includes 15-minute increments and streamflow releases from the past 7 days.

Our Analysis

SMUD's and PG&E's proposals, including gaging and publication of flow information, would provide substantial amounts of new flow and lake level data for recreational visitors. This information would be useful in planning and staging water-related trips to the Project, such as flat water and whitewater boating trips and fishing trips.

Public Information Services

Public information at the primary recreational sites helps visitors understand acceptable and prohibited activities, as well as provide information about important cultural and environmental resources in the area.

As part of Proposed Article 1-25, *Public Information Services*, SMUD proposes to develop public information services that would require SMUD to develop brochures and maps, and develop an interpretation and education plan for the Project. Specifically, SMUD proposes develop and print one or more brochures and maps that describe the recreational opportunities, recreational facilities, rules, and responsibilities within the area of the Project, including the Canyonlands, high country lakes, and streams. The brochure would be provided to the Forest Service for review and approval prior to completion. The licensee would make the brochure/map available to the public free of charge. The brochure/map would be made available continuously and would be updated as conditions change.

SMUD also proposes to develop an interpretive, educational, and public information plan within 2 years of license issuance, in consultation with the Forest Service and other appropriate agencies and interested parties. At a minimum, the plan would include themes, design, audience, delivery methods, and schedule for implementation for providing up-to-date information such as: sightseeing, hiking, observing wildlife, and utilizing facilities such as boat ramps, campgrounds, and beaches. SMUD proposes to coordinate development of this plan with PG&E.

As part of Proposed Article 2-14, *Public Information Services* PG&E would annually pay $15,000 (escalated by GDP-IDP) to BLM to provide Project recreation brochures and maps and an interpretive, education, and public information plan.

Our Analysis

The proposed brochures and map and the interpretive, education, and public information plan would improve upon existing public education and interpretation information with updated materials that compliment the Forest Service and BLM publications. The proposal would help expand recreational opportunities by providing visitors with easily accessible information about Project resources.

UARP-Only Alternative

The effects of Project operations on existing and proposed recreational facilities would be the same as under the Proposed Action, except that if recreational use triggers are met, the provision of enhanced recreational boating flows would require physical modifications to the White Rock tunnel in year 15.

3.3.6.3 Cumulative Effects

The recreational measures proposed by SMUD and PG&E would improve recreational opportunities throughout much of the SFAR Basin. Each proposed measure is incrementally small. However, together, the recreational measures would improve opportunities in the region, allowing the Projects to adapt to change recreational use over time, better using existing recreational resources, and developing new resources that address current and foreseeable recreational activities, such as hiking and biking.

3.3.6.4 Unavoidable Adverse Effects

None.

3.3.7 Land Use

3.3.7.1 Affected Environment

Land Ownership

The UARP is located in El Dorado County and the northeastern part of Sacramento County, California, within the SFRR, SFSC, and SFAR drainages. The Project boundary encompasses about 9,432 acres, which includes the seven developments as well as the proposed Iowa Hill development (including transmission tie-in and access roads) (table 3-68). The Forest Service administers about 64 percent (6,048 acres) and BLM administers less than 1 percent (42 acres) of the federal lands within the UARP boundary, none of which are in the proposed Iowa Hill development. SMUD owns about 34 percent (3,193 acres) of the land. The private owners (Sierra Pacific Industries) hold about 2 percent (150 acres) of the land within the Project boundary.

The proposed Iowa Hill development boundary including the transmission line tie-in would include about 283 acres of land. The Forest Service administers 185 of these acres, and the remaining acres are owned and managed primarily by SMUD (77.9 acres) and Sierra Pacific Industries (20 acres).

BLM owns about 227 acres of undeveloped land in the vicinity of the Chili Bar Project. About 48 of those acres are located inside the Chili Bar Project boundary.

Table 3-68. Land ownership (acres) within the FERC Project boundaries, by development.[a] (Source: DTA and Goodavish, 2005a)

Development	SMUD	Forest Service	BLM	Private	Totals
Loon Lake	253.1	2,041		11.3	2,305.4
Robbs Peak	28.2	188.8		33.5	250.5
Jones Fork	666.6	518.8			1,185.4
Union Valley	2,018.1	2,257.5		6.8	4,282.4
Jaybird	52	336		7.9	395.9
Camino		227.1		0.2	227.3
White Rock	96.6	293.4	42.3	70.3	502.6
Iowa Hill	77.9	185		20	282.9
Total	**3,192.5**	**6,047.6**	**42.3**	**150**	**9,432.4**

[a] The Commission charges SMUD annually for the use of federal lands under section 10(e) of the FPA for 4,553.41 non-transmission line acres and 359.79 transmission line acres, which is less than the total federally owned acres in this table because acreage transferred to the Forest Service in the 1960s for which SMUD retains occupancy rights is not included in the total.

Land Uses

Industrial Uses

Industrial uses with the Project areas are predominantly related to SMUD and PG&E's hydropower operations. These facilities (described in sections 2.1.1 and 2.2.1, *Project Description)* include 12 reservoirs, 12 transmission lines, tunnels, and support facilities.

Recreational Uses

Rubicon reservoir in the Loon Lake development is surrounded by the Desolation Wilderness Area within the Eldorado National Forest, and the Forest Service manages the land around the reservoir consistent with wilderness goals and objectives. The land within and immediately surrounding Buck Island and Loon Lake reservoirs is public land managed primarily for recreational activities, including boating, fishing, hiking, horseback riding, camping, and wilderness appreciation. The Rubicon OHV Trail passes along the north side of Loon Lake and Buck Island reservoir, and users camp at informal dispersed campsites near the route.

SMUD provides formal public recreational facilities and shoreline access primarily at four of the reservoirs in Crystal Basin (described in section 3.3.6.1, *Recreational Resources*). Facilities include four campgrounds, a boat launch, a wilderness trailhead, and a chalet at the Loon Lake development; two campgrounds, two day-use areas, an interpretive trail, and a fishing pier at the Robbs Peak development (Gerle reservoir); three campgrounds, a day-use area, a boat-launch, a trail, an information station, and a sanitation station at the Jones development (Ice House reservoir); and 12 campgrounds, a day-use area, three boat launches, and two sanitation stations at the Union Valley development. There are two private resorts, Robbs Valley Resort which intrudes on the Project boundary at the Robbs Peak development, and Ice House Resort in the vicinity of the Jones Fork development. A commercial whitewater put-in, a public whitewater put-in, and the Nugget Campground are located along the SFAR downstream of Chili Bar dam.

Recreational use in the Canyonlands at the Jaybird, Camino, and Slab Creek/White Rock developments is informal and minimal and generally limited to fishing and dispersed camping on Eldorado National Forest lands; boating on Junction, Brush Creek, Slab Creek, and Chili Bar reservoirs via informal boat launches (boats are not permitted on the Camino reservoir); and OHV use. There are no developed recreational facilities at the reservoirs associated with the three developments. The downstream reach of the Chili Bar Project is a popular whitewater recreation run.

The proposed Iowa Hill development would be located within the Eldorado National Forest, near Slab Creek reservoir and the communities of Camino and Swansboro/Mosquito. No formal recreational facilities are proposed at this development.

Timber Harvesting

There are an estimated 428,844 acres of land managed for commercial timber production on the Eldorado National Forest. Timber-producing land is classified into five major forest types: mixed conifer, red fir, ponderosa pine, sub-alpine, and hardwoods. Timber harvesting emphasizes regeneration of poorly stocked stands. Timber harvesting occurs near each development at Robbs Peak, Jones Fork, Union Valley, Jaybird, and the proposed Iowa Hill development, as well as on privately owned lands owned by Sierra Pacific Industries adjacent to the Project boundary.

Residential Uses

Private residential development in the Project area is sparse with several privately owned parcels abutting the Project boundary along the north end of Loon Lake reservoir, several parcels in vicinity of Gerle reservoir, two parcels in the vicinity of Jones Fork development, several parcels abutting the Union Valley development, one parcel near the access road to the south of Camino developments, and several parcels in the vicinity of the Slab Creek/White Rock development. All of these private-residential parcels are zoned as Natural Resource Areas by El Dorado County and may be used for rangeland, wildlife management, forestry, water resource development, and or residential use supporting one dwelling per 40 to 160 acres. There is also sparse residential development to the north and south of the Iowa Hill site, which would be constructed on SMUD-owned land currently designated as rural residential with a platted lands overlay, on Eldorado National Forest lands, and on Sierra Pacific Industries lands designated as Natural Resource. The lands in the Chili Bar Project area include rural residential parcels, and several residences are located within 0.75 mile downstream of Chili Bar dam.

Access Roads

The SMUD operations and maintenance staff use a variety of federal, state, county, and private highways/roads to access Project facilities. SMUD's use of these roads consists of light and heavy vehicles at varying levels of frequency. All roads (about 104) within the UARP were surveyed and identified for existing or potential sources of erosion or sediment that may reach a watercourse. SMUD, Sierra Pacific Industries, the Forest Service, El Dorado County, or a combination of two or more of these jurisdictions maintains these roads. Main access roads to Project features and Project campgrounds that were paved generally had formal drainage systems, implemented erosion control measures, and little or no observed erosion and sediment transport. Access roads to transmission line towers generally followed the natural grade and used water bars for drainage. Ruts were observed on several of these roads, but sediment usually did not leave the roadway. In the worst cases, sediment traveled 15 to 20 feet from the road. Because these roads are typically on the tops of ridges and far from streams or rivers, there is little opportunity for sediment reaching watercourses.

Unpaved roads and trails (surfaced with gravel or native materials) that provide access to Project features typically have drainage features, including side ditches, water bars, and cross culverts. Some of these roads are near watercourses and have the potential to transport sediment to the water; however, most of these roads have higher usage and appear to be maintained. Very few problem areas were identified. During the winter, SMUD plows Ice House Road and several other roads needed to operate and maintain the UARP facilities. SMUD also voluntarily plows selected parking areas for recreationists in accordance with the Eldorado National Forest's annual snow removal plan, and during spring opening of campgrounds. SMUD removes the snow from Ice House Road consistent with a use permit issued by El Dorado County.

The roads that would serve the Iowa Hill development are U.S. Highway 50 (U.S. 50), Carson Road, Larsen Drive, North Canyon Road, Slab Creek dam access road, Slab Creek reservoir access road, Cable Road, and Iowa Hill Road. U.S. Highway 50 is the primary east-west transportation corridor through the county that serves all of the county's major population centers. Carson Road is a two-lane, east-west roadway extending from Camino to Placerville. Cable Road is a two-lane road paved up to the Sierra Express Drive intersection that runs generally north-south (with many curves). The remaining road segment to Iowa Hill Road is loose gravel or dirt. Cable Road would serve as the primary access route for the upper reservoir site, and it would be graveled from Sierra Express Drive to the Iowa Hill development as part of the Project improvements. Iowa Hill Road, off of Cable Road, is the access road to the upper reservoir site. Iowa Hill Road is a dirt road with no shoulder, and it would be graveled as part of the Project improvements. Larsen Drive is a two-lane, rural local collector that runs generally north-south between North Canyon Road and Carson Road. It also connects North Canyon Road to Cable Road. North Canyon Road is a two-lane north-south local road between Placerville and Camino. Slab Creek dam access road, off of North Canyon Road, provides access to the lower reservoir site, and it has a varying roadway width and no shoulder. It connects to Slab Creek reservoir access road at Slab Creek reservoir. Both Slab Creek dam access road and Slab Creek reservoir access road would be upgraded as part of the Proposed Action.

The Chili Bar Project access road extends to the Project facilities east from Highway 93. Three privately developed roads lead to shoreline areas that are located on Project lands including two roads off of Rock Creek Road along the northern shore of the Chili Bar reservoir and one road off of Bear Rock Road on the southern side of the Chili Bar reservoir.

Vegetation Management below Transmission Lines

SMUD currently implements a vegetation management program to maintain the vegetation in the transmission line right-of-way. SMUD voluntarily complies with California Public Utility Commission rules and regulations regarding power line clearances (General Order 95). The purpose of the plan is to sustain an adequate distance between overhead transmission lines and vegetation within the right-of-way. SMUD mainly uses mechanical methods, such as hand cutting and bulldozing, to clear the right-of-way outside the Eldorado National Forest. Recently, the Forest Service authorized SMUD to use herbicides in addition to mechanical treatment within the right-of-way on National Forest System lands. Herbicides allow for selective treatment of vegetation where undesirable plant species, such as noxious weeds, are selectively treated, and desirable species, such as low-growing trees and shrubs that provide wildlife habitat or food for foraging, are preserved. The reduction of fuels within the right-of-way has an added benefit as it creates a fuel break that will contribute to the control or containment of a wildfire.

Fire Risk and Protection

SMUD conducted a fire risk and protection study that concluded that that fire risk is highest in lands within the immediate vicinity of the UARP reservoirs and where recreation occurs. Fire risk progressively decreases moving further away from the reservoirs. Within the Pacific Ranger District, there are about 28,200 acres in need of fuels reduction treatment. Projected fuel treatments to reduce fire hazard to acceptable levels includes treating areas with a combination of thinning and slashing in the first decade, followed by periodic underburning to maintain desired conditions over the next five decades. SMUD's study found a positive correlation between human-caused fires and proximity to dispersed recreation located on Eldorado National Forest-managed lands sites; historically, fires are clustered along roads and surrounding recreational areas such as Union Valley, Loon Lake, and Ice House reservoirs. However, available data do not allow distinction between the types of human-caused fires. While transmission line sag is a fire risk, measures are in place to evaluate and remove hazard trees under and adjacent to transmission lines. Removal of these trees on a periodic basis minimizes the risk of fire start from the transmission lines.

While some wildfires in the UARP area have occurred historically, the Eldorado National Forest has an active fuels management program in place to minimize fire risk. Fires at UARP-related recreational areas are relatively rare, and when they occur they are usually small and quickly suppressed.

Land Management

Federal

As noted above, federal lands managed by two federal agencies (Forest Service and BLM) account for about two-thirds (6,090 acres) of the acreage within the Project boundary.

Forest Service—In 2001 and 2004, the Eldorado National Forest Land Resources and Management Plan was amended by the Sierra Nevada Forest Plan Amendment. This was a planning effort to respond to the study of the Sierra Nevada Mountain bioregion. The Sierra Nevada Plan addressed the following five management problems: (1) old forest ecosystems and associated species, (2) aquatic, riparian, and meadow ecosystems and associated species, (3) fire and fuels management, (4) noxious weeds, and (5) lower Westside hardwood forest ecosystems. The 2004 amendment established management direction and goals; land allocations; desired future conditions; standards and guidelines for future management actions; and strategies for inventory, monitoring, and research to support adaptive management.

The goals of the old forest and associated species strategy are to (1) protect, increase, and enable desired conditions of old forest ecosystems and conserve species associated with these ecosystems while meeting people's needs; (2) increase the frequency of large trees, increase structural diversity of vegetation, and improve stability and distribution of old forests across the landscape; and (3) restore forest species composition and structure following large-scale, stand-replacing disturbance.

The aquatic management strategy goals are to maintain and restore (1) water quality, (2) species viability, (3) plant and animal diversity, (4) special habitats, (5) watershed connectivity, (6) floodplains and water tables, (7) watershed condition, (8) streamflow patterns and sediment regimes, and (9) stream banks and shorelines.

The goals for fire and fuels management include reducing threats to communities and wildlife habitat from large, severe wildfires and re-introducing fire into fire-adapted ecosystems. The long term goals are (1) treating fuels in a way that reduces intensity and spread, therefore making fire suppression more effective; (2) treating hazardous fuels in a cost-efficient manner to maximize program effectiveness; and (3) actively restoring fire-adapted ecosystems. The management of hazardous fuels in and around communities combined with strategic placement of treatment across broad landscapes can modify wildland fire behavior.

The Eldorado National Forest Land and Resource Management Plan was also amended in 1998 to include the Desolation Wilderness Management Guidelines. These guidelines were developed because of the following issues: (1) increased day use in the wilderness due to increasing population in urban areas and improved access at wilderness trailheads, (2) the development of more refined methods of managing wilderness use, and (3) the national direction for the Forest Service to use land resource management plans to create standards and guidelines for consistent wilderness management.

U.S. Bureau of Land Management—The BLM's management plan for the SFAR pertains to the management of public lands. This management plan contains a set of assumptions that apply to the UARP and the Chili Bar Project. Planning Assumption #10 states, "It's anticipated that there will be no significant changes in water flow in the SFAR in the foreseeable future" (BLM, 2004, not seen, as cited in DTA and Goodavish, 2005a).

The Federal Land Policy and Land Management Act is the organic act of the BLM. The act establishes the agency's multiple-use mandate to serve present and future generations. The act requires periodic and systematic inventorying of publics and land use planning to project present and future land uses.

El Dorado County—All lands in the study area owned by El Dorado County are located outside the Project boundary. Lands in El Dorado County are subject to the policies detailed in the El Dorado County General Plan, River Management Plan, Trails Master Plan, and Water Agency Water Resource Development and Management Plan.

In El Dorado County, designations include Rural Residential, Low, Medium and High Density Residential, Natural Resource Areas, and Open Space. Rural Residential is defined as areas for residential and agricultural development where there is one dwelling unit per 10 to 160 acres. Low Density Residential establishes areas for single-family residential development in a rural setting with a maximum of one dwelling unit per 5 acres. Medium Density Residential is for detached single-family residences with larger lot sizes that enable limited agricultural land management activities. There is a maximum of one dwelling unit per 1 acre. High Density Residential areas are suitable for intensive single-family residential development (condominiums, townhouses, detached dwellings, and manufactured homes) at densities from one to five dwelling units to 1 acre. In the vicinity of UARP, within the Eldorado National Forest boundary, both governmental and non-governmental lands are designated as Natural Resources Area, which means these areas contain economically viable natural resources and protect the economic viability of those resources and those engaged in harvesting/processing of those resources, including water resources development. Compatible uses may include agriculture, rangeland, forestry, wildlife management, recreation, water resources development, and single-family dwellings necessary to support compatible uses. The Open Space land use designation includes public lands under governmental title (other than those designated as Natural Resources) where no development other than that specifically needed for governmental-related open space uses is desired.

3.3.7.2 Environmental Effects

Land Ownership, Management, and Use

The proposed management plans and associated land management strategies and implementation measures could affect land use and land management within the UARP area over the term of a new license. There are no measures in PG&E's Proposed Action that would affect land use at the Chili Bar Project.

Transportation System Management Plan

Under Proposed Article 1-30, *Transportation System Management,* SMUD would (1) develop and implement a transportation system management plan, approved by the Forest Service, for roads on or affecting National Forest System lands, (2) undertake specific road improvements, and (3) provide to the Forest Service an annual snow plowing plan to address public safety and access.

The proposed transportation system management plan would (1) establish SMUD's level of responsibility for Project roads with SMUD having primary responsibility for non-system roads and for maintenance level 1 and 2 roads and sharing levels of responsibility for maintenance level 3, 4, and 5 roads with the Forest Service; (2) include maps showing all roads, a traffic safety and signage plan, drainage crossings, easements or right-of-way agreements identifying those roads for which an easements or right-of-way agreements are needed; road use by season, conditions of the roads, a signage plan, measures to control erosion at the UARP facilities; and identification of access points at the UARP; and (3) provision for 5-year plan updated every 5 years to identify the maintenance and reconstruction needs for Project roads.

SMUD would also address specific road projects, including (1) improvements to North Union Valley Road; Wrights Lake Tie Road to improve the intersection with Ice House campground entrance road, and Lakeshore Road within 5 years of license issuance and close the road to Junction dam to public access and construct a turnaround/parking area within 10 years of license issuance.

Our Analysis

Some of the Forest Service and other public roads the licensee uses to access Project facilities for operation and maintenance purposes are also used by the Forest Service for administrative and land management purposes, and the public for recreational activities. The development of a transportation management plan, in consultation with the Forest Service, would enable ongoing maintenance and associated planning responsibilities to be clearly defined. Such clarification of maintenance responsibilities and implementation of erosion control measures during maintenance activities would minimize the potential for road erosion and damage caused by snow removal or other factors and other resource damage caused from precipitation and increased traffic. We note that any Project access road requiring routine maintenance would need to be included in the Project boundary. Implementation of the specific road improvements to those roads constructed by SMUD and used primarily for Project purposes would enhance public safety and access at several highly used recreational facilities.

Iowa Hill Development

Under SMUD's proposal, construction at Iowa Hill would begin with updating existing access roads to accommodate construction vehicles. The updated roads would serve as the main avenues for construction vehicles and for the estimated 235 temporary construction workers to access the upper and lower construction areas. The access road improvements and regular road maintenance associated with Project construction could enhance the potential for development after construction is complete.

Along with its license application, SMUD filed a draft Transportation Management Plan that addresses traffic safety and road improvements (also discussed in section 3.3.10.2). Appendix A of this plan states that SMUD would comply with federal and state laws, ordinances, regulations, and standards (LORS) that would govern the construction of Iowa Hill and the transport of materials on public roads and highways.

To address traffic safety and the road improvements noted above, SMUD's draft Transportation Management Plan includes a traffic analysis that addresses construction workers' parking, public safety for children, public information dissemination, and emergency access. According to this plan, SMUD would provide parking for about 30 workers near the powerhouse access tunnel entrance and at the upper reservoir. The draft plan also considers an offsite parking area (and a shuttle service) near U.S. 50 to reduce the number of construction worker trips on most area roads.

Under the proposed access routes, SMUD would reduce potential hazards to school buses and children of the Camino Union School District by coordinating most of the Project site construction commuter traffic to occur before 6:30 a.m. so as not to interfere with morning pick-up times from 7:00 to 8:00 a.m. Material deliveries to the Project site would occur between 9:00 a.m. and 2:00 p.m. while school is in session. In the afternoon, however, construction traffic could overlap with school traffic. To ensure the safety of school children, construction workers would be informed of bus routes and times to reduce the possible conflict between construction worker traffic and school traffic. SMUD would organize meetings and other forms of communication to inform the public about transportation effects.

SMUD proposes to submit a final Transportation Management Plan at least 90 days prior to any land disturbing activity. The plan would include descriptions of road segments to be upgraded, along with engineering assessments of the roads used for transporting oversize materials. All temporary lighting, signs, and traffic control devices would follow the standards of the Federal Highway Administration and the California Department of Transportation. The final Transportation Management Plan would have an emergency access policy. SMUD would also provide directions to ensure that most vehicles would access the site through the East Camino Interchange; and a message board would be provided for construction workers to facilitate carpooling to the construction site. Truck deliveries to the Project site would be scheduled to avoid conflicts with local traffic. As noted above, training would be provided to construction in workers with regard to school bus routes and child safety. Measures would also be taken to minimize dust and erosion from transportation. In the draft Transportation Management Plan, SMUD proposes to develop a road monitoring program to monitor the condition of Project-related roads and repair any damage caused by construction-related traffic. SMUD would provide a point-of-contact and a mechanism for the public to voice any concerns or to report violations of traffic protocols established in the plan

During the public meeting and in comment letters on the draft EIS, many local residents expressed concerns about public safety related to construction of the Iowa Hill development despite the protection measures outlined in the draft transportation plan. Local residents expressed a continuing concern about the increased construction traffic and the effect it would have on local traffic, children using school buses, and those walking or bicycling along the narrow roads.

To address these concerns, SMUD is considering alternative routes that it describes in filings dated December 7, 2007 and January 2008. The 11 alternatives evaluated by SMUD in its December 7, 2007, filing include the following:

Routes to Lower Construction Site

1—Carson Road East (original proposed route), exiting U.S. 50 at the Camino at-grade intersection;

3—Carson Road West with Underpass, exiting U.S. 50 at a new connection in the vicinity of the existing Carson Road at-grade intersection;

5—Barkley Road, exiting U.S. 50 at the existing Camino at-grade intersection;

8—Carson Road East with Underpass, exiting U.S. 50 at a new connection in the vicinity of the existing Carson Road at-grade intersection;

10—Jacquier Road, exiting U.S. 50 at the Point View Drive interchange, and requiring a new connector road to Jacquier Road; and

11—Golf Course with Underpass, exiting U.S. 50 at a new connection in the vicinity of the Carson Road at-grade interchange, and transiting the Apple Mountain Golf Course.

Routes to Upper Construction Site

2—Cable Road via Cedar Grove Exit, exiting U.S. 50at the Cedar Grove interchange;

6—Cable Road via Camino Exit, exiting U.S. 50 at the Camino at-grade interchange;

7—Badger Hill Road, exiting U.S. 50 at the Pollock Pines interchange;

9—Mace Road/Cable Connector, exiting U.S. 50 at the Cedar Grove interchange; and

13—Golf Course with Underpass with New Road to Upper Site, similar to alternative 11, with the addition of a new road (the SW Connector) to the upper construction site.

SMUD evaluated the 11 alternative routes based on the length of the routes, roadway geometric alignments, existing traffic volumes, neighborhood and local business impacts, potential park and ride locations near U.S. 50, and the amount of roadway construction needed to accommodate construction vehicles (CH2M HILL, 2008b). To determine the preferred routes, SMUD gave higher preference to shorter routes, roadways with stronger and wider construction cross-sections, roadways with milder grades, and routes with the fewest local businesses and residences along the route. Routes with higher traffic volume were considered less desirable. Regarding access from U.S. 50, interchanges were preferred over intersections, because interchanges allow vehicles to exit the roadway more safely and without the need to stop to make left turns from the highway. For similar reasons, park-and-ride locations on the north side of U.S. 50 were preferred so that vehicles would not need to cross the high-speed road. Construction of an underpass, required for routes 3, 8, and 11, would make those alternatives extremely costly compared to most of the other options. Similarly, the need for a new road across the golf course and compensation for acquisition or temporary use of the property would increase the cost of those alternatives (#11 and #13).

Based on these criteria, SMUD concludes that the preferred routes to the lower construction site would be Carson Road East (#1), Barkley Road (#5), and Jacquier Road (#10), noting that all three routes offer a good balance of minimizing community impacts (by avoiding most residences, businesses, bus routes, etc.), maximizing the construction contractor's efficiency (by using roadways that would reduce trip length and that would not require major reconstruction), and minimizing overall project costs. Among these three routes, SMUD concludes that there is no "best" route, and that all offer benefits and some tradeoffs.

Again based on these criteria, SMUD concludes that the preferred route to the upper construction site would use the SW Connector rather than depending upon Cable Road (#2, #6, #7, #9). The primary constraint associated with all of the studied routes to the upper construction site is the geometric cross-sections of the roads. Cable Road, Mace Road, Blair Road, and Badger Hill Road would require significant improvements to allow construction vehicles to pass safely. The roads currently have narrow cross sections, have deteriorated pavement or only gravel and dirt construction, and in some places have obstructions immediately adjacent to the roadway. Much of the distance is single lane, and the roads have many sharp turns and narrow curves. Blair Road also has a single lane bridge. In addition, the use of these roads in some areas would require access to private property.

In contrast, the SW Connector would not have these issues, and if constructed, it would provide a second egress from the construction site (the other egress being along the existing Cable Road). However, the SW Connector would traverse steep slopes, and its feasibility has not been demonstrated. If it turns out that there is no feasible way to construct the SW Connector, SMUD concludes that alternatives #2 (Cable Road via Cedar Grove exit) and #9 (Mace Road/Cable Connector) have the fewest negative characteristics among the upper construction site routes. The negative aspects of the routes include traffic in residential areas (#2) and logistical issues for the contractor (#9).

In addition to its other criteria, SMUD considered various park-and-ride alternatives as a means of alleviating traffic-related project effects. Vehicles could access routes to the upper reservoir from a park-and-ride location on Forest Service property along 8 Mile Road or at three possible locations around the SPI Camino mill property. Using these routes at the daily hours described in the draft transportation plan would avoid adverse impacts to the bus routes, existing traffic volume, and businesses along these roadways. However, SMUD indicates in its study that all of the studied park-and-ride sites are not necessarily available or feasible for use as Project staging areas.

Ultimately, SMUD may spread various types of construction traffic out among multiple routes to alleviate congestion, to reduce costs and improve construction efficiency, and to act in the best interests of the community. The routes of the construction traffic will be defined in the final Transportation Management Plan. The plan should also address the feasibility of the SW Connector and therefore the use of the preferred routes to the upper construction site. Selection of an alternative route in consultation with the Advisory Committee would help address public safety concerns raised by local residents and reduce user conflicts on the existing local roads.

Once operating, we could not expect the two on-site employees and periodic trips by supply and maintenance vehicles to generate much Project-related traffic at Iowa Hill.

Trails System Management Plan

Under Proposed Article 1-31, *Trails System Management*, SMUD would develop a trails system management plan, approved by the Forest Service, for the trails that are needed for Project operations and are located on or affect National Forest System lands. SMUD would also address specific trails management projects, as described in Proposed Article 1-19, *Specific Recreation Measures*. Section 3.3.6, *Recreational Resources*, contains information on specific elements of the plan and trails projects.

Our Analysis

The trail system management plan would identify measures to ensure that safety, maintenance, and rehabilitation measures associated with the trails are addressed in a consistent manner and so as not to adversely affect environmental resources. Some of the Forest Service trails the licensee uses to access Project facilities for operation and maintenance purposes are also be used by the Forest Service for administrative and land management purposes, and the public for recreational activities. The trails system management plan would provide for ongoing maintenance and improvement of the trail system for UARP, Forest Service, and people using the recreational facilities at the reservoir. Trails requiring routine maintenance would need to be included within the Project boundary.

Iowa Hill Development

The construction schedule at Iowa Hill does not include initial upgrades of trails as the trails are not main avenues for accessing the construction areas at Iowa Hill or Slab Creek. The trail usage generated from construction activity would be minimal.

Trail usage created during operation of the proposed project would be minor.

Facility Management

Under Proposed Article 1-32, *Facility Management*, SMUD would develop and implement a facility management plan, approved by the Forest Service. The proposed plan would include a map showing all UARP facilities, including structures on or affecting National Forest System or BLM lands and above-or below-ground storage tanks; a description of the type and season of use of each structure; and a description of the condition of each structure, and planned maintenance or removal. In addition, every five years SMUD would prepare a plan identifying maintenance, reconstruction, and removal needs for UARP facilities, including transmission lines.

Our Analysis

Development and implementation of the proposed facility management plan would provide Forest Service or BLM with information on planned maintenance activities that might affect federal lands.

Proposed Project Boundary

Project boundaries of the UARP and Chili Bar Project would be changed under the proposed actions. SMUD proposes to revise the UARP Project boundary to encompass the new Iowa Hill development south of Slab Creek reservoir, which covers about 283 acres and includes a berm, tunnel, powerhouse, and transmission line. Steep terrain limits land use in the area. Currently, lands are used minimally for timber production by Sierra Pacific Industries and Eldorado National Forest with limited dispersed recreation. SMUD would also include the Project recreational facilities.

PG&E proposes to revise the Chili Bar Project boundary. The existing Chili Bar Project boundary includes about 255 acres of PG&E-owned lands from approximately 50 to 250 feet from either side of the river and extending from 3.2 miles upstream of the Chili Bar dam to 320 feet downstream of the dam. The PG&E proposed boundary would be about 103 acres within the normal maximum water surface elevation at 997.5 feet mean sea level and would enclose all Project works, as well as a 12-foot wide corridor for a new proposed hiking trail (the Sand Bar Trail) to provide public access to the reservoir shoreline.

Our Analysis

The UARP proposed boundary change would not affect land ownership, but would change land use in vicinity of the Project south of Slab Creek reservoir. Under the Proposed Action, existing timber production and recreational use would be converted to industrial use. However, because existing land use is limited to timber production and dispersed recreation, the environmental effects of the proposed boundary change would be minor. Inclusion of the Project recreational facilities would ensure the ability of the Commission to enforce compliance with the proposed measures for recreation facility, road, and trail improvements and maintenance over the term of any license issued for the Project.

The proposed Chili Bar Project boundary excludes approximately 152 acres of BLM, PG&E, and private lands included in the existing boundary. PG&E does not provide any specific information about why the lands are no longer needed for Project purposes. However, land use and ownership would not be changed, and recreational access to the reservoir would be provided through development of the Sand Bar Trail. Environmental effects of the proposed boundary on land use and management would be negligible.

Effects of Proposed Iowa Hill Development (Overall)

The proposed Iowa Hill development would be located south of Slab Creek reservoir. The current land uses, including recreation, are minimal due to the steep terrain. The SMUD-owned lands have no existing use while the Sierra Pacific Industries and Eldorado National Forest lands are management mainly for timber production. The construction of the proposed Iowa Hill development would have minimal effects on land use and management at UARP. Construction of the Iowa Hill development would not prevent future development of residences on the private parcels around the Project, but would adversely affect residential parcels, ranging from short-term construction-related disturbances to the long-term obstruction of views. However, the Project as proposed may enhance the potential for development because of access road improvements and regular road maintenance.

Vegetative Management Plan

The proposed vegetation management plan primarily affects terrestrial resources and is discussed in section 3.3.4.2, *Terrestrial Resources, Vegetative and Noxious Weed Management* and would address vegetative management under Project transmission lines.

Fire Management and Response Plan

Under Proposed Article 1-34, *Fire Management and Response Plan*, SMUD would develop and implement a plan for the prevention, cost sharing, coordination, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations. The proposed plan would include (1) the identification of fire hazard reduction measures to prevent the escape of Project-induced fires, (2) the locations of exit routes and determination of fire suppression strategies, as well as address fire danger and public safety associated with Project-induced recreation, (3) analysis of emergency response and fire prevention needs including equipment and personnel, (4) reporting, (5) lists of the location and availability of fire suppression equipment and personnel, and assurances that prevention measures meet water quality protection practices, and (6) investigation of Project-related fires.

Our Analysis

The UARP continues to create a wildfire threat. Recreation at the reservoirs and stream reaches, including Project facilities and user-created dispersed sites, pose a substantial fire risk and that risk will increase as recreational use increases in the future. Given the known high incidence of fire starts and previously treated and untreated fuels in the area, SMUD should take reasonable preventative and pre-suppression actions at its Project facilities to help prevent wildfires and create safer conditions for the visitors brought to the Crystal Basin by the Project facilities and reservoirs. Implementation of the proposed fire management and response plan would improve planning, management, and coordination for wildfire protection and prevention measures, as well as lead to a reduction in the occurrence and suppression of wildfires that might be Project-induced.

3.3.7.3 Unavoidable Adverse Effects

None.

3.3.8 Aesthetic Resources

3.3.8.1 Affected Environment

The UARP is located in El Dorado County and the northeastern part of Sacramento County, California. UARP lies on the western slope of the Sierra Nevada mountain range. This part of the county is largely undeveloped and retains much of its natural character, with scattered rural residences and small communities located along major corridors throughout the western slope. Nearly all of the UARP facilities, except for the White Rock powerhouse and the section of the UARP transmission line that leads from the powerhouse to Folsom Junction, are located on lands within the Eldorado National Forest.

The UARP existing facilities and proposed Iowa Hill development can be placed into three aesthetically distinct geographic areas: Desolation Wilderness, Crystal Basin, and Canyonlands. SMUD identified key view points (table 3-69) associated with Eldorado National Forest viewsheds within and near the Project boundary to assess the existing visual condition of UARP facilities and operations within the surrounding forest landscape.

Table 3-69. Aesthetics resources at UARP, key viewpoints. (Source: DTA and Goodavish, 2005a)

Rubicon Trail	Sunset / Fashoda Road
Loon Lake reservoir	Union Valley reservoir
North Loon Lake Road	Union Valley Bike Path
Red Fir Access Road	Big Hill Lookout Road
McKinney Creek Road	Ice House-Wrights Road
Wentworth Springs Road	Ice House Reservoir Road
Gerle Creek Access Road	Ice House reservoir
Gerle Creek reservoir	Bryant Springs Road
Ice House Road	Forebay Road
Wolf Creek Road	Highway 193
Yellow Jacket Road	State Scenic Highway 50
Deer Knob Peavine Road	

Desolation Wilderness

The Desolation Wilderness lies within the crest zone of the Eldorado National Forest. The Eldorado National Forest is managed in terms of visual quality objectives (VQO), which are reflected in the 1988 Land and Resource Management Plan (Forest Service, 1988, not seen as cited in DTA and Goodavish, 2004). The VOQs represent a combined rating of the scenic integrity or visual variety of the landscape with a sensitivity rating that reflects the number and relative concern of viewers for the scenic quality of the landscape. The Desolation Wilderness is characterized by a strongly glaciated landscape with peaks that tower above glaciated rocky basins. The UARP boundary is excluded from wilderness designations but is required to be managed in a manner that is consistent with the adjacent wilderness. Desolation Wilderness is managed for a VQO of Preservation that allows only ecological changes to be made, where management activities (except for low visual impact recreational facilities) are prohibited. Because the facilities at UARP are man-made, the Project will never meet the wilderness Preservation VQO. The Forest Service goal is to move as close to a Preservation VQO as is reasonable.

The UARP facilities within the wilderness are associated with Rubicon reservoir and affect views from the Rubicon Trail. As viewed from the trail, the scale and color of the main dam blend in fairly well with the surroundings. The auxiliary dam has an angular form that contrasts with but does not dominate the characteristic landscape. Due to the proximity of the trail to the intake structure, boom, and gaging structure, the built facilities are major visible features that contrast with the natural appearing wilderness area and dominate views from the trail. Traveling north from the reservoir, Rubicon trail splits. Along the northwest trail, the outlet structure, gauging station, and cable crossing over the channel dominate the view. The tunnel outlet is gated by a chain link fence that detracts from the natural setting. The concrete color and texture of the tunnel matches that of the surrounding rocks although the smooth texture and geometric form appear unnatural. The light color of the gaging station, contrasts with the characteristic landscape.

Crystal Basin Landscape

The Crystal Basin lies within the mixed conifer-red fir zone of the Eldorado National Forest. Within the Crystal Basin are 5 areas of power generating developments: Loon Lake, Robbs Peak, Union Valley, Jones Fork, and Jaybird. Views from trails, roads, and reservoirs are affected by the UARP facilities.

At the Loon Lake development, the main and auxiliary dams at Buck Island reservoir have a horizontal form and smooth texture that contrasts with the natural setting, whereas the scale and color of the dams reasonably blend well. The Buck Island dam, intake, transmission lines, and powerhouse are not obvious to those utilizing the Rubicon Trail or the Buck Island reservoir. At Loon Lake reservoir, the scale and horizontal line of the main and auxiliary dam contrasts with the natural settings surrounding the dam, although the colors blend in well. Looking at these features from the reservoir and Red Fir Access Road they are unnatural appearing and dominate the view. The main and auxiliary dams at Loon Lake are intermittently visible from Rubicon Trail but are obscured by the landforms and vegetation. The Loon Lake dike and powerhouse are off the reservoir shoreline and are not visually evident from the reservoir, although the angular shape of the powerhouse contrasts the surrounding landscape. The powerhouse is visually evident from North Loon Lake Road. The intake at Loon Lake is near the shoreline, light in color, and angular in shape making it subordinate to the surrounding landscape. The Loon Lake intake can be seen easily from the Rubicon Trail and other points on the reservoir. The transmission line and substation at this development are hard to see from the reservoir but are noticeable from North Loon Lake Road and McKinney Road. One tower is visible from Rubicon Trail.

Within the Robbs Peak development, users at Gerle Creek reservoir, the trail to Angel Peak, and the Summer Harvest Trail can see the UARP dam and intake. The dam and intake area introduce an angular shape and smooth texture into the landscape. The color is similar to the granite rock but contrasts with the forested background.

At the Union Valley development UARP facilities such as the Gerle Creek canal, Robbs Peak dam area, and the Robbs Peak penstock can be seen from Ice House Road near the Robbs Peak forebay. The Gerle Creek canal and the Robbs Peak dam area do not dominate the view but both have contributed to the developed nature of the forebay site. Development at the dam area at Robbs Peak includes dam gates, an intake structure, fences and gates, cleared areas, and a small building. The dam area also consists of angular shapes and light colors which contrast with the surrounding scenery. The Robbs Peak penstock forms a dominate line that can be seen briefly from Ice House Road. The penstock is also evident from Big Hill Lookout Road, Big Hill Vista, Union Valley reservoir, and portions of the Union Valley bike path.

The Jones Fork penstock, near the Jones Fork powerhouse, is also visible from Ice House Road. The penstock is well screened to the east but is visible to the west of Ice House Road because of clearing from the road. The penstock is visible where there are forest openings at other locations, such as from Big Hill Lookout Road. It is also visible in the middle-ground viewed from Big Hill Vista. The penstock is light in color and contrasts the soil and dark green surrounding vegetation.

Along Deer Knob Peavine Road, the Union Valley dam, powerhouse, switchyard, and intake can be seen. The dam dominates the view. The powerhouse is angular and the color contrasts with the surrounding environment. The switchyard and substation are in close proximity to the powerhouse which together dominates the view of a confined canyon setting. Two towers of the Union Valley transmission line can also be seen from Wolf Creek Road near Deer Knob Peavine Road.

The Union Valley dam and transmission lines, and the Robbs Peak penstock, transmission lines, and powerhouse, can be seen from the Union Valley reservoir. The horizontal form of the Union Valley dam is apparent and contrasts with the surrounding landscape. The Robbs Peak penstock color blends well with surrounding soil but in combination with other surrounding features, such as the powerhouse, it dominates the view. The powerhouse is dark in color and contrasts with the light soil surrounding it in the foreground view from the reservoir but blends in with the surrounding vegetation when viewed in the middleground. Most of the Union Valley transmission lines are shielded from view by the forest, although visibility is temporarily increased due to the Cleveland Fire, which occurred in 1997.

From different view points on Ice House reservoir, there are views of the main dam, intake, and dikes. The main dam is angular and contrasts with the surrounding landscape. When the water level is high, the scale of the dam is relatively small when compared to the size of the reservoir; it is noticeable but does not dominate the view from any location. The intake is only visible to viewers directly in front of it. The dikes at Icehouse reservoir are low and similar in color to the surrounding shoreline.

At the Jaybird development from Bryant Springs Road, the Union Valley dam and substation, as well as Union Valley-Jaybird transmission line are visible. From the road, the Union Valley dam is large in scale and takes up the view. The substation is seen in front of the dam contributing to the dominating view. The Union Valley-Jaybird transmission towers are screened by forest vegetation and only visible intermittently whereas the transmission lines govern the view around Junction reservoir.

Canyonlands Landscape

The Canyonlands lie within the front country zone of the Eldorado National Forest. The front country terrain is characterized by rolling uplands and steep rugged river canyons. The canyon lands contain the Camino development and the Slab Creek reservoir / White Rock development. At the Camino development there are no Eldorado National Forest managed viewsheds in the area. Relatively few people view the UARP facilities in this area.

UARP facilities, such as the Camino penstock and powerhouse, and the Camino-White Rock transmission lines affect views from Forebay Road (El Dorado County Road). The penstock contrasts with the natural setting because it is linear in form and does not blend well with the dark green forested hillside. Where the penstock is visible from Forebay Road, it dominates the upstream view. From Forebay Road bridge, the powerhouse and substation are not easily noticeable. The transmission line corridor dominates the view from locations along Forebay Road and where they cross over the canyon from the powerhouse to a knoll above the river.

Within the Slab Creek/White Rock development, the White Rock Spoil pile can be seen from State Highway 193. The spoil pile stands out and dominates the view because of its geometric shape, color, and size, in comparison to the surrounding forest land.

Reservoir Levels

SMUD conducted a survey to evaluate visitors' aesthetic expectations for, and satisfaction with, water surface elevations at the Loon Lake, Union Valley, and Ice House storage reservoirs. Visitors were asked about their historical and current use and satisfaction with reservoir levels. They were shown three pictures of different reservoir elevations, and asked what their level of satisfaction would be if the reservoir looked like the picture during their visits.

Of those interviewed who had visited Loon Lake reservoir before, only 15 percent said they had been dissatisfied with water levels in the past. Most respondents (92 percent) at Loon Lake reservoir were neutral, satisfied, or very satisfied with reservoir elevations at or above 6,399 feet (11 feet below full-pool). About half of the respondents were dissatisfied or very dissatisfied at an elevation of 6,390 feet (20 feet below full-pool), but only a quarter of respondents would find the 6,390-foot elevation to have a negative effect on their experiences.

Of those interviewed who had visited Union Valley reservoir before, 38 percent said they have been dissatisfied with water levels in the past. Over three-fourths of the respondents (78 percent) at Union Valley reservoir were neutral, satisfied or very satisfied with the 4,852-foot reservoir elevation (17 feet below full-pool). At elevation 4,816 feet (54 feet below full pool), 70 percent of the respondents were dissatisfied or very dissatisfied with the appearance of the reservoir and 72 percent said their experience would be negatively affected.

Of the respondents who have visited Ice House reservoir before, 34 percent said they have been dissatisfied with water levels in the past. Most respondents (88 percent) at Ice House reservoir were satisfied with reservoir elevations at and above 5,438 feet (12 feet below full-pool). At elevation 5,425 feet (25 feet below full-pool), 55 percent of the respondents were dissatisfied or very dissatisfied with the appearance of the reservoir. Similarly, 47 percent of respondents said their experience would be negatively affected at the 5,425-foot level.

Proposed Iowa Hill Development

For its 2005 Visual Resources Technical Report (DTA and Goodavish, 2005b), SMUD prepared photographic visual simulations at five key observation points within and near the proposed Iowa Hill development boundary focusing on the visibility of the proposed upper reservoir, switchyard, and transmission line from residential viewpoints. This 2005 study used still photos to simulate the view from each viewpoint looking toward the upper reservoir berm. Two simulations were completed for each key observation point. One photo depicted the view of the project 1 year after construction, and another depicted the view 10 years after construction. SMUD identified the key observation points in consultation with the Forest Service (figure 3-36) within and near the proposed Iowa Hill development boundary to represent views of the aesthetic environment of the UARP facilities and operations as well as to assess the aesthetic resources of the Project[40]. The analysis includes the effects on visual resources due to the existence of existing and proposed facilities and their operations. Field results

[40] Selection of key observation points was limited by private property access and no privately owned residential parcels were included in the study. Some of the private residential parcels may have more direct views of the project site than the publicly available view points included in the study

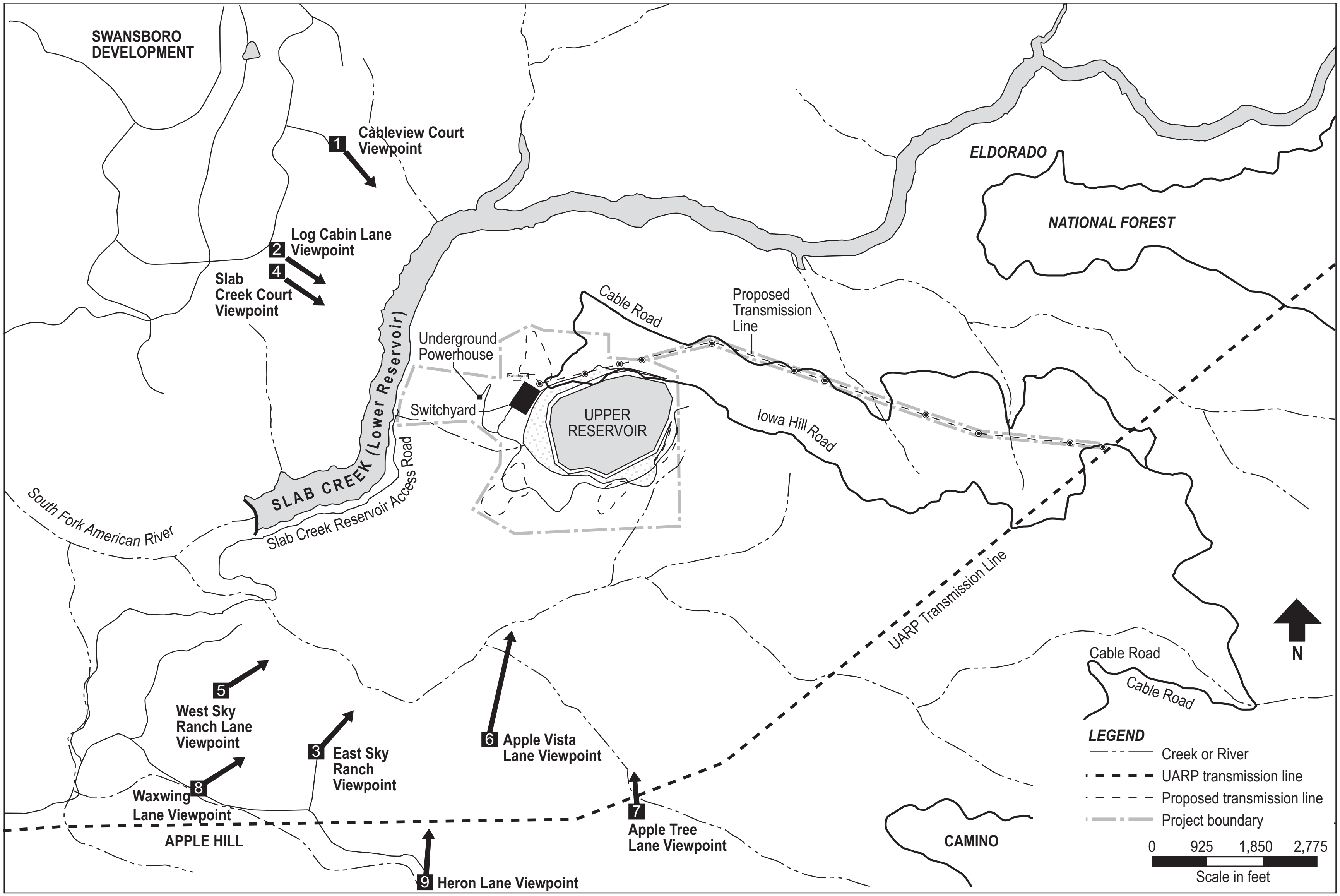

Figure 3-36. Key observation points in Project area. (Source: CH2M HILL, 2008a; PG&E, 2005, as modified by staff)

indicated that views of proposed Iowa Hill development are confined to lots located on the canyon side of roads and courts that border the outer edge of the subdivision above the SFAR: Deer Canyon Court, Cableview Court, Log Cabin Lane, Slab Creek Court, and White Oak Drive. There appear to be no views of proposed Iowa Hill reservoir from the "interior" roads of the development.

Along Deer Canyon Court, the proposed Iowa Hill development would not be seen from the road, although the road ends in a cul-de-sac where three lots may have views of the proposed development. On Cableview Court (no. 1 on figure 3-36), there would not be views of Iowa Hill because the area is heavily forested. A view of Iowa Hill to the south would be possible from an unmarked road off the side of Cableview Court, although vegetation would partly screen the view. Views from Log Cabin Lane (no. 2 on figure 3-36) were obscured by forested areas. About 10 lots on the east side of the road between Cableview and Slab Creek Courts (no. 4 on figure 3-36) would be affected by the proposed Iowa Hill development. Iowa Hill would be visible from the backyard of a lot at the north end of Slab Creek Court. The visibility of the proposed Iowa Hill facilities from these viewpoints could also be affected in the future should the trees that currently block views of the facilities be removed either by homeowners or through natural events such as bug kill or wildfires.

One key observation point is located on White Oak Drive (no. 4 on figure 3-36), which terminates at an entrance gate to a large lot from which Iowa Hill can be seen to the west. The proposed Iowa Hill development can be seen from the gate on Chute Camp Road (no. 5 on figure 3-36). Sky Ranch Lane (east and west) heads north and veers west, where the proposed Iowa Hill development can be seen (no. 3 on figure 3-36). It then turns into a private drive where the posted signs ask people to turn around. Along Winding Lane, the area is heavily wooded and there is no access to the lot at the end of the road. The lot, however, appeared to have a direct view to the north of the proposed Iowa Hill development based on the parcel map information. Skyview Drive passes under the existing UARP (Loon-White Rock) transmission line, where Iowa Hill could be seen from near the transmission line tower along the road. No apparent views of the proposed facility were evident from Mace Drive. Forebay Road provides access to the east end of Slab Creek reservoir and the Camino powerhouse. From this observation point, Iowa Hill and the slope the transmission line were visible at the last switchback in Forebay Road before it descends into the SFAR canyon.

In its 2008 addendum to the 2005 technical report (CH2M HILL, 2008a), SMUD compared the results of the 2005 report to the results of newly conducted 3-D visual simulations from the same 5 viewpoints and also presented the results of 3-D visual simulations for 4 new viewpoints. The public requested the 4 additional viewpoints at an Advisory Committee Visual Resources Subcommittee meeting in December 2007. The four additional viewpoints are Apple Vista Lane, Apple Tree Lane, Waxwing Lane, and Heron Lane. All 9 viewpoints are shown in figure 3-36.

For the 5 original viewpoints, the 3-D simulations depict the views toward the project directly after construction rather than 1 or 10 years later, and include a conceptual location of the lower portal at Slab Creek. The simulations also present a worst-case simulation by clearing all trees in the foreground area that could screen the view toward the upper reservoir. This was done because tree placement cannot be accurately represented and future tree clearing at any viewpoint is unknown. Additionally, in the 3-D simulation transmission lines were lowered from 120 feet to 100 feet, because transmission line structures could be lowered to 100 feet to reduce visibility. The comparison of the 2005 and 2008 simulation results are presented in table 3-70. For the 4 new viewpoints included in the 2008 addendum (CH2M HILL, 2008a), the 3-D simulations indicate that the view of the upper berm from Apple Vista Lane (viewpoint 6) is minimal. It is located behind trees on top of the ridgeline and only faintly viewable. From viewpoints 7-9, Apple Tree Lane, Waxwing Lane, and Heron Lane, the berm is hidden by vegetation and topography.

Project Area Management

Forest Service

Management of all National Forest System lands within the Project boundary is guided by several documents including the Eldorado National Forest Land and Resource Management Plan. All of the Project lands and lands influenced by Project operations that are managed under the Eldorado National Forest Land and Resource Management Plan fall within the Desolation Wilderness, Crystal Basin, or the Canyonlands areas.

The Eldorado National Forest Land and Resource Management Plan provides standards and guidelines for the VQO specified for each management area. VQOs are a measure of the degree of acceptable alteration permitted within the natural characteristic landscapes and are applied to all Project proposals and activities on National Forest System lands. The VQOs prescribed by the Eldorado National Forest Land and Resource Management Plan for the National Forest System lands within the UARP facilities boundary are as follows.

Preservation—The Preservation VQO allows for ecological change only. Except for very low visual-impact recreational facilities (such as hiking trails), management activities are prohibited. This objective applies to wilderness areas, primitive areas, other specially classified areas, areas awaiting classification and some unique management units that do not justify special classification. Project facilities that fall under the Preservation VQO include Rubicon reservoir and its diversion and tunnel. Although the Rubicon reservoir area sits inside the Desolation Wilderness boundary, the reservoir itself is not within the wilderness due to congressional exclusion, however, the act calls for the excluded lands "…. to be managed in a manner that is consistent with the adjacent wilderness."

Table 3-70. Comparison of Project visibility in the photographic visual simulations and 3-D visual simulations. (Source: CH2M Hill, 2008a, as modified by staff)

Location	2005 Photographic Simulation	2008 3-D Simulation	Comparison
Viewpoint 1 Distance to Upper Reservoir is 1.0 mile (middleground view) **Cableview Ct.**	The middle photo simulation shows the upper reservoir berm above the ridgeline and tops of the transmission line structures nearest to the reservoir. The switchyard equipment would not be discernable. It would add a form to the top of the ridgeline and be a dominant feature. There would be a change in color and texture at the ridgeline. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would be less prominent due to vegetation growth near it. The color of the berm would change.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would barely be visible; it would not dominate the view. The tops of the transmission line structures nearest to the reservoir would not be discernible.	The upper reservoir berm would be above the ridgeline and be a dominant feature in the photographic simulation. In the 3-D simulation, its visibility would be limited due to its location at the top of the ridgeline and the tint of the berm blending with the surrounding environment. It would be a subordinate feature in the 3-D simulation. Its mass would be smaller than that shown in the photographic simulation.
Viewpoint 2 Distance to Upper Reservoir is 0.8 mile (middleground view) **Log Cabin Lane**	The middle photo simulation shows the upper reservoir berm, partially screened by a tree that is at the viewpoint location. The berm's form would be noticeable, but would not dominate the view. A change to the ridgeline would not be visible. A change in color and texture to the area through the tree would be visible. The switchyard and transmission line structures would not be visible. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would barely be visible through the tree.	The 3-D simulation shows the top of the upper reservoir berm slightly below the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, but would not dominate the view. The switchyard equipment and transmission line structures would not be discernible.	The upper reservoir berm would be slightly below the ridgeline and not a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be slightly below the ridgeline. Its visibility and its mass would be similar to that shown in the photographic simulation.

Location	2005 Photographic Simulation	2008 3-D Simulation	Comparison
Viewpoint 3 Distance to Upper Reservoir is 1.1 mile (middleground view) **East Sky Ranch Lane**	The middle photo simulation is visible because it would change the ridgeline from an uneven texture to a smooth surface. It would add a form that does not dominate the view. The color and texture would blend with the surrounding environment. The switchyard equipment and transmission line structures would not be discernible. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would barely be visible due to the vegetation growth near it.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, but would not dominate the view. The switchyard and transmission line structures would not be discernible.	The upper reservoir berm would be slightly below the ridgeline and would not be a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would be more noticeable than the photographic simulation depicts, but would not dominate the view. Its mass would be comparable to that shown in the photographic simulation.
Viewpoint 4 Distance to Upper Reservoir is 0.8 mile (middleground view) **Slab Creek Ct.**	The middle photo simulation shows the upper reservoir berm's form as a dominant feature and the tops of the transmission line structures nearest to the reservoir are evident. It would change the height, texture, and color of the ridgeline. The bottom photo (10 years after the project would be constructed), the upper reservoir berm would remain a dominant feature. Minimal vegetation growth around the berm would be evident, and the color of the berm would change.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible similar to Viewpoint 2, and would be more noticeable than in Viewpoint 3, but would not dominate the view. The switchyard equipment and the transmission line structures would not be discernible.	The upper reservoir berm would be slightly above the ridgeline; it would be a dominant feature in the photographic simulation. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would be less noticeable than the photographic simulation depicts. It would not dominate the view; its mass would be smaller than that shown in the photographic simulation.
Viewpoint 5 Distance to the Upper Reservoir is 1.2 mile (middleground view) **West Sky Ranch Lane**	The middle photo simulation shows the upper reservoir berm, partially screened by a tree that is at the viewpoint location. It would add a form to the ridgeline. The color and texture along the ridgeline would change. The berm would be visible and noticeable, but would not be a dominant feature in the photo. The switchyard and transmission line structures would not be visible. The bottom photo (10 years after the project is constructed), the upper reservoir berm would remain noticeable; the only visible change would be the color of the berm. Vegetation would have grown, but would not screen the berm.	The 3-D simulation shows the top of the upper reservoir berm at the ridgeline. The ridgeline would change from an uneven texture to a straight horizontal line. The berm would be visible and noticeable, similar to that shown in Viewpoint 3, but would not dominate the view. The switchyard equipment and transmission line towers would not be discernible.	The upper reservoir berm appears to be above the ridgeline in the photographic simulation. It would be visible and noticeable, but would not dominate the view. In the 3-D simulation, the upper reservoir berm would be at the ridgeline. It would not dominate the view. Its mass would be comparable to that shown in the photographic simulation.

Retention—The Retention VQO provides for management activities that are not visually evident. Under Retention, activities may only repeat the form, line, color and texture frequently found in the characteristic landscape, but changes in their qualities of size, amount, intensity, direction and pattern should not be evident. Most of the reservoirs and surrounding shorelines associated with the UARP have a Retention VQO, including Buck Island, Loon Lake, Gerle Creek, Union Valley, Ice House, Robbs Forebay, and Slab Creek reservoirs.

Partial Retention—The Partial Retention VQO allows for management activities that remain visually subordinate to the characteristic landscape. Activities may repeat the form, line, color, or texture common to the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape. The area surrounding Junction reservoir has a Partial Retention VQO. Portions of Union Valley and Ice House reservoirs (and the surrounding area), and the upper development area for the Iowa Hill development have a Partial Retention VQO.

Modification—Under a Modification VQO, management activities may visually dominate the characteristic landscape. However, activities of vegetative and land-form alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area character-type. None of the UARP reservoir areas are in a Modification VQO.

U.S. Bureau of Land Management

The BLM-managed land in the UARP boundary is about a 40-acre parcel, located at White Rock. Visual Resource Management by BLM is based on the agency's Visual Resource Management system, which involves inventorying scenic values and establishing management objectives for those values through the resource management planning process. The BLM VQOs are defined by the Eldorado National Forest Land and Resource Management Plan. The standard intended to decrease conflicts with visual management objectives of the National Forests and BLM, yet allow continued Project operation. The BLM visual management objectives also apply to the 48 acres of BLM-managed lands within the Chili Bar Project boundary.

El Dorado and Sacramento County General Plans

The general plans for El Dorado and Sacramento counties include goals and objectives associated with the protection of visual resources, however there are no inventory and assessment systems similar to those of the federal agencies for managing visual resources. Therefore, the aesthetic assessment of Project facilities on lands outside the Eldorado National Forest (except for BLM lands where the VRM system applies) will use the environmental checklist questions from the CEQA Guidelines for evaluating any on-going visual or auditory effects of the Project within El Dorado and Sacramento counties.

3.3.8.2 Environmental Effects

Visual Resource Protection Plan

Under Proposed Articles 1-27 and 2-16, *Visual Resource Protection*, SMUD and PG&E would develop and implement, in coordination with the Forest Service and BLM, respectively, visual resource protection plans. The proposed visual resource protection plan was designed to improve how well Project facilities blend in with the surrounding landscape. SMUD and PG&E would file plans with the Commission with the Forest Service (for UARP) and BLM approval (for Chili Bar) including proposed mitigation and implementation schedules to bring the Projects' facilities affecting visual resources into compliance with visual resource standards and guidelines. Enhancement measures would include (1) surface treatments with natural appearing materials that will be in harmony with the surrounding landscape, (2) use of non-specular conductors for the transmission lines, (3) use of native plant species to screen facilities from view, (4) reshaping and revegetating disturbed areas to blend well with surrounding visual characteristics, and (5) locating transmission facilities to minimize visual impacts.

Under the plan, SMUD would implement the following specific visual enhancement measures: (1) at Rubicon reservoir, paint the metal components of the gaging station, intake booms, telemetry facilities, cable crossing and bucket a non-reflective black color and replace the chain link fence with black fencing within 2 years of license issuance; (2) at Robbs Peak forebay, paint the railings black, replace the chain link fences with vinyl black fences, paint the roof a dark gray color; (3) at Robbs Creek, paint the powerhouse facilities the same color as the penstock within 8 years of license issuance; (4) at Union Valley dam and substation, sandblast the guardrail to remove white paint then repaint with black paint or replace with core-ten guardrail, within 13 years of issuance; and replace the chain link fences with vinyl black fence with black posts, where powder coated posts are preferred over painted metal; (5) at Loon Lake, paint the doors on the substation a dark gray within the first two years, and remove the Loon Lake passive reflector (Wentworth Peak) from the skyline to a location with a backdrop and camouflage it to blend into the surroundings within 2 years of license issuance, and paint the roof of the gate shaft with approved colors within 2 years of issuance; (6) paint the handrails and guardrails at Gerle reservoir non-reflective black and paint the licensee-owned weather stations with non-reflective black paint within 4 years; and (7) at the Jones Fork, paint the penstock to match the color of the Robbs Peak penstock with in the first 3 years the license is issued.

Under Proposed Article 1-44, *Compliance with Visual Quality Standards*, SMUD would develop a design for the Iowa Hill development that meets the visual quality standards of the Eldorado National Forest Land and Resource Management Plan and would provide the Eldorado National Forest with plan specifications and simulated views of the design to assist in determining whether the design meets the visual quality standards.

Our Analysis

Some Project facilities and operations are visible on the landscape and contrast with the surrounding forested setting. Implementation of visual resources plans including the proposed measures would help to ensure that Project facilities blend with the surrounding landscape, yet allow the operation of UARP and Chili Bar Project facilities. Painting facilities black will make them less visible from a distance considering the facilities are surrounded by dark forested landscapes. Painting the facilities or taking action to blend them in with surroundings would enhance aesthetics at the Project by minimizing the view of Project facilities.

Reviewing any new construction with BLM, prior to any ground-disturbing activities would ensure that any new construction at the Chili Bar Project would blend with the surrounding landscape.

Iowa Hill Development

In the 2008 addendum (CH2M HILL, 2008a) to the Visual Resources Technical Report, SMUD concludes that the 3-D simulation demonstrates that following construction, the upper reservoir berm, switchyard, and transmission line would comply with the Eldorado National Forest Partial Retention VQO found at the upper reservoir site. The Partial Retention VQO allows for forest management activities that may be noticeable while blending well with the natural appearance of the landscape. The Forest Service does not agree with SMUD's conclusion and instead indicates that the berm would permanently dominate the landscape because of the introduction of line, color, texture, and form at a scale that contrasts with the surrounding natural appearing landscape as viewed by some local residents. Based on the Forest Service criteria, we conclude that the proposed project facilities located at the upper reservoir site, as currently designed, would not blend with the surrounding natural appearance of the landscape and would not meet the Partial Retention VQO.

In its report SMUD also concludes that the tunnel portal entrance may conflict with the VQO category (Retention) in the area around the tunnel portal and road leading to the portal. Because the tunnel portal occurs within the Retention VQO, there are stricter visual standards that allow only management activities that are not visually evident and appear to be from natural causes. The 2008 report shows that the tunnel portal would be visible within Slab Creek reservoir only when the viewer is directly in front of and facing the portal and the portal would not be visible from the opposite bank because the steep terrain precludes access to that bank except for a few residences. After reviewing the report and based on the Forest Service criteria, we also conclude that the tunnel portal may not meet the Retention VQO.

As noted above, SMUD would consult with the Eldorado National Forest on the design of the Iowa Hill development. In the 2008 addendum (CH2MHILL, 2008a) SMUD proposes to consult with Eldorado National Forest about the tunnel portal designs and whether or not the proposed tunnel portal would meet with the VQOs. If, as a result of these consultations, the Eldorado National Forest concludes that the tunnel portal would not meet the Retention VQO, SMUD states that it would develop mitigation measures in consultation with Eldorado National Forest. We assume that SMUD would include any needed mitigation measures in the visual resources protection plan. Overall, SMUD's consultation with Eldorado National Forest in the development of final designs would help to minimize any effects on the viewscape from the proposed upper reservoir berm and tunnel portal.

Under the proposed construction sequence, SMUD would begin construction by first improving the existing access roads and clearing the majority of the 283 acres of land associated with the Iowa Hill development. SMUD would then drill and blast to excavate the reservoir and tunnel leading to Iowa Hill. After the reservoir and tunnel are complete, SMUD would construct the powerhouse and other facilities underground. Construction activity would entail using vehicles, trailers, equipment, materials, laborers, earthen debris, and fencing. The area would be de-vegetated, re-graded, leveled, barricaded, lined, and filled. Effects from construction on visual resources would last for up to 5 years. The contractor would be responsible for implementing dust control measures within the Project limits and approaches to the construction area. During construction traffic would increase on local roads. Dust and dirt in the area would increase from all the construction vehicles as well as the excavation and construction process. The negative impacts would affect boaters, anglers, trail users, road users, residents, and any others near the construction of Iowa Hill. The level of use in the Project area is relatively low and the effects associated with dust, dirt, and traffic would be limited to the 4-year construction period.

The operation of Iowa Hill would vary from day to day. Some days the development would not be used at all and other days it could be used heavily. On heavy use days, the water level fluctuation would increase then decrease about 9 to 15 feet, whereas weekly fluctuation would be approximately 30 feet; however the maximum fluctuation in Slab Creek reservoir would not be altered by Iowa Hill. Generally, the Iowa Hill reservoir would rise during the day in response to generation and fall during the night in response to pumping. Operation of Iowa Hill reservoir would have minimal effects on the aesthetic environment.

Reservoir Levels

Also, under Proposed Article 1-23, *Reservoir Levels*, SMUD would, within 6 months of licensing issuance, meet or exceed the end-of-the-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs as shown in table 3-21 in section 3.3.2.2, *Water Resources*.

Our Analysis

Based on the user preference surveys, reservoir levels in BN, AN, and Wet water years would satisfy the majority of users of the Loon Lake, Union Valley and Ice House reservoirs. At Loon Lake, about 50 percent of the users would be satisfied with end of month water surface levels except for all month in CD water years and September in Dry water years. At Union Valley and Ice House reservoirs, at lease 75 percent of users would be satisfied with end of month water surface levels in July of BN water years and in AN and Wet water years. Users would generally not be satisfied with surface water levels in CD and Dry water years; however these reservoir levels would be similar to the current operations and would not have any additional effect on water surface levels.

UARP-Only Alternative

Under the UARP-only Alternative, the Iowa Hill development would not be constructed and the visual impacts on Iowa Hill and the surrounding canyon terraces would not occur. The remaining aesthetic enhancements proposed by SMUD would be as described under SMUD's Proposal.

3.3.8.3 Unavoidable Adverse Effects

There would be short-term negative effects from construction activity on boaters, anglers, trail users and residents in the vicinity of the proposed Iowa Hill development.

3.3.9 Cultural Resources

3.3.9.1 Affected Environment

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (section 106), requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register of Historic Places (National Register) prior to an undertaking. An undertaking means a Project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. In this case, the undertaking is the proposed issuance of new licenses for the Projects. Potential effects that may be associated with this undertaking include any Project-related effects associated with the day-to-day operation and maintenance of the Projects after issuance of a new license.

Historic properties are cultural resources listed or eligible for listing in the National Register. Historic properties represent things, structures, places, or archeological sites that can be either Native American or European-American in origin. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources also have to have enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archeological sites may not have enough contextual integrity to be considered eligible.

Section 106 also requires that the Commission seek concurrence with the State Historic Preservation Officer (SHPO) on any finding involving effects or no effects on historic properties, and allow the Advisory Council on Historic Preservation an opportunity to comment on any finding of effects on historic properties. If Native

American properties have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by a proposed new license within a project's APE. The APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties and/or traditional cultural properties (TCPs), if any such properties exist. In this case, the APE for the UARP encompasses all lands and waters within that project's boundaries plus the location of the proposed Iowa Hill development. The APE for the Chili Bar Project encompasses all lands and waters within the existing licensed project boundary, including the access road from Highway 193, the powerhouse and dam, and upstream to a point upriver of the UARP White Rock development. It also includes the route of PG&E's proposed Sand Bar hiking trail, which PG&E proposes to bring within its proposed license boundary. The SHPO concurred with these respective APEs by letters dated April 22, 2003 and November 24, 2004.

Cultural History Overview

Over the years, archaeologists have proposed a number of archaeological chronologies for the North-Central Sierra Nevada and for the Sacramento Valley/foothills regions in which the American River drainage lies. Collectively, they can be loosely organized into five general periods characterized by artifacts and other remnants of human settlement.

To date, archaeologists have found no conclusive evidence that humans occupied the American River drainage during the Late Pleistocene period, prior to 10,000 BP. This appears to have begun to change toward the end of the Early Holocene period (10,000 BP-7000BP) in areas to the east of the Sierra crest, as indicated by the presence of stemmed projectile points and stone tools.

Archaeologists have found more evidence of human occupations for the Archaic period (7000 BP to 3200 BP) to suggest that indigenous peoples were beginning to incorporate seeds and other vegetable matter into a diet heretofore based largely on meat (and in the foothills area, fish as well). There is also evidence of trade among groups in the form of shell ornaments and other "exotic" materials that suggest interaction between groups in the Central Valley and groups normally occupying areas east of the Sierras.

During the Early-Middle Sierran period (3200 BP to 600 BP), archaeologists believe there was increasing regionalization of Native land use and also regular use of certain locales. Although no evidence of permanent habitation above 3,500 feet has been found in the American River watershed, scholars generally believe that indigenous peoples timed forays above that elevation to take advantage of local resources. Big game and acorns appear to have been the staple components of Native diet during this period. Toward the end of this period archaeologists have discerned the introduction of the bow and arrow—an important technological development for both subsistence and warfare. Also during this time, relatively large, dense and increasingly sedentary populations began to concentrate in the foothill regions.

By the Late Sierran period (600 BP to 150 BP; also known as the Late Emergent period), there was year-round native occupation in the American River area; there is archaeological evidence of village sites in foothill areas, and increasing populations would have increased competition for resources.

Although contact with Europeans began with mid-16th century coastal explorations by Spaniards, the effect of European presence did not become evident until arrival of Spanish missionaries in 1769. That year initiated a period—extending into the early 19th century—during which missionaries implemented a process to aggregate and colonize the Native inhabitants through the institutions of missions, presidios and pueblos, greatly affecting the demography, social life and culture of the area's indigenous peoples.

With Mexico's independence from Spain in 1821, the missions were gradually secularized as "ranchos" dependent on Native inhabitants for labor required for farming and ranching. The United States' war with Mexico in the middle 1840s resulted in the cession of California in 1848. That same year, discovery of gold initiated Euro-American migration into the region on an enormous scale. There soon emerged a need for food, shelter and the infrastructure that accompanies thousands of people in a developing area. Immigrants from Europe, Asia and elsewhere followed the miners to the gold fields to grow crops, raise cattle, harvest timber, and build towns. Roads were built over the Sierra Nevada, often following trails used by Native populations for millennia.

By 1850, El Dorado County had one of the largest populations in the state. Miners, agriculturalists, loggers and merchants all settled in the area. The UARP and Chili Bar Project area intersects a number of historic period mining districts, in which an elaborate network of ditches and flumes were built, beginning in the mid-19th century, to provide power for miners. As the call for hydraulic power increased, so did the size of the ditches, at first providing water for placer mining and later to the expanding agriculture of the region. Grazing emerged as one of the biggest industries in the county and surrounding area, even as the gold rush began to decline. The many unsettled areas of the Sierra Nevada and foothills drew cattlemen, soon followed by sheepherders, including a significant number of Basques. In the 1890s logging, which had begun in the area in the mid-19th century, became a major extractive activity in the county under the American River Land and Lumber Company and under successor companies until the Great Depression.

Of the many cultural groupings occupying various ecological niches in the Sierra Nevada and foothills, those most usually associated with the UARP and Chili Bar Project area are the Miwok, Nisenan (Southern Maidu) and Washoe. Travelers and explorers in the early 19th century would have encountered these people living within their traditional territories. The Coast Miwok and Plains Miwok had for many years been affected by missionization and the Mexican ranchos, the Sierra Miwok less so. The Nisenan occupied the Sierra foothills below about 3000 feet in the vicinity of the American, Bear, Cosumnes and Feather River. The Washoe lived in the vicinity of Lake Tahoe, east of the Sierra crest, but traveled extensively to the west. However, traditional ways of life were deeply disrupted by the disease, wars with military expeditions, enslavement and relocation that attended Euro-American occupation of the region in the 19th century and precipitated significant disruption of traditional ways of life. Nisenan, Miwok and Washoe communities were displaced from their lands by miners, ranchers and others seeking to extract resources from the region.

By the late 19th century the “Rancheria” emerged as a Euro-American solution to problems of displaced Native peoples in California. The rancherias were lands purchased by Congressional authorization for displaced and homeless Native Americans of various tribal groups. Although the US government terminated 30 rancherias under the California Rancheria Act of 1958, court decisions forced the government to recognize the “tribes, bands, communities and groups” of 17 rancherias and restore those Rancherias to their previous status. Among these were the Shingle Springs and Auburn Rancherias, whose residents include Nisenan and Miwok families; and the Jackson Rancheria, home to a population of primarily Sierra Miwok. Some Nisenan and Miwok are affiliated with other Rancherias, such as Sheep Ranch, Tuolumne, Chicken Ranch, and Buena Vista.

The El Dorado Indian Council is among groups without federal recognition that represent descendants of the historical tribes affected by displacement and Federal Indian policy. The Washoe, after many attempts to regain their lands and establish a reservation, were provided with 156 acres of land near Carson City for the Carson Indian Colony in 1917; an additional 40 acres were allocated for the Washoe at Dresslerville, and the Reno Sparks Indian Colony was allocated for both Washoe and Northern Paiute communities. In 1970, in a settlement of a claim against the government, the Washoe gained another 40 acres near Woodfords in Alpine County, California.

Prehistoric and Historic Archaeological Resources

Archaeological surveys in and around the UARP began in the 1940s, with increasing frequency after passage of the NHPA in the mid-1960s. Many of the surveys have been conducted by the Forest Service or its consultants in association with various logging and other projects, particularly during the period from the 1970s to 1990s. Archaeological surveys conducted between 1999 and 2004 in association with SMUD’s relicensing effort combined verification of data from the earlier surveys and systematic field investigations of locations not previously surveyed in the APE. These surveys did not include the land above the Project's tunnels because there are no Project operations on the surface at these locations. The archaeological resources inventory report prepared for SMUD documented 87 sites in the APE. Forty-seven of the sites consisted of prehistoric components (with three of these also having some historic period artifacts), while 40 sites dated to the historic period. The prehistoric sites generally consist of bedrock mortars and lithic scatters, a few possibly associated with camps or other Native American use of the area. The historic-period sites include old roadbeds, remnant ditches and dams associated with irrigation, mining remains, and home sites. The Forest Service had previously determined five of the prehistoric sites and two of the historic sites were ineligible for the National Register. The eligibility of the remaining 80 sites has not been formally determined; these "unevaluated" sites are considered by the archaeologists, SHPO and SMUD as "potentially eligible" until such time as more intensive archaeological investigations may be undertaken.

Location surveys conducted for SMUD and PG&E in 2004 and 2005 in the Chili Bar Project APE were accomplished chiefly by boat, due to the steep slopes of the river canyon and heavy vegetation. These surveys identified four historic-period archaeological sites. PG&E ultimately determined, in consultation with the SHPO, that two of these (a mine adit and a hydraulic mining cut with associated equipment pad, were ineligible for the National Register. PG&E did not evaluate the third site, known as the Chili Bar Toll House Cemetery because it lies on BLM land outside its proposed Project boundary. This cemetery consists of a headstone marker and a flat area that may have been prepared as a cemetery pad; information in PG&E's application associates the grave with Ella Coolidge (who died April 24, 1862), daughter of a toll house keeper whose wife reportedly was a Native American. The fourth recorded resource is an old road alignment from Rock Creek Road to Chili Bar reservoir, which features a section of fieldstone wall. PG&E has asked the SHPO to concur in its opinion that the road alignment is not eligible for the National Register. By letter dated August 9, 2005, the SHPO concurred with PG&E's determination that the road alignment is not eligible.

Traditional Cultural Properties

The previously-mentioned Chili Bar Toll House Cemetery is the only publicly known potential TCP to have been formally recorded to date in either the UARP or Chili Bar Project APE.

SMUD contacted the Native American Heritage Council in association with its relicensing effort. By letter of March 16, 2004, they informed SMUD that a sacred site was located in the Project, and suggested contact with the El Dorado Miwok Tribe for further information. SMUD also commissioned an ethnographic report in its effort to identify TCPs in the UARP. The study included a review of existing literature coupled with interviews with Tribal elders and others knowledgeable of traditional Sierra Miwok, Nisenan and Washoe lifeways in the area of the project. Interviews with descendants of 19th and early 20th century Euro-American settlers were also included in the study to provide a fuller picture of land use and occupation of the UARP area over time. The ethnographic study did not result in identification of specific TCPs (beyond the recorded prehistoric sites, which may be considered potential TCPs by virtue of their association with area Native American groups). The failure to record specific TCPs may be attributable to Native American concerns about potential plundering of cultural sites should they be identified. The study did, however, document the tribes' strong sense of association with the area and the continued importance to them of gathering plants for instrumental, medicinal, ceremonial and food uses.

PG&E also contacted tribes, identified by California's Native American Heritage Council as potentially interested in the Project, to elicit information or concerns those tribes might have regarding TCPs in the Chili Bar Project. Although none of the contacted tribes and groups (El Dorado Miwok Tribe; Ione Band of Miwok Indians, Shingle Springs Band of Miwok Indians, Sierra Native American Council, United Auburn Indian Community, and Wilton Rancheria) offered comment, the El Dorado Miwok Tribe requested a map of the area depicting the Project.

Historic Buildings and Structures

Neither Project APE contains buildings or structures more than 50 years old and both hydroelectric Projects (including Project facilities) date to the late twentieth century.

3.3.9.2 Environmental Effects

Continued Project operation and enhancements and new construction could affect cultural resources listed in or eligible for inclusion in the National Register.

Under Proposed Articles 1-28 and 2-17, *Heritage Resources*, SMUD and PG&E would complete, within 6 months after license issuance, HPMP for the Forest Service (for UARP) and BLM (for Chili Bar) approval. Each HPMP would take into account Project effects on prehistoric and historic resources, Native American traditional cultural values, direct and indirect effects to heritage resources within the APE, ethnographic studies, historic archaeological studies, and Project recreational impacts to archaeological properties affecting National Forest System or BLM lands, as applicable. Each HPMP would also provide measures to mitigate the identified impacts, a monitoring program, and management protocols for the ongoing protection of archaeological properties. The plans would be filed with the Commission, and SMUD and PG&E would implement the plans upon approval.

Under Proposed Articles 1-29 and 2-18, *Heritage Resource Discovery*, if prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value are reported or discovered, or a known deposit of such items is disturbed on National Forest System or BLM lands and licensee adjoining property, a licensee would immediately cease work in the area so affected. SMUD or PG&E would notify the Forest Service or BLM, as applicable, and would not resume work on ground disturbing activities until it received written approval from the land-owning agency. If it deems it necessary, the Forest Service or BLM could require SMUD or PG&E to perform recovery, excavation, and preservation of the site and its artifacts at the licensee's expense through provisions of an Archaeological Resources Protection Act permit issued by the Forest Service or BLM.

Iowa Hill Development

The Settlement Agreement also contains a separate provision (Proposed Article 1-45, *Heritage Resources Protection*) regarding cultural resources protection for the construction and operation of the event that the Iowa Hill development. Under this provision if prior to or during ground disturbance or as a result of Project operations, items of potential cultural, historical, archeological, or paleontological value were reported or discovered, or a known deposit of such items was disturbed, SMUD would immediately cease work in the area so affected. SMUD would then notify the Forest Service and would not resume work on ground-disturbing activities until it received written approval from the Forest Service.

Our Analysis

SMUD drafted an HPMP that was reviewed in second draft form by the Forest Service. On February 11, 2008, the Commission staff circulated a draft PA and draft HPMP for comment and directed SMUD to file a revised HPMP within 90 days of the close of the comment period. Implementation of SMUD's HPMP in consultation with the SHPO, Tribes, the Forest Service and the Commission would ensure that adverse effects on historic properties arising from UARP operations or Project-related activities over the term of the license would be avoided or satisfactorily resolved. Similarly, an HPMP for the Chili Bar Project, prepared and implemented by PG&E in consultation with the SHPO, Tribes, BLM and the Commission would ensure that adverse effects on historic properties arising from Project operations or Project-related activities over the term of the license would be avoided or satisfactorily resolved.

UARP-Only Alternative

Under the UARP-only Alternative, the proposed Iowa Hill development would not be constructed and measures to protect historic properties at Iowa Hill would not be necessary; however, SMUD and PG&E would still develop and implement the proposed HPMPs to address the potential effects of issuing new licenses for the continued operation of the UARP and Chili Bar Project on historic properties.

3.3.9.3 Cumulative Effects

The UARP and Chili Bar Project are among a large number of hydroelectric Projects in central California that affect prehistoric and historic archaeological resources located along the American River and its tributaries. These Projects attract recreational use around the reservoirs. The increased recreational use resulting from the availability of the reservoirs has contributed to both inadvertent and intentional destruction of prehistoric and historic archaeological resources and of potential TCPs. While continued erosion and recreational use of the American River area would be expected to continue to affect archaeological resources and potential TCPs, the measures included in HPMPs for the UARP and Chili Bar Project, as well as measures being or already developed and implemented at other hydroelectric projects in the area, would cumulatively reduce the rate of destruction of these cultural resources.

3.3.9.4 Unavoidable Adverse Effects

In the event of relicensing and pursuant to the NHPA, the Commission would execute PAs with the SHPO and the Advisory Council on Historic Preservation (should they chose to participate) to implement final HPMPs within one year of license issuance as a condition of any license for the UARP or Chili Bar Project. Each licensee, the Tribes, the Forest Service and BLM would be invited to participate in the respective PA as consulting parties.

Execution of the PAs and implementation of the final HPMPs would ensure proper protection and management of significant cultural resources within the Projects' APEs and would also provide satisfactory resolution of any Project-related adverse effects.

3.3.10 Socioeconomic Resources

3.3.10.1 Affected Environment

The region of influence includes the local area, or El Dorado County as a whole and communities in proximity to the UARP, Chili Bar Project, and Iowa Hill development, and the regional area, or the Sacramento Primary Metropolitan Statistical Area (PMSA), which comprises the economically linked counties of Sacramento, Placer, and El Dorado.

El Dorado County

El Dorado County occupies 1,711 square miles of land and is located on the western slope of the Sierra Nevada between the Central Valley of California and the state of Nevada. It contains the Eldorado National Forest, which is considered one of California's most prized recreational areas. The northern boundary of the county is primarily defined by the Middle Fork American River and the southernmost border is shared with Amador County. U.S. Highway 50 runs east/west through El Dorado County, while state highways 49 and 89 run north/south through the western and eastern portions of the county, respectively.

Population

El Dorado County has an estimated population of 176,841 (103.4 persons per square mile), an increase of 40.3 percent from the 1990 census, approximately double the growth of the entire United States (20.4 percent) and 1.7 times the comparable growth for the state of California (U.S. Census, 2005). The population of El Dorado County is projected to reach 241,263 individuals by 2025. New home permits, which grew by nearly threefold during 1995-2004, will decelerate gradually from a peak of 2,123 in 2005 to 1,743 in 2025 as constraints on developable land begin to bind (California Department of Finance, 2004).

Employment

There were an estimated 87,689 full-time and part-time jobs in El Dorado County during 2004, a 68 percent gain over the 1990 count. Of the 2004 total, just over 54,000 jobs were classified as wage and salary as opposed to proprietor's employment (BEA, 2007).

In contrast to much of the United States, El Dorado County added a significant number of manufacturing jobs during the 1990s, but the California Department of Finance is projecting a sharp slowdown in that growth going forward. The western slope of the county is "emerging as an information technology center" recently attracting such businesses as software engineering and research and development. This shift is reflected in recent historical growth patterns and in the current population projections (California Department of Finance, 2004).

Much of the job growth is in white collar occupations. Growth in information technology jobs, which was virtually flat from 1995-2004 (530 jobs to 540 jobs), is expected to accelerate to 710 jobs in 2025. Professional services jobs increased from 2,000 in 1995 to 5,840 in 2004 and are projected to climb to nearly 12,000 in 2025 (California Department of Finance, 2004). In 2005 38.9 percent of the work force was engaged in management and professional service jobs (U.S. Census, 2005). Jobs in health and education and in leisure services will experience similar expansions, but farming and construction jobs (300 and 4,960 jobs, respectively) will be relatively unchanged from the 2004 count, the latter owing to an anticipated slowdown in the home construction industry.

Income and Demographics

Median household nominal income in El Dorado County was $63,147 in 2005, and per capita nominal income is estimated to be $38,652 (U.S. Census, 2005). Household income for the county amounted to $6.6 billion in 2004 (U.S. Bureau of Economic Analysis, Regional Economic Accounts).

El Dorado County's racial and ethnic composition is less diverse than much of California. Most of the residents (89.2 percent) were White, 3.7 percent Asian, 1.2 percent Native American or Alaska Native, 0.8 percent African American, 0.03 percent Native Hawaiian and other Pacific Islander, 2.8 percent some other race, and 2.2 percent two or more races.

The median age is 39.3 years, and 66.1 percent of the population was between 18 and 64 years of age. The poverty rate was 7.7 percent compared to 13.2 percent for the state as a whole. The housing stock for El Dorado County stood at 77,181 units as of January 1, 2004. Single-family homes accounted for 64,227 units, multiple-family dwellings accounted for 8,580 units, and mobile homes accounted for 4,374 units. In December 2001, the median home price in the county was $215,000 but in 2005 it was $542,000 (U.S. Census, 2005).

Placerville is the county seat of El Dorado County and is located at an elevation of 1,866 feet. Incorporated in 1853, Placerville had a population of about 9,900 individuals as of 2001. Besides Placerville, communities with populations of 1,000 or more in the county include South Lake Tahoe, El Dorado Hills, Shingle Springs, Pollock Pines Cameron Park, and Diamond Springs. The closest major population center outside the county is the city of Sacramento, located about 44 miles to the west.

Sacramento County

Employment

There were 779,572 full and part-time jobs in the county in 2004 with 642,586 classified as wage and salary. Government jobs (181,118 workers) form the bulk of Sacramento County’s employment. Other service jobs, such as retail (83,596 jobs), healthcare and social assistance (67,099 jobs), and professional and technical services (50,947 jobs), dominate the economy. Construction jobs (55,892 workers) are the majority of non-service occupations. During 2001–2004, job growth was a modest 4.3 percent but this was more than twice the growth for the state of California. During the same interval, jobs in educational services, construction, utilities and real estate underwent the fastest rate of growth while management of companies and enterprise, forestry, fishing and related activities, mining, and manufacturing have each declined.

Income and Demographics

The inflation-adjusted household income in 2005 in Sacramento was $51,793 and inflation adjusted per capita income was $24,616. The total household income for the county amounted to $43.2 billion in 2004, or 3.4 percent of the total state of California personal income.

Sacramento’s racial and ethnic composition is similar to the state of California. Approximately 60.2 percent are White, 13.8 percent Asian, 1.2 percent Native American or Alaskan Native, 10.1 percent African American, 0.7 percent Native Hawaiian and other Pacific Islander, 9.9 percent some other race, and 4.2 percent two or more races.

Sacramento County's population has a median age of 33.7, and individuals 18 to 64 years of age accounted for 61.7 percent of Sacramento County's total population in 2005. The poverty rate in Sacramento County rose from 11.1 percent in 2003 to 13.6 percent in 2005. In 2005, the median home value of occupied units was $365,500.

Placer County

Employment

The Projects are expected to affect only small parts of Placer County. Placer County's population has a slightly lower median age than that of El Dorado's population; 38.4 compared to 39.9, but it is still considerably higher than the median age of the state of California (34.4). Individuals aged 18 to 64 make up 63.1 percent of the total population. Placer County's poverty rate during 2005 was just 5.5 percent, less than half the poverty rate of California and Sacramento County.

The racial composition of Placer County is comparable to El Dorado County's, with 84.9 percent White, 5.2 percent Asian, 0.9 percent Native American or Alaskan Native, 1.1 percent African American, 0.1 percent Native Hawaiian and other Pacific Islander, 5.0 percent some other race, and 2.7 percent two or more races.

The median value for homes in Placer County in 2005 was $492,000, and housing in Placer County is 78 percent single-unit.

Income and Demographics

Placer County has a higher inflation adjusted median household income than the state of California, $62,080 and $53,629, respectively, and the 2005 inflation-adjusted per capita income is also higher at $31,853.

The most common occupations in Placer County in 2004 were in retail trade, which employs more than 25,000 workers or 15.6 percent of private sector wage and salary employment. Retail trade is followed closely by construction, employing almost 14 percent of private sector workers. From 2001-2004, there have been no apparent significant shifts in employment among industry employment shares.

3.3.10.2 Environmental Effects

The Impact Analysis for Planning (IMPLAN) model was used to derive estimates of the socioeconomic costs and benefits of the UARP and the Iowa Hill development. The IMPLAN model is an input-output model developed in 1979 by the Forest Service and is one of the most widely used input-output models to evaluate the impact of changes in policy on regional socioeconomics and to produce socioeconomic forecasts. Its primary attribute is that it captures multiplier effects as changes in policy create ripples throughout the economy. The effects of policy can be classified as direct, referring to changes in production associated with a change in demand; indirect, referring to a secondary impact caused by the changing input requirements of producers; and induced, referring to changes in household spending as a function of the additional employment generated by the direct and indirect effects. IMPLAN's assumptions are limiting in that they restrict production functions to be homogenous across all firms within an industry, and linear with constant returns to scale. Output is also assumed to be homogenous or undifferentiated by quality, branding, etc. The IMPLAN model places no constraints on supply, and it assumes that in- and out-migration maintains the region under study at full employment at all times. While these assumptions are not entirely realistic, the model does serve as a sound approximation of real world effects of policy changes on the local and regional economies.

UARP

IMPLAN model results indicate that UARP-related operation and maintenance expenditures directly benefit the local and regional economies. At the local level, UARP generates 131 jobs in El Dorado County and additional personal income totaling $9.7 million. Total operation and maintenance expenditures within the county produce $26.2 million in additional outputs. At the regional level, 186 jobs are associated with the UARP adding $13.9 million in personal income. Additional regional output amounts to $37.0 million. Non-resident recreational activities in the Crystal Basin generate 166 direct jobs and 63 secondary or induced jobs at the local and regional levels. These jobs raise personal income by $3.6 million at the local level and $1.7 million at the regional level. Whitewater recreation downstream on the SFAR downstream of Chili Bar dam generates $33.0 million in revenues and taxes annually to El Dorado County.

Further benefits accrue to Eldorado National Forest and El Dorado County in the form of fees and taxes. SMUD subsidizes Eldorado National Forest in the maintenance of recreational facilities located at the UARP. These payments amounted to approximately $335,000 in 2004. SMUD also contributes to the local infrastructure including maintenance of roads, fire fighting, and telephone lines. SMUD has also contributed to producing recreation brochures for Crystal Basin and is a contributor to one-time projects such as helipad lighting, restoration of the Crystal Basin Information Station, lighting design for Loon lake Chalet and reconstruction of the Eldorado National Forest lookout at Big Hill. Although SMUD lands are tax-exempt under California law, SMUD paid $184,000 in property taxes to El Dorado County in 2003 and has paid approximately $3.0 million through the middle of 2005.

SMUD lists six specific socioeconomic elements where the baseline operation of UARP provides benefits at the local level.

- **Air Quality Benefits—**By generating significant amounts of electricity without producing any undesirable air emission as a byproduct, the UARP has a positive effect on air quality.
- **Summer Recreational Opportunities—**The general operational regime of storing some of the spring runoff and releasing it in the summer and early fall

contributes to the whitewater recreation industry on the SFAR. And in years with sufficient precipitation, near full reservoirs during the spring and summer provide an abundance of flat-water recreation opportunities in the Crystal Basin.

- **Access for Winter Recreation—**SMUD plows snow during the winter from Highway 50 to the Loon Lake Chalet area and creates parking areas along the route for winter recreationists.
- **Economic Effects—**expenditures by SMUD's local project operations (Fresh Pond) and non-resident visitors to the Crystal Basin area create local jobs, direct income, and secondary income.
- **Road Maintenance—**SMUD helps maintain the roads it uses to access Project features, performing paving, repairing road segments, installing guardrails, and cleaning out culverts.
- **Grid Stability—**the UARP is used to help ensure reliability of the electric transmission system within SMUD's service area and Northern California.

SMUD indicates that the Proposed Action does not cause any change from baseline conditions and therefore would not interfere with the provision of the above benefits to the local community.

Our Analysis

SMUD's conclusions regarding employment and income at the local and regional levels are drawn from the application of the IMPLAN model to the operation of the proposed facility under the Proposed Action. As such, we consider the results to be sound. Regarding the six specific socioeconomic elements, the Proposed Action would not change baseline conditions, and, therefore, the flow of the above benefits to the local area would continue unimpeded.

Iowa Hill Development

The Iowa Hill development would have short-term effects during its construction and long-term, operational effects.

SMUD identifies and summarizes the local short-term socioeconomic benefits of the Iowa Hill development as derived primarily from the creation of short-term construction jobs and long-term operations jobs. Secondarily, SMUD indicates that the upper reservoir would facilitate access to water for the purposes of fighting forest fires by airdrop. Access to the upper reservoir would provide a safer source of water for aircraft, which currently must fly through narrow canyons. At the regional level, SMUD asserts that benefits would accrue in the form of increased operational flexibility, efficiency and reliability; [power] transmission system benefits; and environmental benefits.

Effects of Construction of Iowa Hill

Input-output analysis was used to evaluate the contribution of the Iowa Hill development construction to the El Dorado County economy. The inputs to the model were construction cost estimates on capital, materials and supplies, and labor. The output of the model is employment and income. The following 10 assumptions served as a backdrop to the model:

1. The region of influence for the construction economic impact analysis is El Dorado County.
2. Construction is anticipated to start July 2009 with operation expected to commence in 2014.
3. Impacts are evaluated for a 5-year construction period.
4. Total construction expenditures on materials and supplies are estimated to be $235 million in 2004 dollars. Of these expenditures, $75 million would be spent within El Dorado County.
5. Average local (within El Dorado County) construction expenditures on materials and supplies for a 5-year construction period are $15 million.
6. SMUD is expected to hire a total of 830 construction personnel over the course of the 5-year construction period, for an average of 166 personnel working on the Project each of the 5 years.
7. Total construction payroll was estimated at $115 million in 2004 dollars.
8. About 25 percent of the construction workforce is assumed to be local (from El Dorado County). Thus, the average local construction payroll over the 5-year construction period is estimated at $5.75 million in 2004 dollars.
9. Disposable labor income is 70 percent of total labor income. This means that 30 percent of gross income is used for taxes and savings.
10. The base year of analysis is 2001 but the impacts were adjusted to reflect year 2004 price levels.

Each assumption is based on the distribution of average expenditures developed for the Project by Montgomery Watson-Harza, assuming a total construction cost estimate of $445.1 million[41] (not including interest during construction and sales tax on equipment) (MWH, 2004, as cited in CH2M HILL and DTA, 2005a). Assumptions 1 through 3 frame the geographic market and the length of the construction period. Assumptions 4 through 8 outline Project costs, labor requirements, and source. Table 3-71 partially reproduces the cost estimates for materials, supplies, and labor.

Table 3-71. Iowa Hill development construction cost estimates, 2004. (Source: CH2M HILL and DTA, 2005a)

	Total Cost	**Average Annual Cost**
Expenditures on materials and supplies	$235,000,000	$47,000,000
Local expenditures on materials & supplies	$75,000,000	$15,000,000
Construction payroll	$115,000,000	$23,000,000
Local construction payroll	$28,750,000	$5,750,000

[41] In April 2007, SMUD submitted to FERC an increased Iowa Hill construction cost estimate ranging from $519.6 million to $704.1 million (not including interest during construction and sales tax on equipment), reflecting a 17 percent to 58 percent increase in the cost estimate. SMUD indicates that the range results from the variability in construction cost information sources and reflects, among other things, a number of factors. Some of these factors might alter the project-related income and employment estimates presented in the draft EIS. For example, the tightening of the skilled labor market in the Northern California region could lead to an increase in average wages paid to local workers. On the other hand, the increased global competition for commodity items like steel, concrete, and fuel could result in higher prices paid for those commodities, but would likely not affect local project-related income and employment. Given the variability of the construction cost estimates and the uncertainty associated with whether the higher material and labor costs would benefit persons within the region, the analysis of construction-related jobs and personal income discussed in this EIS was not revised to reflect the higher construction cost estimates. As a result, the estimates presented here may underestimate the potential employment and income impact of Iowa Hill construction. However, it impossible to determine the degree to which the results presented here underestimate the likely impacts.

Our Analysis

SMUD provides average Project construction expenditures but not statistical distributions of estimated costs that would permit the derivation of a range of possible employment and income outcomes. The Project is relatively small scale, such that even large deviations from average expenditure estimates would not yield employment and income effects that would have a substantial impact on local and regional economies.

Regarding assumption 8, SMUD estimates that 25 percent of the construction labor force would be sourced locally. Given that approximately 10.1 percent of the El Dorado county workforce is engaged in wage and salary construction jobs (California Department of Finance, 2004), this is a reasonable assumption.

The construction expenditures, including the payroll for the 166 direct jobs, are projected to generate a further 370 indirect and induced jobs, primarily in the service sector (i.e., grocery stores, restaurants, gas stations). This projection is derived using the IMPLAN model. The projection of 370 secondary jobs rests on the assumption that about 32 percent of the total expenditures ($75 million out of $235) million would go to local suppliers. SMUD does not indicate how it arrived at a figure of 32 percent local sourcing.

Monetizing the local short-term benefits, the IMPLAN model indicates that construction of the Iowa Hill development would generate local income on the order of $18.9 million per year over the 5-year construction period. There would be $4 million in direct income (payments to local suppliers of labor and materials) and $14.9 million in secondary income (worker and supplier expenditures on goods and services). SMUD asserts that $18.9 million in annual additional income represents just 0.3 percent of the total 2004 El Dorado County annual personal income of $6.31 billion.

Effects of Operations of Iowa Hill

The IMPLAN model was also used to evaluate the long-term employment and income benefits for the operational phase of the Iowa Hill development. The Covered Employment and Wages data published by the U.S. Bureau of Labor Statistics proved inadequate for use as inputs to the model, so SMUD substituted an input data set composed of actual operations and maintenance average expenditure distributions for the SMUD Fresh Pond hydroelectric facility (a facility similar to the proposed Iowa Hill development) and SMUD personnel expertise. Expenditures are those devoted to labor, materials, and supplies required to operate the Project. The total cost in 2004 is just slightly more than $3.5 million. Table 3-72 shows Iowa Hill development operations expenditure data.

Table 3-72. Iowa Hill operational payroll and operation and maintenance expenditures, 2004. (Source: CH2M HILL and DTA, 2005b)

	Total Cost	Cost Spent Within El Dorado County	Cost Spent Within Sacramento Region
Payroll[a]	$262,480[b]	$262,480[b]	$262,480[b]
Other O&M Expenditures[c]	$3,306,000	$1,653,000	$1,983,600
Total	$3,568,480	$1,915,480	$2,246,080

[a] Includes benefits. Payroll shown for El Dorado County is for the two Iowa Hill employees who are assumed to be El Dorado County residents while that shown for the Sacramento region is for the same two Iowa Hill employees who are also residents of the Sacramento region (El Dorado, Placer, and Sacramento counties).

[b] Total annual O&M labor cost at Fresh Pond was estimated at $10,637,230. Because 2 percent of these costs are spent on headquarters staff, only 98 percent is actually associated with Fresh Pond. Assuming 81 full-time employees at Fresh Pond, the average labor cost (salary plus benefits) per employee is $128,722. Since Iowa Hill operation would have two O&M employees, the labor cost for these two additional O&M employees is estimated at $257,400 (or 2 times $128,722).

[c] 50 percent of the other O&M expenditures are spent within El Dorado County. Thus, of the total $3,306,000 in other O&M expenditures, $1,653,000 (or 50 percent), is spent within El Dorado County. For the Sacramento region, the amount of other O&M expenditures spent within the region is $1,9843,600 or 60 percent of the total other O&M expenditures for Iowa Hill in 2004.

The payroll component accounts for just a small fraction (7.3 percent) of total expenditures and would support just two full-time employees sourced from within the Sacramento Region (including El Dorado County). The remaining expenditures on materials and supplies are assumed to be split 50-50 between El Dorado County and other areas and 60-40 between the Sacramento region (including El Dorado County) and areas outside. Such a split reflects the same local/regional distribution as do operational expenditures at the SMUD Fresh Pond site.

Using this expenditure data and its geographic distribution as inputs to the IMPLAN model generates 12 indirect and induced jobs in addition to the two jobs directly generated at the Project. These 14 jobs are just a tiny fraction (0.03 percent) of the overall employment for El Dorado County, and the annual income generated from them ($698,300 direct, indirect, and induced) is an even smaller fraction (0.01 percent) of the county total personal income.

Project operation is expected to add $3.5 million in direct output, $670,129 in indirect output, and $303,162 in induced output for a total of $4.5 million.

The IMPLAN model was also run for the Sacramento region, inclusive of El Dorado County. In this case, the direct jobs generated by Project operation remain at two but there would be 18 indirect and induced jobs created as well. These would lead to $262,500 in direct income and $812,300 in indirect and induced income. These outcomes represent insignificant fractions of the total income for the Sacramento region.

In terms of output in the Sacramento Region, the IMPLAN model predicts $6.1 million or just 0.01 percent of the total regional output.

Our Analysis

Use of the IMPLAN model is a sound approach to evaluating the effect on labor and income from proposed Project construction and operations. Although the use of expenditure data from the Fresh Pond facility is not ideal, it is acceptable in light of the lack of published government data. The numbers of jobs and their associated income and output are extremely small relative to the economies of El Dorado County and the Sacramento region as a whole, and the operational phase of the proposed Project would not carry with it substantial economic benefits.

Regional and Environmental Benefits

SMUD lists the benefits of the Project to the region and to itself as the provision of operational flexibility, efficiency, and reliability; transmission system benefits; and environmental benefits.

Operational flexibility, efficiency, and reliability imply that the Project would strengthen SMUD's ability to cover periods of peak power demand without the need for additional power generation facilities. SMUD's UARP provides about 20 percent of the power needs to about 180,000 homes in its service area during a normal water year. The Proposed Action would support this operation by improving the facility's ability to smooth the delivery of power between peak and off-peak periods. Transmission system benefits refer to the reliability and stability of the system in delivering power to customers without constructing new transmission lines. Environmental benefits refer primarily to improved air quality in the Sacramento Valley that would ensue during Project operations, and secondarily, SMUD indicates that the Iowa Hill development would create a safer source of water for aircraft engaged in fighting forest fires in the vicinity to refill their water buckets. Currently, aircraft must fly through narrow canyons to refill their buckets

Our Analysis

SMUD does not explicitly state that the Iowa Hill development would result in lower energy prices to consumers, nor does it relate the smoothing of power delivery to socioeconomic benefits such as the potential for increased disposable income, positive employment effects, and economic development of the region. Improved regional air quality is mentioned as a key socioeconomic benefit of the existing Project, but it is not quantified in monetary terms. The benefit of facilitated access to water for fire-fighting aircraft also is not quantified in monetary terms. Likely, the lack of supporting empirical data and analysis is a function of the relatively small size of the Project. While socioeconomic benefits would certainly accrue to the region, the extent of these benefits would be negligible from a social accounting perspective.

Property Values

The number of jobs created by the Project would be small. Because at least 25 percent of those jobs would be sourced from the local labor market, the Iowa Hill development likely would have zero or negligible effects on the overall demand for local housing. However, the Iowa Hill development may affect housing amenities in the area, particularly scenic views. This section describes the nature of the change in scenic views and the potential monetary impact on area housing values.

SMUD evaluated short- and long-term effects of the Iowa Hill development on residential property values from the effects of (1) views of the upper reservoir, switchyard, and transmission tie-in; (2) the proximity of the proposed transmission lines to nearby properties; and (3) the improved accessibility brought about by the upgrading of Cable Road and Iowa Hill Road on the properties to which access is provided. Particular attention is paid to the Apple Hill and Swansboro areas (see figure 3-36). In both areas property values are rising significantly. It is possible that, owing to negative alteration of scenic views and construction of transmission lines, the Iowa Hill development could adversely affect or even reverse this trend. In total, there are 70 properties from which scenic views may be affected by the Iowa Hill development, all of which are located within a 3-mile radius of the proposed site (this geographic definition is based on standards developed by the Forest Service).

SMUD concludes that property values in the area would suffer a short-term reduction as scenic views are adversely affected by the construction itself. Secondarily, high noise levels and reduced air quality during the construction period would also reduce housing values temporarily. In the long-term, however, SMUD concludes that housing values would be unaffected. Furthermore, SMUD concludes that 28 properties directly adjacent to the Iowa Hill site could see a small increase in property values if the proposed access road improvements are made. That benefit would not be realized if the SW Connector were built in lieu of upgrading Cable Road.

SMUD’s analysis is qualitative and based on a review of applied academic and practical literature on the effects of scenic views and transmission lines on property values. Assessment of the Iowa Hill development’s impact on scenic views from surrounding properties is derived from a review of the literature on the impact of scenic views on property values. The conclusions are supported by the presentation of a series of photographs that show the actual pre-construction view and a simulated, post-construction view.

In addition, SMUD referenced recent sales data, and conducted interviews with local real estate professionals. SMUD identified the changes to the visual environment seen from residences in the Project area. These study results are supplemented by existing academic and applied research on property values, presumably because of a lack of existing data on property sales in the vicinity of the site and because the Project represents a new development for which historical comparisons are not available.

The literature on the impact of scenic views on property values is nearly unanimous. Several academic studies reveal that scenic views have an unequivocally positive impact on sales price ranging from 1.4 to 16.6 percent. Some studies reviewed are clearly not relevant to the Project, however, such as the case where ocean views offer the highest premium on property values.

Our Analysis

Rather than undertake original research, SMUD submitted results based on an extensive review of already existing academic and applied property value research. Much of this research is based on the use of statistical models that isolate and quantify the effect of various attributes on the value of a particular good. When applied in the study of property/housing values, these models frequently incorporate attributes such as the square footage of the property, its number of bathrooms, lot size, distance from major transportation facilities, age, and any other feature(s) that could create variation in property values, including environmental attributes such as whether the property offers a scenic view and its proximity to infrastructure. This approach is a generally accepted methodology and has been featured prominently in the academic literature. SMUD reviewed articles taken from both the peer-reviewed academic journals (*Land Economics, Journal of Real Estate Literature, Journal of Real Estate Research*) and from private consulting firms and government agencies.

The property value research described above was supplemented by an analysis of Project views based on comparisons of actual and simulated photographs for five viewpoints located within Forest Service guidelines of 3 miles from the proposed site. The actual photographs show the viewpoints as they currently exist and the simulated photos show the viewpoints' likely appearance one year after construction and 10 years after construction. Of particular interest are the views of the canyons that surround Iowa Hill. According to the photos, the Project would not obscure the views of the canyons; however, the Project includes construction of a berm that would be visible from all five viewpoints. Also a portion of the proposed switchyard and a portion of the proposed transmission lines would be visible. The changes in view would moderate over time as the berm is covered with more mature vegetation and thicker forest cover screened views of the switchyard and transmission lines. While the analysis of the photo simulations can be considered subjective, the method is a reasonable approach to the analysis.

Proximity to Transmission Lines

In addition to the construction of the upper reservoir itself, a 3-acre switchyard would be located adjacent to the reservoir, and a new, 2-mile-long 230-kV transmission line would connect the switchyard to the existing Loon-White Rock transmission line. SMUD states that the switchyard would not be visible and would therefore have no effect on property values in the area, although it does not support this position with any data.

SMUD concludes that the placement of transmission lines would have aesthetic effects and possibly health, safety, and noise effects as well. To estimate the monetary impact of transmission lines on property values, SMUD relied extensively on research conducted by Hamilton and Schwann, who examined the impact of transmission lines on Canadian properties. The authors found that transmission lines have no statistically significant impact on property value past a distance of 656 feet, and SMUD applies this result to Iowa Hill. Only 6 properties would lie within 656 feet of the proposed transmission lines, and SMUD states that they would experience some negative impact. But in general, SMUD indicates that any negative impacts on property values would be mitigated because the views of the proposed transmission lines would be partially obscured by thick tree cover. However, there are two very small (2.5-acre) undeveloped parcels that lie partially within the transmission line's zone of potential influence, whose values could be decreased by as much as 33 percent ($1,650).

In addition to the Canadian study, SMUD refers to several other studies in Montana and in Australia that show distance thresholds to be in the range of 0.31 mile to 1.24 miles where negative perceptions of health, safety, and aesthetics begin to erode property values. In general, transmission lines were found to have only small impacts on property values (on the order of 2 to10 percent for single family homes). Some findings suggest that there is no impact on property values and in other cases, transmission lines were found to raise property values because they offer owners the use of right-of-way for recreational purposes.

The number, quality and geographic dispersion of the studies reviewed by SMUD appear to include adequate representations of the impact of transmission lines on property values in the markets studied and are reasonably applied to El Dorado County, California.

Of the 70 properties under study, SMUD concludes that housing values would decrease up to 33 percent for two undeveloped properties adjacent and 15 percent for two properties just east of the Iowa Hill site. In the Apple Hill area, 16 properties would decline by 3 percent in value and in Swansboro, 22 properties would undergo a 5 to 10 percent decrease. SMUD concludes that under the Proposed Action, the 28 properties adjacent to Iowa Hill Road would rise in value by 5 percent because of road improvements included in that proposal. That property value increase would not occur if the SW Connector were built in lieu of improving existing roads.

SMUD believes that the long-term effects of the Iowa Hill development on property values would be zero at worst and modestly improved at best as mitigation efforts such as re-vegetation of the site help to adjust perceptions over time. SMUD is already committed to mitigate the impact on scenic views and under the Settlement Agreement would develop a design for the Iowa Hill development that meets the visual quality standards of the Eldorado National Forest Land and Resource Management Plan to ensure adequate protection during utilization of the Forest. Upgrading Cable Road/Iowa Hill Road under the Proposed Action would lead to modest (assumed 5 percent) improvement in property values for the 28 properties affected by that action.

In sum, SMUD's conclusions regarding the impact of the Iowa Hill development on area property values are reasonable. Because the Project is not expected to affect property values by generating increased demand for housing, the conclusions rest primarily on the effect of the Iowa Hill development on aesthetics and secondarily on the improved access associated with the proposed upgrading of Cable Road/Iowa Hill Road. SMUD is committed to achieving Forest Service standards of visual quality according to the Settlement Agreement.

Effects on Fiscal Conditions and Services

In this section we address the impact of the Project on local government fiscal resources in El Dorado County. According to SMUD, El Dorado County's revenues and expenditures increased from approximately $100 million in fiscal year (FY) 1998–1999 to about $160 million in FY 2002–2003. Major sources of El Dorado County revenue are intergovernmental transfers from the federal and state governments, and taxes and assessments. Intergovernmental transfers account for approximately half of all revenue sources while taxes and assessments account for about a third. Over the past 5 years, the proportion of county revenues from taxes and assessments has declined from about 32 percent in FY 1998–1999 to 29 percent in FY 2002–2003. On the other hand, the proportion of the county's revenues from intergovernmental transfers has increased from about 45 percent in FY 1998–1999 to 51 percent in FY 2002–2003. In each FY from FY 1998–1999 to FY 2002–2003, El Dorado County government appears to have generated a surplus of revenues over expenditures.

In the area of the proposed Iowa Hill development, five elements of government services were studied, including schools, fire protection, law enforcement, emergency response services and hospital use, and available hospital resources.

Schools—Based on conversations with local school officials, SMUD asserts that overall enrollment in El Dorado elementary public schools is undergoing a decline and that this trend is expected to continue. High school enrollment, on the other hand, has been experiencing a slight increase. Further, since the Iowa Hill development is not expected to generate any meaningful level of population increase, the capacity of the local school system should remain adequate.

Fire Protection—The majority of the physical space of the Iowa Hill development would be located on private SMUD-owned property with some additional encroachment on federal lands (Eldorado National Forest). However, the California Department of Forestry and Fire Protection has agreed to provide assistance to the El Dorado County Fire Department in the event of a major fire. SMUD does not conclude that Iowa Hill development would raise the probability of a fire and thus does not attempt to quantify its impact on the local budget. However, under Proposed Article 1-34, *Fire Management and Response Plan*, SMUD would develop a fire prevention and response plan in consultation with state and locate fire agencies and would implement the plan.

Law Enforcement—SMUD states that, in spite of an anticipated increase in theft and vandalism at the site, plus an increase in emergency medical situations, there would be no impact on local law enforcement. SMUD plans to deploy its own private security personnel at the site during construction.

Emergency Response—SMUD does not anticipate any significant impacts on the county's emergency response system because it plans to implement construction safety plans, particularly with respect to blasting.

Search and Rescue—The workers at the site would not engage in activities that would raise the possibility of the need for additional search and rescue operations.

Hospital—Because it is a relatively small undertaking, the Iowa Hill development would not have any material impact on hospital care in El Dorado County. SMUD does not address the potential costs associated with providing hospital services for construction workers who may be injured on the job, except to state that in the event of such an occurrence, patients would receive treatment in trauma centers located outside of El Dorado County. As such, the fiscal impact of the Project on El Dorado hospitals would be at or near zero.

Our Analysis

We reviewed the information provided on the potential effect on schools in El Dorado County and conclude that construction of the Project would not result in school population growth over the normal growth. Again, the relatively small size of the Project is consistent with SMUD's conclusions.

The fact that there will be human activity involving heavy equipment and machinery in the area where there was none before would probably increase the risk of fire but given that the state of California has agreed to assist the county in the event of such an occurrence, the impact on El Dorado County's fiscal budget would be zero. Therefore, SMUD's conclusion with regard to this fiscal impact element is reasonable.

Since local law enforcement would be assisted by private security, we would not expect cost impacts on local law enforcement services.

There is no reason to doubt that SMUD's construction safety plan would preclude an increase in the county's emergency response activity or in search and rescue hospital services.

Economic Value of Harvestable Timber

The Iowa Hill development would permanently eliminate 128 acres of timberland and temporarily affect 25 acres during construction. SMUD used prevailing market prices for species known to be common to the Eldorado National Forest, and applied growth estimates provided by the Forest Service. Assuming all timber is composed of the most valuable species (Ponderosa Pine), the financial loss associated with its removal would amount to $699 per year and a net present value of $11,500 (using a 6 percent discount rate).

Our Analysis

There was no formal timber inventory or "cruise" of the area. However, it is understood that the estimates of the financial losses provided by SMUD are conservative, in that they account for the worst possible case. Given that the acreage is relatively small and that a full forest inventory of the area is not available, SMUD's approach is sound and its findings reasonable. Construction of the Iowa Hill development would have a minor effect on timber harvesting.

Construction Traffic Impact and Impact on Tourism at Apple Hill

SMUD provides a worst case scenario for the impact of construction-related traffic and then measures these findings against California Environmental Quality Act guidelines. The guidelines state that the impact of the Iowa Hill development would be significant if it would:

1. Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to ratio on roads, or congestion at intersections);
2. Exceed, either individually or cumulatively, a level of service standard established by El Dorado County for designated intersections;
3. Result in a change in traffic patterns, including either an increase in traffic levels or a change in location that result in substantial safety risks;
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses;
5. Result in inadequate emergency access;
6. Result in inadequate parking capacity; or
7. Conflict with adopted policies, plans, or programs supporting alternative transportation.

SMUD focused on automobile and truck traffic likely to be generated by the Project, stating that the area does not have public transportation facilities and is generally not suitable for walking or bicycling. Of most concern is the effect of traffic on tourism at Apple Hill and potential effects on homes located on or near the transportation routes, such as along Cable Road.

Under the transportation assumptions included in the Proposed Action, traffic would be generated by construction workers driving to the site and by trucks delivering construction materials and supplies to the site. SMUD assumes the worst case scenario, where all construction workers travel to the site from the greater Sacramento area. It assumes 360 daily trips would be generated under the assumptions that average vehicle occupancy is 1.3 persons and the peak-level workforce is 235. SMUD does not make clear why it chose 1.3 as the average vehicle occupancy but it may be assumed that it derives from previous research on journey-to-work habits for construction workers in the area. Most if not all of the worker trips generated by the construction would occur in off-peak hours assumed to be 5:30 a.m. to 6:30 a.m. and 3:30 p.m. to 4:30 p.m. Normal highway peak traffic commute hours are 7:00 a.m. to 8:00 a.m., and 5:00 p.m. to 6:00 p.m. Project-related trips would overlap with the afternoon school bus hour of 3:00 p.m. to 4:00 p.m.

According to the January 2005 *Iowa Hill Pumped Storage Development Socioeconomic Assessment of Construction and Operations Technical Report* (page 57), the Iowa Hill construction would further generate 25 delivery truck trips per day traveling over the same routes used by construction workers during non-commute hours. The specific materials and equipment expected to be delivered to the Project site was not given. SMUD concludes that while there would be additional traffic generated by the Project, most of it would occur in off-peak hours and further, since it would occur in off-peak directions (west-east during mornings and east- west during evenings) its impact would be minimal. SMUD's studies show that the construction activity would not affect the level of service at key intersections except at the Carson Road Eastbound ramp during the a.m. period. Assuming that 10 percent of the construction-generated traffic used this intersection to access the site, SMUD concludes that there would be a minimum of queuing delays. According to SMUD, queuing problems would not be expected to emerge until more than 20 percent of construction traffic uses this intersection. In this case, congestion could occur on U.S. Route 50, which is the area's major highway. These findings are based on levels of service outlined in the *2000 Highway Capacity Manual.* It is not clear why SMUD chooses to assume a 10 percent split between the use of the Carson Road interchange and The Old Highway interchange. SMUD further asserts that there is sufficient capacity to accommodate the construction traffic in the peak years of construction and consequently it would have minimal impact on traffic conditions during the off-peak years of construction.

In spite of the fact that most of the traffic would occur on week days, SMUD indicates that construction activities could exacerbate the traffic congestion that currently occurs during the annual Apple Hill recreational season. This is because while most of the estimated 500,000 visitors to the area during the season come on weekends, there is substantial traffic generated on weekdays as well. SMUD does not quantify the impact of construction traffic on Apple Hill tourism but given the modest level of additional traffic it would be reasonable to assume that Apple Hill tourism would not be significantly affected. The report addresses air traffic, emergency access and parking and finds no reason to believe that Project-generated traffic would have any impact on any of them. Finally, post-construction traffic impacts would be extremely minimal because the number of workers during this phase would be negligible.

Subsequent to publication of the draft EIS and in response to public concerns over the transportation issue, SMUD prepared the *Iowa Hill Pumped-Storage Development Transportation Route Technical Report* (CH2M HILL, 2008b), which investigated several routes as alternatives to the proposed route described in the draft EIS. The report considered alternative routes to both the upper and lower construction sites, and also evaluated the use of park and ride and/or equipment staging facilities as a means of alleviating traffic pressures. The alternatives evaluated in the technical report and the evaluation criteria are described briefly in this final EIS in section 3.3.7.2, *Environmental Effects; Land Ownership, Management, and Use; Transportation System Management Plan.*

The technical report includes a quantitative study of traffic patterns in the Iowa Hill area that was lacking in earlier reports. Based on traffic counts, a review of roadway features such as sharp turns, narrow roadways, and deteriorated roadways; a review of additional construction requirements such as a new overpass or road widening; and a review of homes and businesses located along the alternative routes. SMUD concluded that the following routes would be preferable from the “community-focused” point of view of minimizing impacts on neighborhoods and visitors:

Routes to Lower Construction Site:

- Route 1—Carson Road East (same as original proposed route)
- Route 5—Barkley Road
- Route 10—Jacquier road

Routes to Upper Construction Site:

- Route 9—Mace Road/Cable Road

All of those routes would avoid going through the town of Camino, and would avoid neighborhoods to the extent possible. The primary conclusion of the technical report, however, is that in terms of minimizing neighborhood impacts, the SW Connector route linking the upper and lower construction sites would be much superior to any of the alternative routes to the upper construction site. Significantly, however, the feasibility of constructing the SW Connector has not been determined at this time.

Our Analysis

Despite a few shortcomings in SMUD’s reports, we find the overall approach and results to be reasonable. SMUD provides a worst-case scenario where it is assumed that all workers and deliveries are sourced from the greater Sacramento area and the analysis is conducted during what are scheduled to be the peak construction years. However, SMUD does not support its contention that the peak travel hours in the area are different from the peak travel hours for construction workers, except to say that the non-construction hours are "normal." Additionally, SMUD does not consider the potential adverse effects on the condition of the area roads that could result from increased truck traffic, likely because there are no weight restrictions on the roads that are most likely to serve the trucking needs of the Project.

The traffic counts and quantified approach to route evaluation in the Transportation Route Technical Report (CH2M HILL, 2008b) is a substantial improvement over the transportation-related information we had available for preparing the draft EIS. The technical report uses a reasonable approach to evaluating and comparing the various alternative routes that could be used to the upper and lower construction sites. We find that because the Project would generate only a small number of additional vehicle traffic, its impact on total traffic would be minimal. If the SW Connector proves to be a feasible route to the upper construction site, the potential adverse effect to homes on or near Cable Road and the other access roads would be eliminated. As discussed in section 3.3.7.2, SMUD would develop and implement a transportation management plan to address traffic safety and road improvements. These measures may include the use of a park-and-ride facility and/or staging area to reduce construction-related car and truck trips to the construction sites. Additionally, SMUD could plan to disperse different types of traffic along different routes, so that the potential traffic disruption along any one route would be reduced.

Recreational Impacts

SMUD indicates that there is little if any recreational activity in the Iowa Hill area owing primarily to (1) the lack of water-related recreational opportunities; (2) the lack of recreational facilities (campgrounds, trails, etc.); and (3) the loose gravel/dirt, unimproved, 4-mile-long segment of Iowa Hill Road/Cable Road leading to the site from Camino.

There are, on the other hand, limited recreational activities downstream of the Iowa Hill site at Slab Creek reservoir and other places further downstream from Slab Creek and Chili Bar. SMUD studies show that recreational use of Slab Creek reservoir is low compared to other UARP sites, primarily because at an elevation of 1,850 feet with steep topography, access is limited. The area is used primarily by local residents who are limited to just two points of access. Construction traffic could impact recreation at Slab Creek reservoir by periodically limiting access to the area but the SMUD does not foresee any drastic change in the availability of the recreational activities at this site during the construction phase of the Project.

Construction techniques planned for the Project would not affect water levels in areas downstream of Slab Creek reservoir, including White Rock powerhouse, the SFAR downstream of Slab Creek dam, Chili Bar reservoir, and the reach downstream of Chili Bar reservoir. Therefore, recreational activities in these areas such as flat water boating will not be affected by the Project and therefore will not have any socioeconomic effects.

SMUD reports that the *operation* of the Project could affect recreational use at various downstream locations. In particular, (1) the 8-mile reach of the SFAR between the Slab Creek dam and PG&E's Chili Bar reservoir; (2) at Chili Bar reservoir; and (3) in the 19.1-mile reach downstream of Chili Bar dam. Since flat water boating and swimming at Chili Bar reservoir are currently prohibited, there is no reason to consider the socioeconomic impact of the Project on them. Recreational activities around Chili Bar reservoir such as picnicking, off-highway vehicle use, hiking and fishing are not anticipated to be adversely affected by Project operations.

To simulate the impact on recreational use of downstream facilities, SMUD relies upon the CHEOPS model. This is a model of water balance required to meet particular monthly and daily power generation schedules. The recreational effects of the Project stem primarily from the level of fluctuation in water levels at the reservoir. The model predicts that operation of the Project will cause water levels the Slab Creek reservoir to fluctuate by 6 feet or more approximately 95 percent of the time, more than 18 feet approximately 5 percent of the time, up to a maximum of 30 feet. In relative terms, current water level fluctuations at the Slab Creek reservoir are typically between 2 and 5.1 feet but on a weekly basis may fluctuate by up to 30 feet.

Our Analysis

SMUD concludes that construction techniques employed during the construction would preclude any adverse impact on recreation during the construction of the Project. There is no basis for argument on a socioeconomic basis and therefore this statement is considered valid.

The recreational impact of the Project-operation phase is concentrated in the Slab Creek reservoir. According to a visitor survey and use count conducted in summer of 2002, annual use of the Slab Creek reservoir is 5,100 visitor days per year and that 78 percent of the users reside locally in El Dorado County. Swimming is the most popular activity among visitors while 36 percent reported fishing along streams and rivers in the area, and 33 percent fishing directly at the reservoir. Twenty-eight percent reported canoeing or kayaking. Other activities were non-water based such as hiking/walking (44 percent), wildlife viewing (42 percent) picnicking (31 percent) and photography (25 percent). Slab Creek reservoir has limited access at this time, no signing or other information to direct the public to the access points, and a lack of facilities and security. As these items are provided, recreational use is expected to increase considerably. The Slab Creek reservoir access plan and recreation plan would address these needs, consistent with Iowa Hill operations needs. The current low use should not be assumed into the future.

SMUD reports that the change in daily water level fluctuations at the Slab Creek reservoir during the operation of the Project would be 6 feet or more 95 percent of the time compared to current fluctuations of between 2 and just over 5 feet for the same proportion of the day. SMUD states that the reservoir levels will change more rapidly than what recreational visitors are used to and goes on to say that without properly informing visitors of this development, these fluctuations could pose a safety issue. The difference in overall levels, however, is not stark and in isolation will not impact swimming or other water-related activities at the site. Nor will they impact non-water-related activities at the site. SMUD does not provide empirical support on which to base this conclusion either through original research or published literature. And because SMUD does not believe recreation at Slab Creek reservoir would be affected, there is no accompanying socioeconomic impact statement.

Implicit in SMUD's conclusion is that the predicted fluctuations in water levels during operations are not materially different from current water level fluctuations at the site and further, that recreational activity at Slab Creek reservoir is relatively light and owing to Department of Homeland Security concerns, will likely be restricted going forward. Given the small amount of recreational activity at Slab Creek, SMUD's conclusion is reasonable. One could argue that even if there were to be a decline in recreational use at Slab Creek reservoir, the socioeconomic impact in monetary terms would be negligible because 78 percent of visits were from the local area and therefore do not contribute to El Dorado County's tourism services economy to any significant degree.

Impact on Camino Community Lifestyle

SMUD reaches the conclusion that because the population of the County and in particular, the city of Camino would be unaffected by the number of jobs created, there would be negligible impacts on public services and lifestyles in the community. This section describes the SMUD analyses and conclusions in more detail.

SMUD is concerned with the impact of the Iowa Hill development on the lifestyle of the Camino Community. The effects of the Iowa Hill development are measured against elements of the Camino Community Action Plan (CCAP) "that are relevant to the construction and operation of the [Project]." These include,

- Enhance the sense of community, maintain Camino's natural environmental qualities, and small town atmosphere;
- Minimize traffic hazards/impacts on local roads and on U.S. 50;
- Improve access to recreational services; and
- Growth should be slow and controlled.

SMUD reports that the Iowa Hill development is consistent with the relevant goals outlined in the CCAP. The Iowa Hill development would not draw increased population to the area nor would it cause current residents to leave the area. This conclusion is based on the relatively few numbers of workers required for construction and operation of the Project and further, that the construction and operation of the Iowa Hill development is not expected to induce commercial, industrial or residential development in the area. It follows that the Iowa Hill development would not alter Camino's population growth or composition, nor would it change Camino's rural, small town character.

SMUD also states that the Iowa Hill development would not significantly alter the topography, geology or vegetation of the area, except where the proposed upper reservoir and associated facilities and the proposed transmission line would be sited. This would preserve the Camino Community's natural environmental qualities.

Operation of the Iowa Hill development would not result in air emissions but during construction, expectations are that there will be air emissions in the form of dust particulates and hydrocarbons. However, the report states that emissions would be localized in the vicinity of the upper reservoir and along the dirt road portions of the access roads until such time as they are upgraded with gravelling. With respect to noise, as discussed in section 3.3.10.2, *Air and Noise* Quality, construction and operation of the Project would raise ambient noise levels but as in the case of air quality, it would be limited to the immediate vicinity of the site and would not affect the Camino community.

SMUD states that casual visitors to Camino or Apple Hill or motorists on U.S. 50 would not notice the changes in topography, geology or vegetation caused by the Iowa Hill development because intervening topography and vegetation would obscure many of the views. SMUD also states that although recreationists at Slab Creek reservoir would notice the facilities, these facilities would not stand in stark contrast to already existing man-made features of the area and thus would not have a drastic impact on the recreational experience.

Access to recreational services, particularly those at Slab Creek reservoir, could be impeded by traffic congestion during the construction phase. In the operations phase, upgrades to the road made during construction would improve access. Under those circumstances, we conclude that the Iowa Hill development would be inconsistent with CCAP objectives regarding recreational facilities in the short term, but would be consistent with these objectives over the long term.

SMUD states that traffic hazards would develop during the peak construction period (months 30-36), and that these hazards could adversely affect the quality of life in Camino. Specifically, SMUD indicates that construction traffic could have an impact on (1) children walking in the morning to their bus stops on roads that comprise the Project access routes (if they are walking at or before 6:30 a.m.); (2) vehicles on the roads that comprise the Project access routes between approximately 5:30 a.m. to

6:30 a.m., including those attempting ingress or egress to/from residences, those transporting children to the bus stops in the morning, and other vehicles on the road; (3) the local p.m. school bus trips (3:00 p.m. to 4:00 p.m.); (4) children walking home from their bus stops in the afternoon, if walking on roads that comprise the Project access routes; (5) vehicles on the roads that comprise the Project access routes between approximately 3:30 p.m. to 4:30 p.m., including those attempting ingress or egress to/from residences, those transporting children to their homes from the bus stops in the afternoon, and other vehicles on the road; and (6) the traffic congestion that occurs during the Apple Hill season.

Our Analysis

Assuming that the results of the IMPLAN model are correct, it is reasonable to state that given the small number and temporary nature of the construction workforce to be employed during construction of the Iowa Hill development and the even smaller workforce required for its operation, the conclusions drawn by SMUD regarding the impact on Camino's population are reasonable. Even the indirect and induced jobs generated by the construction would not be sufficient to alter the population of Camino because, similar to the directly created construction jobs, many indirect or secondary jobs would be filled by workers commuting from the Sacramento region while others would be sourced from other areas of El Dorado and perhaps even Placer counties. Traffic hazards created by the Project are clearly inconsistent with the objectives of the CCAP; however, SMUD is committed to minimize the impact in its Transportation Management Plan, which is to be submitted prior to the initiation of the construction phase.

3.3.10.3 Unavoidable Adverse Effects

The Iowa Hill development would have unavoidable adverse effects on property values adjacent to the site during both the construction and operational phases of the Project. Traffic congestion would have an unavoidable adverse effect during the construction phase of the Project, particularly in the peak months (30–36).

Property values in the area immediately adjacent to the site may decline in value by as much as 33 percent, and 15 percent for two properties just east of the Iowa Hill site. In the Apple Hill area, 16 properties would decline by 3 percent in value and in Swansboro, 22 properties would undergo a 5 to 10 percent decrease in value.

Traffic congestion on roads leading to the site would be likely to worsen during the construction phase and in addition, would create hazards for residents of Camino during this period. Traffic congestion during the construction phase could also adversely affect tourism in the area.

3.3.11 Air Resources

3.3.11.1 Affected Environment

The California Air Resources Board (CARB), as part of the California Department of Environmental Protection, is responsible for protecting public health and the environment from the harmful effects of air pollution. Pollutants associated with air emissions, such as ozone, particulate matter, and nitrogen dioxide, are associated with respiratory illness. Carbon monoxide, another air pollutant, can be absorbed through the lungs into the bloodstream and reduce the ability of blood to carry oxygen. Sources of air emissions include commercial facility operations, fugitive dust, on-road vehicles and trucks, aircraft, boats, trains, and natural sources such as biogenic and geogenic hydrocarbons and wildfires.

The topography and meteorology of the western slope of the Sierras are the important factors in the environmental effects of air quality emissions. Dispersion of high pollutant concentrations in downwind areas is hindered by the mountainous topography. Frequent inversions, in which warm air overlays cool air, trap pollutants close to the ground. In summer, long days, stagnant air, and high temperatures facilitate photochemical production of ozone (O_3) from precursor air pollutants such as volatile organic compounds (VOC) and oxides of nitrogen (NO_x). Regional transport of these precursors from the Sacramento Valley and the San Francisco Bay area result in high ozone concentrations. CARB has officially designated the western portion of El Dorado County as “ozone impacted” from transport from those areas.

To reduce harmful exposure to air pollutants, the federal Clean Air Act (CAA) requires the EPA to set outdoor air quality standards for the nation with the option for states to adopt additional or more protective standards if needed. CARB has adopted ambient (outdoor) air quality standards (AAQS) that are more protective than federal standards and has implemented standards for some pollutants not addressed by federal standards. An AAQS establishes the concentration above which the pollutant is known to cause adverse health effects to sensitive groups within the population such as children and the elderly. The goal is for a localized Project effects not to cause or contribute to an exceedance of the standards. Criteria pollutants for which AAQS have been established are ozone, carbon monoxide, lead, nitrogen dioxide, particulate matter, and sulfur dioxide. California and federal AAQS for criteria pollutants are presented in table 3-73.

Table 3-73. California and federal ambient air quality standards. (Source: CARB, 2006).

Pollutant	Averaging Time	California Standards	Federal Standards Primary	Federal Standards Secondary
Ozone (O_3)	1 hour	0.09 ppm (180 μg/m^3)	-	Same as primary standard
	8 hour	0.07 ppm (137 μg/m^3)	0.08 ppm (157μg/m^3)	
Respirable Particulates (PM_{10})	24 hour	50 μg/m^3	150μg/m^3	Same as primary standard
	Annual mean	20 μg/m^3	--	
Fine Particulates ($PM_{2.5}$)	24 hour	No standard	35 μg/m^3	Same as primary standard
	Annual mean	12 μg/m^3	15 μg/m^3	
Carbon Monoxide (CO)	1 hour	20 ppm (23 μg/m^3)	35 ppm (40 μg/m^3)	None
	8 hour	9.0 ppm (10 μg/m^3)	9 ppm (10 μg/m^3)	
Nitrogen Dioxide (NO_2)	1 hour	--	--	Same as primary standard
	Annual mean	0.25 ppm (470 μg/m^3)	0.053 ppm (100 μg/m^3)	
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm (655 μg/m^3)	--	--
	3 hour	--	--	0.5 ppm (1300 μg/m^3)
	24 hour	0.04 ppm (105 μg/m^3)	0.14 ppm (365 μg/m^3)	_
	Annual mean	--	0.03 ppm (80 μg/m^3)	--

Existing Air Quality

To manage air quality problems, California is divided into 15 air basins, each of which is associated with an Air Quality Management District. The UARP study area is located across Sacramento and El Dorado counties, which are respectively within the Sacramento Valley Air Basin and Mountain Counties Air Basin. El Dorado has its own AQMD and Sacramento falls within the Sacramento Metropolitan AQMD. The proposed Iowa Hill development would lie in western El Dorado County. Chili Bar Project facilities are also located in El Dorado County, downstream of the UARP.

State and National Area Designations

Both the California and federal governments use ambient air monitoring data to classify areas according to their attainment status with respect to criteria pollutants. These designations are used to identify areas with air quality problems and help determine whether Project emissions would be considered significant under the NEPA and California Environmental Quality Act assessments. The three basic designation categories are:

- Attainment—indicates that ambient air quality is not in violation of the established standard for the specific criteria pollutant.
- Non-attainment—indicates that the ambient air quality violates the established standard for the specific criteria pollutant.
- Unclassified—indicates that there is currently insufficient data for determining attainment or non-attainment.

In addition to the above designations, the California includes a subcategory of the non-attainment designation:

- Non-attainment-transitional—given to non-attainment areas that are making progress and nearing attainment.

Sacramento and El Dorado counties are currently in attainment for nitrogen dioxide, sulfur dioxide, and lead, non-attainment for ozone (O_3) and particulate matters (PM), and in maintenance (previously non-attainment) for carbon monoxide (CO). Specifically, both the Sacramento Valley Air Basin exceed the national and state AAQS for ozone and the state AAQS for PM_{10}, the Sacramento Valley and PM_{10}. Table 3-74 presents the study areas' existing state air quality designations for criteria pollutants. State standards are presented as they are more protective than federal standards.

Table 3-74. California State area designations for criteria air pollutants.

Air Basin	**O_3**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**NO_2**	**SO_2**	**VRP**
Sacramento Metropolitan Air Basin (Sacramento County)	N	N	N	A	A	A	U
Mountain Counties Air Basin (Eldorado County)	N	N	U	U	A	A	U

Note: A – attainment
N – non-attainment
U – unclassifed
O_3 – ozone
PM_{10} – respirable particulate matter
$PM_{2.5}$ – fine particulate matter
CO – carbon monoxide
NO_2 – nitrogen dioxide
SO_2 – sulfur dioxide
VRP – visibility reducing particulates

The 1990 amendments to the CAA require federal agencies to conform to applicable State Implementation Plans (SIPs) for non-attainment areas. SIPs are state air quality regulations that provide for the implementation, maintenance, and enforcement of the National AAQS and include emissions limitations and control measures to attain and maintain the standards. The Sacramento Metropolitan Air Basin and the El Dorado Air Basin adopted the 1994 Sacramento Area Ozone Regional Clean Air Plan submitted as a SIP for ozone non-attainment. As of 2002, the Sacramento area has exceeded its goals for reduction of VOC and met its goal for reduction of NO_x (SMAQD, 2003).

EPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the "transportation conformity" regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51, and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation plans. Since the proposed Project is a non-transportation project, only the general conformity rule applies.

The general conformity rule applies to federal actions occurring in air quality regions designated as being in non-attainment for the National AAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. The proposed Projects are currently designated as serious non-attainment for 8-hour ozone, and as CO maintenance (previously nonattainment) areas. Sacramento County is also designated as moderate nonattainment for PM_{10}. An air conformity analysis was prepared as a supplement to this EIS and is included in appendix B of this document.

3.3.11.2 Environmental Effects

Construction of the Iowa Hill development under the UARP would create additional air emissions. Operations of the UARP under the No-action, UARP-only, and Iowa Hill alternatives would also increase air emissions. The environmental effects of air emissions related to the implementation of UARP alternatives are presented in this section. A General Conformity Analysis includes all operational and construction emissions from each alternative is included Attachment Air-2.

The potential environmental effects of the Chili Bar Project were evaluated and examined for air emissions. The Chili Bar Project has limited reservoir and storage, and operation by PG&E is to manage flow releases from upstream of SMUD's White Rock powerhouse. PG&E proposes only minor modifications as needed to implement resource management measures, and does not propose changing existing Chili Bar operations, thus air emissions resulting from Chili Bar operation would continue to be negligible.

Effects of Construction

The No-action Alternative and the UARP-only Alternative do not involve construction of any kind and thus would not have air emissions effects related to construction activities. Only construction activities during development of Iowa Hill have potential environmental effects on ambient air quality.

Construction of the Iowa Hill development under SMUD's Proposed Action would potentially result in effects on air emissions. Short-term air quality may be affected by emissions of exhaust pollutants from construction equipment and dust from earthmoving activities. Both potential effects would be temporary (limited to the construction period) and local (only occurring in the immediate vicinity of the construction activity).

To assess potential short-term effects of construction emissions on ambient air quality, SMUD conducted a worst-case screening using an air quality dispersion modeling analysis.

The predicted worst-case construction impacts and ambient air quality concentrations are shown in table 3-75.

Table 3-75. Predicted total ambient concentrations during construction period.

Pollutant	Averaging Time	Maximum Construction Impacts ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Ambient Concentration ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1 hour	241	198	439	470	--
	Annual	16.9	16.9	33.8	--	100
SO_2	1 hour	2.7	83.6	86.3	650	--
	24 hour	0.3	45.9	46.2	109	365
	Annual	0.0	6.5	6.5	--	80
CO	1 hour	503	2,240	2,743	23,000	40,000
	8 hour	114	992	1,106	10,000	10,000
PM_{10}	24 hour	29.5	52	81.5	50	150
	Annual	6.6	16.8	23.4	30	50
$PM_{2.5}$	24 hour	9.0	40	49.0	--	65
	Annual	2.0	9.9	11.9	12	15

The air conformity analysis estimated construction-related emissions with the CARB's OFFROAD2007 model. The usage of equipment, likely duration of each activity, and labor estimates for each activity for the construction were determined by the Engineer. Results of this analysis are presented in table 3-76.

Table 3-76. Estimated air emissions from construction activities.

	Peak-Year Emissions (tons/year)					
Activity	**NO_X**	**CO**	**VOC**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-site heavy equipment and trucks	33.3	12.3	3.5	0.04	1.4	1.3
Fugitive dust	NA	NA	NA	NA	31.0	6.1
Vehicles for deliveries (on-road)	1.8	1.6	0.2	0.003	0.07	0.05
Worker travel vehicles (on-road)	1.0	9.9	1.0	0.01	0.09	0.05
Total construction emissions	36.1	22.8	4.7	0.18	32.56	16.9
De minimis emission levels significance	50	100	50	--	100	100

Our Analysis

Development of Iowa Hill would result in air emissions from construction equipment, earth moving activities, construction worker's commutes, material deliveries, and earth hauling. Fugitive dust during construction, particularly during excavation of the site, would contribute substantially to particulate matter emissions.

Table 3-75 indicates that maximum construction effects during the worst-case scenario would still be within the most stringent state standards, despite elevated short-term emissions at the site. Because PM_{10} emissions are predominantly caused by fugitive dust (table 3-76), staff recommends application of water or chemical dust suppressant on unpaved surfaces, combined with vacuum sweeping and water flushing of paved surfaces to minimize fugitive dust emissions during construction. Additionally, re-planting vegetation in disturbed areas as quickly as possible would further reduce fugitive dust emissions.

Off-road equipment would be required to follow the updated emission standards established by CARB to reduce exhaust emissions from construction engines. Staff also recommends limiting diesel engine idling, shutting off engines when not in use, and using preventative maintenance to keep engines running optimally to further minimize NO_x emissions.

Implementation of these measures would reduce the short-term air emissions effects from construction activities.

Effects of Operations

The existing UARP produces 1,835,000 MWh of renewable energy by utilizing the water cycle. Conventional hydroelectric generation is a reliable, efficient, economical, and less polluting source of energy resulting in zero air emissions. However, future demand calculations estimate a need for 2,696,000 MWh of energy, which would require simple cycle turbine, gas-fired generation to supply 861,000 MWh of on-peak generation. Annual emissions for a No-action Alternative have been estimated assuming gas-fired generation using a simple cycle turbine.

The required energy generation and overall emissions from the operation of the Proposed Action and UARP-only Alternative have been evaluated based upon best- and worse-case emission scenarios with the best-case being all electric generation supplied by gas-fired combined cycle turbines and the worst-case scenario being coal fired generation. Energy requirements and generation sources for all scenarios are summarized in table 3-77.

Table 3-77. Energy generation and requirements for all Project alternatives.

	Energy Generation (MWh)			
Scenario	**Hydroelectric**	**Simple Combustion Turbine**	**Combine Cycle Turbine or Coal**	**Total**
No-Action	1,835,000	861,000	--	2,696,000
UARP-Only	1,699,000	931,000	66,000	2,696,000
Iowa Hill	1,443,000	--	1,253,000	2,696,000

No-action Alternative

Under the No-action Alternative (Baseline Condition), the continued operation of existing UARP facilities will not result in any atmospheric emission of criteria pollutants or other hazardous material that can affect air quality. The continued operation of the existing facilities under the No-action Alternative will, on average, result in the annual generation of 1,835,000 MWh of clean energy.

Future demand need is estimated to be 2,696,000 MWh, which represents an increase of 861,000 MWh. This increased demand beyond the generation capacity of the hydroelectric project would have to be generated by an additional energy supply. In the case of no action, this supply would most likely be a simple combustion turbine, which is considered “state of the art” and is most easily permittable. Air emissions resulting from simple combustion turbine generation are presented in table 3-78.

UARP-Only Alternative

The UARP-only Alternative is identical to the Proposed Action with the exception of the Iowa Hill development. The UARP-only Alternative would reduce flows available for energy generation, resulting in the annual generation of 1,699,000 MWh of hydroelectric energy and a deficit of 136,000 MWh from the No-action Alternative. Because the Iowa Hill development would not be constructed under this alternative, the energy deficit from the new flow regime as well as future energy needs would be met by other energy sources, such as power purchase from the energy market, a mix of fuel generation sources, gas turbines, etc. These additional sources would create emissions that may result in environmental effects. The analysis presented here assumes that additional energy requirements would be met through a combination of simple combustion turbine and combined cycle turbine (best-case) or coal-fired (worst-case) generation. Air emissions resulting from the UARP-only Alternative are presented in table 3-78.

Table 3-78. Estimated air emissions from operational activities.

			Peak-Year Annual Emissions (tons/year)				
Scenario	**Energy Source**		**NO_X**	**CO**	**VOC**	**PM_{10}**	**SO_2**
No-Action	Hydroelectric + On-Peak simple combustion turbine	--	71.9	35.3	20.7	8.6	10.3
UARP-only	Hydroelectric + On-Peak simple combustion turbine	Combined cycle turbine	81.0	39.5	23.6	10.0	12.0
		Coal	81.4	41.8	23.0	10.6	14.5
Iowa Hill	Hydroelectric Pumped-Storage	Combined cycle turbine	62.7	25.7	23.8	12.5	15.0
		Coal	69.5	68.3	12.5	24.4	63.9

Proposed Action-Iowa Hill Development

The Proposed Action would increase flows to Project-related streams during the spring, thereby decreasing the volume available to generate electricity at UARP facilities. SMUD proposed a pumped-storage facility to compensate for this reduction in energy generation. The reduction in energy from loss of flow combined with the increased energy demand to run the pump storage results in a loss of 392,000 MWh compared to the No-action Alternative. In this case, 931,000 MWh of on-demand energy provided by the Iowa Hill development would help meet future energy needs when coupled with 1,253,000 MWh from combined cycle turbine or coal-fired energy sources. The pumped-storage facility would not contribute air emissions because reversible turbines would use electricity from a transmission line tied in to the existing Camino-White Rock line to pump water into the upper reservoir. Additional air emissions would be added only through combine cycle turbine or coal-fired generation sources. Air emissions resulting from the Proposed Action are presented in table 3-78.

Our Analysis

Operation of the existing UARP with conventional hydroelectric generation would not contribute air emissions. Environmental effects of air emissions would result only from energy generation by additional sources such as simple combustion turbine, combined cycle turbine, and coal-fired generation, which are needed to meet estimated future demands. Table 3-79 presents net operational air emissions between No-action and the UARP-only alternatives and Proposed Action after the implementation of the

Iowa Hill development in 2014 and compares the net increase or decrease in emissions to thresholds levels established in 40 CFR 93.153.

Table 3-79. Net peak-year emissions due to the UARP-only Alternative and Proposed Action following operation of Iowa Hill Development (post 2014).

		Net Annual Emissions (tons/year)					
Scenario	**Additional Source**	**NO_X**	**CO**	**VOC**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
UARP-only	Combined Cycle Turbine	9.1	4.2	2.9	1.6	1.4	1.3
	Coal	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill	Combined Cycle Turbine	–9.2	–9.6	3.1	4.7	3.9	3.5
	Coal	–2.4	33.0	-8.1	53.6	15.8	14.2
De minimis		*50*	*100*	*50*	*100*[a]	*100*	*100*

[a] SO_2 *de minimis* level does not apply to the Projects, as located in attainment area.

Table 3-79 indicates that net emissions of all criteria pollutants would not exceed *de minimis* threshold levels compared to the No-action Alternative. Net increases of air emissions between the No-action Alternative and UARP-only Alternative would be substantially lower than threshold levels. In some cases, net emissions from the Proposed Action are lower than no action emissions. For instance, use of combined cycle turbine in the place of simple combustion turbine generation under the Proposed Action would reduce emissions of NO_x and CO. Coal-fired generation in the Proposed Action would increase emissions of CO, SO_2, and PM but would decrease emissions of ozone precursors NO_x and VOC compared to the No-action Alternative. In general, air emissions from additional energy generation would increase compared to zero emission conventional hydroelectric generation, net increases under proposed alternatives would not exceed thresholds and in some cases the Proposed Action would decrease emissions compared to no action.

3.3.11.3 Cumulative Effects

The cumulative effects on air quality for various Project Alternatives to include emissions and air quality effects resulting from all operational and construction activities of UARP and Chili Bar Project are evaluated, either quantitatively or qualitatively. The cumulative effects are mainly resulting from the UARP, while the Chili Bar Project has negligible effect on air resources.

3.3.11.4 Unavoidable Adverse Effects

Air quality analysis indicates construction of the Iowa Hill development would contribute to air pollutants levels of NO_x, CO, and PM_{10}. These effects would be limited to worst-case conditions during a short-term construction period. With on-site control measures, the air emissions would not exceed the *de minimis* levels.

Among the viable substitute resources to cover the energy supply shortage resulting from the Project alternatives, the gas turbine plants are likely to be used to supply peak energy because they can be started rapidly during periods of high demand. Air emissions resulting from these substitute plants can be controlled to meet the regulations and conformity requirements.

3.3.12 Noise Resources

3.3.12.1 Affected Environment

Noise is defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generation plants, and highway vehicles. The magnitude of noise is described by its sound pressure. Because the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, the decibel. Sound pressures described in decibels are called sound pressure levels.

Sound levels measured using an A-weighted decibel scale are expressed as dBA. Throughout this analysis, all noise levels are expressed in dBA. Several examples of noise pressure levels in dBA are listed in table 3-80.

The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- the amount and nature of the intruding noise;
- the relationship between the background noise and the intruding noise; and
- the type of activity occurring where the noise is heard.

In considering the first of these factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some people more than others, and some patterns of noise also enter into people's judgment of whether or not a noise is offensive.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). The blowing of a car horn at night when background noise levels are approximately 45 dBA generally would be more objectionable than the blowing of a car horn in the afternoon when background noises might be 55 dBA.

Table 3-80. A-weighted (dBA) sound levels of typical noise environments. (Source: FICON, 1992, as modified by staff)

A-Weighted	Overall Level	Noise Environment
120	Uncomfortably Loud (32 times as loud as 70 dBA)	Military jet takeoff at 50 feet
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 feet
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 feet; diesel truck 40 mph at 50 feet
70	Moderately loud	Freeway at 50 feet from pavement edge; vacuum cleaner (indoor)
60	Relatively quiet (1/2 as loud as 70 dBA)	Air condition unit at 10 feet; dishwasher at 10 feet (indoor)
50	Quiet (1/4 as loud as 70 dBA)	Large transformers; small private office (indoor)
40	Very quiet (1/8 as loud as 70 dBA)	Bird calls; lowest limit of urban ambient sound
10	Extremely quiet (1/64 as loud as 70 dBA)	Just audible
0	Threshold of hearing	

Note: dBA – A-weighted decibel scale

The third factor is related to the interference of noise with activities of individuals. In a 60-dBA environment, normal work activities requiring high levels of concentration may be interrupted by loud noises, while activities requiring manual effort may not be interrupted to the same degree.

Time-averaged descriptors are utilized to provide a better assessment of time-varying sound levels. The three most common noise descriptors used in community noise surveys are the equivalent sound level (L_{eq}), percentile distributions of sound levels ($L_{\%}$), and the day-night average sound level (L_{dn}).

The L_{eq} is an energy-averaged sound level that includes both steady background sounds and transient short-term sounds. The L_{eq} is equivalent in energy to the fluctuating sound level over the measurement period. The L_{eq} is commonly used to describe traffic noise levels, which tend to be characterized by fluctuating sound levels.

The $L_{\%}$ indicate the sound level exceeded for a percentage of the measurement period. For example, the L_{90} is the sound level exceeded for 90 percent of the measurement period and is commonly used to represent background sound levels. The L_{10} is the sound level exceeded for 10 percent of the measurement period and represents the peak sound levels present in the environment.

The L_{dn} is another descriptor used to evaluate community noise levels. The L_{dn} is a 24-hour average sound level, which includes a 10 dBA penalty added to nighttime sound levels (10:00 p.m. to 7:00 a.m.) because people tend to be more sensitive to noise during the nighttime. The day-night average sound level is commonly used to describe aircraft and train noise levels.

For the state of California, noise intensity is also discussed in terms of Community Noise Equivalent Level, which presents a weighted average noise level that increases the relative significance of evening and nighttime noise. The Community Noise Equivalent Level descriptor is used to evaluate community noise levels, which includes a 5 and 10 dBA penalty added to evening (7:00 p.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) sound levels, respectively, in consideration of people's increased sensitivity to noise during the evening and nighttime periods.

Existing Noise Environment

The proposed Iowa Hill development is located in a remote and forested area near the communities of Mosquito/Swansboro and Camino, placing it in a rural area where a small number of privately-owned residential properties may be affected by a change in noise levels. Most of the nearby residences with potential to be affected by construction noise are located in Swansboro, approximately one mile northwest of the proposed upper reservoir, along the north canyon rim of the SFAR. There are also a few homes south of the upper reservoir site (along or near Copperton Road) within one mile of the upper reservoir, and several more homes are located approximately one mile southwest of the upper reservoir site. Residences closest to the upper reservoir site include a group of 28 privately-owned parcels along Iowa Hill Road. Some of these parcels abut the proposed Project boundary for the Iowa Hill development. There are no utility services (e.g., electricity, water) in the vicinity of Iowa Hill, therefore current and future development is limited.

Noise Standards

The El Dorado County General Plan has the following specific policy for construction noise:

- **Policy 6.5.1.11**—The standards outlined in table 3-81 shall apply to those activities associated with actual construction of a project as long as such construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends, and on federally recognized holidays. Exceptions are allowed if it can be shown that construction beyond these times is necessary to alleviate traffic congestion and safety hazards.

Table 3-81. Maximum allowable noise exposure for non-transportation noise sources in rural regions—construction noise.

		Noise Level	
Land Use Designation	**Time Period**	**L_{eq}**	**L_{max}**
All Residential (LDR)	7 a.m.–7 p.m.	50	60
	7 p.m.–10 p.m.	45	55
	10 p.m.–7 a.m.	40	50
Commercial, Recreation, and Public Facilities	7 a.m.–7 p.m.	65	75
(C, TR, PF)	7 p.m.–7 a.m.	60	70
Rural Land, Natural Resources, Open Space, and Agricultural Lands (RR, NR, OS, AL)	7 a.m.–7 p.m.	65	75
	7 p.m.–7 a.m.	60	70

3.3.12.2 Environmental Effects

Iowa Hill Development

Effects of Construction

The construction of the Iowa Hill development has the potential to generate noise levels that could be disturbing to residents living in the surrounding area and to recreational visitors at the informal boat launch site at the Slab Creek reservoir.

Under Proposed Article 1-48, *Construction Noise*, SMUD would provide a noise mitigation plan to minimize noise emissions from the construction site. The plan would address vehicle idling, and include provisions to provide advance notice of any materials transport and construction activities within 0.5 mile of the tract where construction is occurring; notices to residents indicating the nature, timing, and duration of all materials transport and construction activities occurring within 0.5 mile of their residences; a noise hot line telephone system for reporting construction noise disturbances; monitoring to address compliance with the above measures; and it would specify actions to mitigate violation of the above measures. SMUD would provide monthly monitoring reports to the Forest Service that includes lists of any complaints of noise disturbances.

Our Analysis

Noise at the construction sites would be intermittent and the intensity would vary. The degree of construction noise may vary depending on the construction phase and activities.

While a large portion of the construction activities for the water conduits and the powerhouse cavern would take place underground, construction of the upper reservoir atop Iowa Hill would generate noise as earth-moving equipment clear the site and build the reservoir berm. SMUD states that most construction work at the Iowa Hill development will begin at 6:30 a.m. in order to avoid traffic congestion. Starting construction work at this time would reduce local construction-related traffic congestion and safety hazards and is allowed under El Dorado County General Plan.

Blasting for the construction of the Iowa Hill development would exceed the El Dorado County General Plan maximum allowable noise limit (60 dB) at several noise sensitive sites; however, the blasting would meet federal and industry standards and be less disruptive over time as activities progress underground. Traffic due to the construction of the Iowa Hill development would not exceed General Plan traffic noise limits.

During the construction period, some of the sensitive sites that are close to the Project may be exposed to high noise levels. Effective noise control during the construction of a project means minimizing noise disturbances to the surrounding community. We would expect SMUD to use a combination of mitigation techniques including equipment noise controls and administrative measures to provide the most effective means to minimize effects of the construction activity noise on people living nearby or visiting the Iowa Hill area.

SMUD would use standard noise mitigation measures to comply with the El Dorado County General Plan noise limits. These measures would likely include ensuring that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine enclosures, and engine vibration isolators, intact and operational and that all construction equipment is inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding). Other typical measures would include limitations on the duration of certain construction/demolition activities, building temporary noise barriers, and planning truck routes to minimize backup alarms and keep trucks away from residences.

Development and implementation of a plan to control construction noise would minimize but not eliminate the potential effects of noise during construction. Neighboring residents and visitors to the Iowa Hill area would hear the construction activities during the daytime but to a lesser extent than would occur without implementation of noise abatement techniques.

Effects of Operations

Operation of the Iowa Hill development has the potential to increase ambient noise levels in the Iowa Hill area. Operational noise associated with the Iowa Hill development is unlikely to be an issue, however, because noise generating facilities (the powerhouse and intake structure) would be located underground.

Our Analysis

The stationary noise source (the turbine/generating units) at the proposed Iowa Hills development would be placed in an underground powerhouse and would not affect noise levels on the surface. Therefore, noise effects associated with operation of the proposed Project would not be significant.

Traffic noise would be limited two employees and periodic deliveries and maintenance activities and would be minor. Not many sensitive land uses would be in the proximity of the proposed Iowa Hills development and the proposed transmission alignment. As noted above, most of these areas are mountainous and desolate, except for a few small housing developments and ranch homes that are at least 1,000 feet away.

The higher voltages at which modern transmission lines operate have increased noise problems. Consequently, these lines are now designed, constructed, and maintained so that during dry conditions they would operate below the corona-inception voltage, meaning that the line would generate a minimum of corona-related noise. Under wet weather conditions, high-tension transmission lines may generate audible noises. The audible noise emitted from high-voltage lines is caused by the discharge of energy that occurs when the electrical field strength on the conductor surface is greater than the "breakdown strength" (the field intensity necessary to start a flow of electric current) of the air surrounding the conductor. This discharge is also responsible for radio noise, a visible glow of light near the conductor, an energy loss known as corona loss, and other phenomena associated with high-voltage lines. The degree or intensity of the corona discharge and the resulting audible noise are affected by the condition of the air—that is, by humidity, air density, wind, and water in the form of rain, drizzle, and fog. Water increases the conductivity of the air and in turn increases the intensity of the discharge. Also, irregularities on the conductor surface such as nicks or sharp points and airborne contaminants can increase the corona activity. Aging or weathering of the conductor surface generally reduces the significance of these factors.

For AC lines and voltages above 400-kV, noise levels of 60 dBA or less at the edge of right-of-way can be annoying to the receptors nearby. However, the short section of 230-kV line associated with the Iowa Hill development would be designed to ensure that corona noise does not exceed 50 dBA at the right-of-way.

3.3.12.3 Unavoidable Adverse Effects

During some phases of construction operations, exceedances to El Dorado County General Plan Noise Criteria are likely to occur. SMUD is committed to employing a combination of mitigation techniques including equipment noise controls and administrative measures to provide the most effective means to minimize effects of the construction activity noise on people living nearby or visiting the Iowa Hill area. However, with a large complex project, the information available during the preliminary engineering phase may not allow final decisions to be made on all specific mitigation measures, and the extent of these exceedances to noise criteria cannot be determined. But they will be temporary and less intrusive because of SMUD's mitigation plan.

3.4 NO-ACTION ALTERNATIVE

Under the No-action Alternative (Baseline Condition), the continued operation of existing UARP facilities will be of significant importance to air quality in the Sacramento region and foothill communities in Placer and El Dorado counties over the term of the new license. Operation of the existing UARP facilities does not result in any atmospheric emission of criteria pollutants or other hazardous material that can affect air quality. The continued operation of the existing facilities under the No-action Alternative will, on average, result in the annual generation of 1,835,000 MWh of clean energy.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Continued operation of the existing Projects would continue to commit lands and waters previously developed for energy production. Construction of the proposed Iowa Hill development would convert about 185 acres of existing forest land to energy production use. This commitment would not necessarily be irreversible or irretrievable because removal of the Project dams and restoration of disturbed areas could return the Projects' areas to near pre-Project conditions. However, given the substantial costs and loss of energy, recreational, and socioeconomic benefits, removal of the dams is unlikely in the foreseeable future.

3.6 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM USES

Under all alternatives considered, the Projects would continue to generate power for customers of SMUD and PG&E and provide recreation and socioeconomic benefits for the duration of any new licenses. The Proposed Actions with staff-recommended modifications would provide significant long-term protection and enhancement of biological, cultural, and recreational resources in the Upper American River Basin, although energy generation at the existing Projects would be somewhat reduced. Construction of the proposed Iowa Hill development would provide a new source of off-peak energy for use during high peak periods and improved the reliability of energy from SMUD.

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 4
Developmental Analysis
Pages 4-1 through 4-14

FEIS

4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the Projects' use of the water resources of the Upper American River Basin to generate power, estimate the economic benefits of the SMUD and PG&E facilities, and estimate the cost of various environmental measures and the effects of these measures on Project operations.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECTS

4.1.1 Economic Assumptions

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the Project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

For our economic analysis of the UARP alternatives, we used the assumptions, values, and sources shown in table 4-1. Similar information for the Chili Bar Project is presented in table 4-2.

Table 4-1. Staff assumptions for economic analysis of SMUD's UARP Project.

Assumption	Value	Source
Base year for costs and benefits	2007	Staff
On-peak power value (mills/kWh)	$73.80	SMUD
Off-peak power value (mills/kWh)	$55.80	SMUD
Pump-back power cost (mills/kWh)	$55.80	SMUD
Dependable capacity value ($/MW)	$95,960	SMUD
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	0 percent	SMUD
Local tax rate	0 percent	SMUD
Insurance rate[a]		Staff
Interest during construction rate	4.1%	SMUD
Discount rate	6.25%	SMUD

Assumption	Value	Source
Long-term bond interest rate	4.4%	SMUD
Return on Equity	6.6%	SMUD
Debt:equity ratio	80:20	SMUD

[a] Insurance is treated explicitly by SMUD, see table 4-3.

Table 4-2. Staff assumptions for economic analysis of PG&E's Chili Bar Project.

Assumption	Value	Source
Base year for costs and benefits	2007	Staff
On-peak power value (mills/kWh)[a]	$73.80	SMUD
Off-peak power value (mills/kWh)[a]	$55.80	SMUD
Dependable capacity value ($/MW)[a]	$95,960	SMUD
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	34 percent	PG&E
Local tax rate[b]	3.18 percent	PG&E
Insurance rate	0.25%	Staff
Discount rate	8.0%	PG&E
Long-term interest rate	7.2%	PG&E
Return on equity rate	11.9%	PG&E
Debt equity ratio	55:45	PG&E

[a] We adopted the SMUD power value estimates because it provided both peak and off-peak values.

[b] Calculated based on PG&E local tax of $87,000 divided by book value of $2,734,000.

4.1.2 Current Annual Costs and Future Capital Costs for the UARP and Chili Bar Project under the No-action Alternative

Total annualized current costs for the SMUD No-action Alternative amount to $40,749,000 (see table 4-3); the total annualized current costs for the PG&E No-action Alternative amount to $2,170,000 (see table 4-4).

Table 4-3. Summary of current annual costs and future costs for SMUD's UARP under the No-action Alternative. (Source: SMUD and PG&E, 2007)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment	$182,000,000		$12,081,300
Total relicensing cost	$24,000,000		$1,593,100
Total net investment	$206,000,000		$13,674,400
Future costs		$6,758,600	$6,758,600
Plant operations and maintenance		$16,896,500	$16,896,500
Administrative and general		$1,761,900	$1,761,900
Insurance		$1,657,600	$1,657,600
Subtotal annual costs			$27,074,600
Total			$40,749,000

Table 4-4. Summary of current annual costs and future capital costs for PG&E's Chili Bar Project under the No-action Alternative. (Source: PG&E, 2005)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Total original net investment	$2,734,000		$398,900
Total relicensing cost	$4,600,000		$671,100
Total net investment	$7,334,000		$1,070,000
Future costs[a]		$554,800	$554,800
Plant operations and maintenance[a]		$358,200	$358,200
FERC fees		$187,000	$187,000
Subtotal annual costs			$1,100,000
Total			$2,170,000

[a] These costs were adjusted by 2.8 percent per year to convert from 2005 to 2007 dollars.

4.2 COST OF IOWA HILL DEVELOPMENT

SMUD estimates the cost to build the Iowa Hill development could range from a low of $552,716,000 to a high of $855,362,000. Staff adopted the midpoint of the low-end and high-end cost estimates for use in the developmental analysis. Capital costs and annual costs for the Iowa Hill development are summarized by major construction area in tables 4-5 and 4-6.

Table 4-5. Summary of Iowa Hill development capital costs under the Proposed Action. (Source: SMUD and PG&E, 2007, Staff)

Cost	Mid-Point Estimate
Mobilization and water handling	$32,136,000
Permanent access road (lower)	$2,764,000
Upper reservoir	$113,878,000
Waterways and intakes	$95,480,500
Powerhouse and access tunnels	$109,727,500
Equipment (installed)	$174,978,500
Transmission line	$18,354,500
Subtotal	$547,319,000
Licensing, SMUD project management and Geotechnical Exploration	$64,509,000
Interest during construction (4.1% annually for 4 years)	$63,364,000
Sales tax on equipment (El Dorado County rate 7.25%)	$28,848,000
Total Construction cost with contingencies	$704,040,000

Table 4-6. Summary of Iowa Hill development annual costs under the Proposed Action. (Source: SMUD and PG&E, 2007, Staff)

	Capital Cost ($)	Annual Cost ($)	Annualized Cost ($)
Iowa Hill development	$704,040,000		$47,536,100
Additional future costs		$1,153,400	$1,153,400
Additional operations and maintenance costs		$2,883,400	$2,883,400
Additional administrative and general costs		$300,700	$300,700
Additional insurance costs		$641,200	$641,200
Subtotal additional future annual costs			$4,978,700
Total annual cost			$52,514,800

4.3 COST OF ENVIRONMENTAL MEASURES

As proposed under the Settlement Agreement and as recommended by staff, the environmental measures for the UARP and Chili Bar Project would both reduce generation and increase annual O&M costs and capital costs. No effect on dependable capacity is anticipated by either utility.

4.3.1 Cost of Environmental Measures for UARP

SMUD provided costs for environmental measures in current dollars. Costs are taken from the Settlement Plan filed in January 2007, and a cost update reflecting the Settlement Agreement submitted on April 11, 2007 (SMUD and PG&E, 2007). Where cost information was inconsistent, staff estimated costs. Table 4-7 summarizes the costs by major resource area for the UARP-only Alternative.[42] No staff modifications are included in this alternative. Our detailed costs and energy benefit reductions for SMUD's UARP-only Alternative environmental measures are provided in appendix C. Additionally, certain costs identified as resulting from SMUD's 90 percent contribution to the implementation of overlapping-issue measures contained in the Chili Bar Project, as described in appendix 2 of the Settlement Agreement are summarized in appendix C.

Table 4-7. Summary of annualized costs for measures included in the UARP-only Alternative. (Source: Staff)

Resource Area	Capital Cost	Annualized O&M Cost	Total Annualized Cost
Geology and soils	$758,600	$18,800	$69,100
Water quantity	$3,311,900	$94,700	$314,500
Water quality	$256,600	$272,200	$289,400
Aquatic resources	$429,100	$89,400	$118,000
Terrestrial resources	$423,800	$249,700	$277,800
Recreation	$37,827,700	$1,457,000	$3,967,900
Land use and aesthetics	$5,820,400	$332,500	$718,600
Cultural resources	$16,400	$5,500	$6,600
Multidisciplinary	$16,400	$486,200	$487,300
Total	$48,860,900	$3,006,000	$6,249,200

[42]Under the UARP-only Alternative, the Iowa Hill development would not be constructed.

Table 4-8 summarizes the costs of the environmental measures by major resource area for the Proposed Action (with Iowa Hill development) and Proposed Action with Staff Modifications. Because we recommend only minor modifications to several proposed environmental measures, the cost of the Proposed Action with Staff Modifications for the UARP is similar to the Proposed Action (with Iowa Hill development).

Table 4-8. Summary of annualized costs for measures included in the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications.[a] (Source: Staff).

	Proposed Action (with Iowa Hill Development)			Proposed Action with Staff Modifications		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$758,600	$18,800	$69,100	$758,600	$18,800	$69,100
Water quantity	$3,311,900	$94,700	$314,500	$3,038,600	$94,700	$296,400
Water quality	$256,600	$272,200	$289,400	$256,600	$272,200	$289,400
Aquatic resources	$429,100	$89,400	$118,000	$429,100	$89,400	$118,000
Terrestrial resources	$423,800	$249,700	$277,800	$423,800	$280,000	$308,100
Recreation	$26,897,700	$1,457,000	$3,242,400	$26,897,700	$1,457,000	$3,242,400
Land use and aesthetics	$5,820,400	$332,500	$718,600	$5,820,400	$332,500	$718,600
Cultural resources	$16,400	$5,500	$6,600	$16,400	$5,500	$6,600
Multidisciplinary	$16,400	$486,200	$487,300	$16,400	$486,200	$487,300
Total	$37,930,900	$3,006,000	$5,523,700	$37,657,600	$3,036,300	$5,535,900

[a] The costs for the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications are very similar. Although costs are similar, certain reservoir level constraints at small reservoirs with no costs are not endorsed by staff as described in section 5.1.3, Rationale for Staff Recommendations in Comprehensive Development.

Table 4-9 summarizes the costs of the environmental measures by major resource area for the Iowa Hill development component of the Proposed Action. Again, the costs associated with the Iowa Hill development component of the Proposed Action with Staff Modifications for the UARP is similar to the Proposed Action (with Iowa Hill development). Our detailed costs for SMUD's Iowa Hill environmental measures are also provided in the last section of appendix C.

PG&E provided costs for environmental measures in current dollars. Costs are taken from the Settlement Agreement filed in January 2007, and a cost update reflecting the Settlement Agreement submitted on May 16, 2007 (SMUD and PG&E, 2007). Table 4-10 summarizes the costs by major resource area for both the Proposed Action (with Iowa Hill development) and the Proposed Action with Staff Modifications for the Chili Bar Project. Our detailed costs and energy benefit reductions for PG&E's Chili Bar Project are provided in appendix B and include a single staff-recommended additional measure providing for a recreation plan.

Table 4-9. Summary of annualized costs for measures associated with the Iowa Hill component of the Proposed Action and Proposed Action with Staff Modifications.[a] (Source: Staff)

	Proposed Action (with Iowa Hill Development)			**Proposed Action with Staff Modifications**		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$0	$0	$0	$0	$0	$0
Water quantity	$54,700	$0	$3,600	$54,700	$0	$3,600
Water quality	$54,700	$2,600	$6,200	$54,700	$2,600	$6,200
Aquatic resources	$382,600	$16,400	$41,800	$382,600	$16,400	$41,800
Terrestrial resources	$546,500	$0	$36,300	$566,500	$0	$37,600
Recreation	$27,300	$0	$1,800	$27,300	$0	$1,800
Land use and aesthetics	$112,000	$3,900	$11,300	$112,000	$3,900	$11,300
Multidisciplinary	$0	$0	$0	$0	$0	$0
Socioeconomics	$0	$0	$0	$0	$0	$0
Total	$1,177,800	$22,900	$101,000	$1,197,800	$22,900	$102,300

[a] Staff adopted all Iowa Hill development measures and added one measure, so the two alternatives are very similar.

Table 4-10. Summary of annualized costs for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: Staff)

	Proposed Action			**Proposed Action with Staff Modifications**		
Resource Area	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**	**Capital Cost**	**Annualized O&M Cost**	**Total Annualized Cost**
Geology and soils	$1,100	$600	$800	$1,100	$600	$800
Water quantity	$40,000	$30,000	$35,900	$40,000	$30,000	$35,900
Water quality	$5,500	$6,600	$7,600	$5,500	$6,600	$7,600
Aquatic resources	$2,200	$11,500	$11,900	$2,200	$11,500	$11,900

Resource Area	Proposed Action			Proposed Action with Staff Modifications		
	Capital Cost	Annualized O&M Cost	Total Annualized Cost	Capital Cost	Annualized O&M Cost	Total Annualized Cost
Terrestrial resources	$12,200	$22,800	$24,700	$12,200	$22,800	$24,700
Recreation	$71,100	$8,500	$18,900	$71,100	$11,200	$21,600
Land use and aesthetics	$0	$0	$0	$0	$0	$0
Cultural Resources	$10,000	$2,000	$3,500	$10,000	$2,000	$3,500
Multidisciplinary	$25,000	$30,000	$33,600	$25,000	$30,000	$33,600
Total	$167,100	$112,000	$136,900	$167,100	$114,700	$139,600

4.3.2 Effect of Proposed Operations on UARP and Chili Bar Project

Several measures affect energy generation. Estimates were made of the effect of environmental measures and the Iowa Hill development by applying the CHEOPs operations model to optimize and simulate the system. Pulse flows are presented in section 3.3.1, *Geology and Soils*. The minimum instream flows, ramping rates and required reservoir levels are presented in section 3.3.3, *Aquatic Resources*. Recreational flows and levels are presented in section 3.3.6, *Recreational Resources*.

Staff notes that a reduction of 136,000 MWh[43] would result from flows needed for environmental and recreational flow requirements at the UARP as shown in table 4-11 and detailed in appendix C. The Iowa Hill development would add 931,000 MWh of super peak energy and 43,000 MWh of off-peak energy as compared to the UARP-only Alternative. Staff does not recommend measures beyond the Proposed Action that would affect energy generation. SMUD also computed the effect on pump-back energy, resulting in a loss of 1,230,000 MWh of off-peak energy. The development would therefore result in an incremental gross energy decrease of 256,000 MWh when compared to the UARP-only Alternative. This pumped-storage facility would be about 79 percent efficient and its value is in the ability to move blocks of off-peak energy into the on peak period along with other ancillary benefits described in section 4.4.

Under the UARP-only Alternative, PG&E estimates an energy reduction of about 709 MWh that would result from flows needed for environmental and recreational flow requirements at the Chili Bar Project relative to no action, as shown in table 4-12. If SMUD were to build the Iowa Hill development, energy generation would decrease by 1,000 MWh at Chili Bar relative to no action.

[43]SMUD estimated 136,000 MWh, including 70,000 MWh of lost on-peak generation and 66,000 MWh of lost off-peak generation.

Table 4-11. Summary of the energy and capacity effect[a] of environmental and engineering measures on the No-action, UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for SMUD's UARP. (Source: Staff)

UARP Power Benefits Effects	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Change in dependable capacity (MW)	0	0	400	400
Change in super peak gross energy generation (MWh)	0	0	931,000	931,000
Change in on-peak gross energy generation (MWh)	0	–70,000	–70,000	–70,000
Change in off-peak gross energy generation (MWh)	0	–66,000	–23,000[b]	–23,000[b]
Total change in gross energy generation (MWh)	0	–136,000	838,000	838,000
Total change in net energy generation (MWh)[c]	0	–136,000[d]	–392,000	–392,000

[a] Increases are shown as positive and decreases as negative.

[b] Computed as –66,000 MWh in previous column plus 43,000 MWh of new off-peak energy associated with the Iowa Hill development.

[c] Net energy change is computed by subtracting the pumping requirements from gross generation.

[d] SMUD identifies some level of uncertainty associated with the effect of environmental measures. The actual loss of energy generation could range from 127,000 to 136,000 MWh.

Table 4-12. Summary of the effect of environmental measures on energy[a] and capacity for the No-action, UARP-only, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: Staff)

Chili Bar Power Benefits Effects	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Lost dependable capacity (MW)	0	0	0	0
Lost on-peak energy generation (MWh)[a]	0	–666	–28	–28
Lost off peak energy generation (MWh)[a]	0	–43	–972	–972
Total lost energy generation (MWh)	0	–709	–1,000	–1,000

[a] PG&E has not revised its modeling of the energy effects since the draft EIS. These values are staff estimates as detailed in appendix C and are based on presently available information.

4.4 COMPARISON OF ALTERNATIVES

Table 4-13 compares the power value, annual costs, and net benefits of the No-action Alternative, UARP-only Alternative, Proposed Action (with Iowa Hill development), and the Proposed Action with Staff Modifications for the UARP. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the Proposed Action with Staff Modifications, and explain why we conclude the environmental benefits are worth these costs. The decrease in net benefits from $67.14/MWh to $41.45/MWh for the Proposed Action represents a decrease of 38.3 percent relative to the unit cost of the No-action Alternative. The decrease in net benefits from $67.14/MWh to $41.45/MWh for the Proposed Action with Staff Modifications represents a decrease of 38.3 percent relative to the unit cost of the No-action Alternative. There is a small difference in net benefit between the Proposed Action (with Iowa Hill development) and Proposed Action with Staff Modifications.

If we look at the incremental effect of building the Iowa Hill development by subtracting the UARP-only Alternative from the Proposed Action with Staff Modifications, we find that the $123,232,800 power benefits slightly exceed the $120,537,800 cost resulting in a net benefit of $2,695,000. Although the economic benefit of the Iowa Hill development may appear marginal, we agree with SMUD that the operational flexibility of pumped-storage projects provides an advantage compared to other types of generators that compete in the ancillary services market. This flexibility includes the ability for pumped-storage projects to start up quickly, rapidly increase load, switch from pumping to generating, and shape the Project's output to meet load requirements. These benefits take on increased importance given SMUD's role as a control area. Without the 400-MW of capacity from the Iowa Hill development, SMUD would have to meet future peak generation needs with simple cycle peaking plants or than power purchased from the energy market.

Costs associated with unanticipated geotechnical conditions, higher construction costs due to inflation or uncertainties associated with estimated quantities could all affect project economics. Similarly, on the benefits side, it is difficult to forecast energy prices and capacity values in the year 2015; however, our economic analysis is based on current power values. Although our estimate shows that the Iowa Hill development has a small positive net benefit, under the policies set relating to Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the utility takes on any financial risk, and the Commission Staff make no representation as to the Projects' ultimate economic viability.

Table 4-14 compares the power value, annual costs, and net benefits for the Chili Bar Project under of the No-action Alternative, UARP-only Alternative, the Proposed Action (with Iowa Hill development), and the Proposed Action with Staff Modifications. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the Proposed Action, as well as any staff modifications, and explain why we conclude the environmental benefits are worth these costs. The decrease in net benefits from $20.97/MWh to $15.38/MWh for the Proposed Action with Staff Modifications represents a decrease of 26.66 percent relative to the unit cost of the No-action Alternative. However, the Proposed Action with Staff Modifications for the Chili Bar Project has minimal effects (about $0.01/MWh) on net benefits when compared to the Proposed Action because staff modifications result in only a modest increase in Project costs associated with a single new environmental measure. If the Iowa Hill development were not constructed, net benefits for the Chili Bar Project would rise to $15.47/MWh or about $0.08/Mwh more than if it were constructed, excluding the effect of staff modifications.

4.5 OTHER ECONOMIC CONSIDERATIONS

In addition to the cost evaluated in sections 4.2 and 4.3, the applicants would incur costs associated with measures that are not part of a potential Commission license. Costs associated with these measures are external to our developmental analysis.

Table 4-13. Summary of annual net benefits for the No-action, UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications for SMUD's UARP. (Source: Staff)

	No Action	**UARP-only Alternative**	**Proposed Action (with Iowa Hill Development)**	**Proposed Action with Staff Modifications**
Dependable capacity (MW)	400.0	400.0	800.0	800.0
Value of dependable capacity ($)	$38,384,000	$38,384,000	$76,768,000	$76,768,000
Super peak generation (MWh)	0	0	931,000	931,000
On-peak generation (MWh)	1,287,000	1,217,000	1,217,000	1,217,000
Off-peak generation (MWh)	548,000	482,000	525,000	525,000
Generation (MWh)	1,835,000	1,699,000	2,673,000	2,673,000
Value super peak generation ($)	--	--	$82,449,400	$82,449,400
Value on-peak generation ($)	$94,980,600	$89,814,600	$89,814,600	$89,814,600
Value off-peak generation ($)	$30,578,400	$26,895,600	$29,295,000	$29,295,000
Value of generation ($)	$125,559,000	$116,710,200	$201,559,000	$201,559,000
Annual power value ($)	$163,943,000	$155,094,200	$278,327,000	$278,327,000

	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Annual power value ($/MWh)	$89.34	$91.29	$104.13	$104.13
Pump-back energy requirements (MWh)	--	--	1,230,000	1,230,000
Annual cost pump-back energy ($)	$0	$0	$68,634,000	$68,634,000
Annualized cost of plant and current environmental measures	$40,749,000	$40,749,000	$40,749,000	$40,749,000
Annualized cost of new Iowa Hill development ($)[a]	$0	$0	$52,514,800	$52,514,800
Annualized cost of new environmental measures ($)[b]	$0	$6,249,200	$5,624,700	$5,638,200
Annual cost ($)	$40,749,000	$46,998,200	$167,522,500	$167,536,000
Annual cost ($/MWh)	$22.21	$27.66	$62.67	$62.68
Annual net benefit ($)	$123,194,000	$108,096,000	$110,804,500	$110,791,000
Annual net benefit ($/MWh)	$67.14	$63.62	$41.45	$41.45

[a] Excluding environmental measures.

[b] Note that SMUD incorrectly includes the cost of Iowa Hill development environmental measures in table 1 of its April 11, 2007, submittal for the UARP-only Alternative, thus our environmental mitigation costs are lower. Other minor differences are explained in appendix C.

Table 4-14. Summary of annual net benefits for the Chili Bar Project under the No-action, UARP-only Alternative, Proposed Action, and Proposed Action with Staff Modifications. (Source: Staff)

	No Action	UARP-only Alternative	Proposed Action (with Iowa Hill Development)	Proposed Action with Staff Modifications
Dependable capacity (MW)	7.0	7.0	7.0	7.0
Value of dependable capacity ($)	$672,000	$672,000	$672,000	$672,000
Generation				
On-peak generation (MWh)	20,736	20,070	20,708	20,708
Off-peak generation (MWh)	11,555	11,512	10,583	10,583
Generation (MWh)	32,291	31,582	31,291	31,291
Value on-peak generation ($)	1,530,300	1,481,200	1,528,300	1,528,300
Value off-peak generation ($)	644,800	642,400	590,500	590,500
Value of generation ($)	$2,175,100	$2,123,600	$2,118,800	$2,118,800
Annual power value ($)	$2,847,100	$2,795,600	$2,790,800	$2,790,800
Annual power value ($/MWh)	$88.17	$88.52	$89.19	$89.19
Annualized cost of plant and current environmental measures	$2,170,000	$2,170,000	$2,170,000	$2,170,000
Annualized cost of new environmental measures ($)	$0	$136,900	$136,900	$139,600
Annual cost ($)	$2,170,000	$2,306,900	$2,306,900	$2,309,600
Annual cost ($/MWh)	$67.20	$73.04	$73.72	$73.81
Annual net benefit ($)	$677,100	$488,700	$483,900	$481,200
Annual net benefit ($/MWh)	$20.97	$15.47	$15.46	$15.38

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 5
Staff's Conclusions
Pages 5-1 through 5-50

FEIS

5.0 STAFF'S CONCLUSIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE[44]

Sections 4(e) and 10(a) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, we consider the water quality, fish and wildlife, recreational, and other non-developmental values of the involved waterway equally with its electric energy and other developmental values. Accordingly, any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses.

This section contains the basis for and a summary of our recommendations to the Commission for relicensing the UARP and Chili Bar Project. To decide which alternative to recommend, we compare the costs and environmental benefits of the alternatives.

Based on our independent review and evaluation of the proposed Projects and the No-action Alternative, we select the Proposed Action (including most of the terms of the Settlement Agreement that are within the Commission's ability to enforce), with some modifications by staff, as the preferred alternative.

We recommend this alternative because (1) issuance of new licenses would allow SMUD and PG&E to continue to operate the Projects as a dependable source of electric energy for their customers; (2) the electricity generated by the UARP and Chili Bar Project (total installed capacity of 1,088 MW and 7 MW, respectively) would avoid the need for an equivalent amount of fossil-fuel fired electric generation and capacity, continuing to help conserve these nonrenewable energy resources while reducing atmospheric pollution; and (3) the recommended environmental measures would protect and enhance aquatic and terrestrial resources, improve public use of recreational facilities and resources, and maintain and protect historic and archaeological resources within the area affected by Project operations.

The Proposed Action includes the construction and operation of the Iowa Hill development. Construction of the Iowa Hill development would disturb the majority of the 283-acre parcel, including 185 acres of lands in the Eldorado National Forest, and introduce new visual elements to the landscape. SMUD proposes in-kind replacement of habitat and construction of an underground powerhouse to minimize the effects on wildlife and neighboring land owners. Though pumped-storage projects use more

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[44] In this section "we" means the Commission staff. This is a standard section for the Commission's NEPA documents that presents the Commission staff's preferred alternative and rationale in support of the preferred alternative; it does not necessarily reflect the Forest Service's conclusions.

energy than they generate, we recommend inclusion of the Iowa Hill development in the preferred alternative because the pumped-storage operations would provide flexibility within SMUD's generating system by using off-peak energy to help meet on-peak energy needs,

We recommend approving most of the Settlement Agreement terms with some minor modifications and making these terms conditions of the licenses to be issued for the UARP and Chili Bar Project.[45] However, we recommend that many of the plans and specific measures for implementation as proposed in the Settlement Agreement be filed with the Commission for approval. This would allow Commission staff to monitor compliance with the conditions of the licenses and review the results of many of the proposed studies and measures.

By letters dated January 30, 2007, and January 31, 2007, respectively, the Forest Service and Interior filed revised preliminary terms and conditions, under section 4(e) of the FPA. The revised preliminary terms and conditions are consistent with the provisions of the Settlement Agreement, and we discuss them in the context of our discussions of the Settlement Agreement measures throughout this final EIS. However, some of the revised preliminary section 4(e) conditions that have been included in the Settlement Agreement are inconsistent with the Commission's policies.

The Forest Service specifies in revised preliminary condition no. 47 that SMUD provide $1,000,000 annually to the Forest Service for the operation, maintenance, and administration of the developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of the Project reservoirs and facilities listed in preliminary condition nos. 44 and 45 consistent with Proposed Articles 18 and 19 in the Settlement Agreement. Although we agree that the developed recreational sites and facilities listed in preliminary condition nos. 44 and 45 are needed Project recreational facilities, the $1,000,000 limit is contrary to the Commission's policy on the imposition of funds and cost caps. SMUD would be responsible under any license issued for ensuring the safe and useful condition of Project recreational sites regardless of the cost. Therefore, we include a measure for SMUD to implement the proposed maintenance activities in our recommended alternative, noting that the collection agreement between SMUD and the Forest Service would serve to define the O&M activities related to Project recreational facilities. We recognize some of the recreation occurs at undeveloped sites surrounding the reservoirs and that the Settlement Agreement includes SMUD's share of the Forest Service's cost of servicing these areas. However, because these costs are incurred for

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[45]The precise wording of these staff recommendations may differ from similar recommendations made by SMUD and PG&E, or as presented in the Settlement Agreement. These wording changes are primarily the result of summarization and are not intended to change any of the Settlement Agreement terms that we recommend.

tasks done outside the project's boundary, we would not recommend the Commission require SMUD to reimburse the Forest Service for these costs

Forest Service specifies in revised preliminary condition no. 56 that SMUD develop and implement a transportation system management plan for roads on or affecting National Forest System lands addressing SMUD's primary responsibility for non-system roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads consistent with Proposed Article 1-30 in the Settlement Agreement. We understand that the Forest Service seeks to ensure that the roads accessing Project recreational facilities are maintained. However, as written, the measure could involve roads not directly related to Project operations or facilities. We modified this measure by clarifying that the transportation system management plan focus on Project access roads that are primarily used for Project purposes within the UARP boundary and would be included in the Project boundary.

BLM specifies in revised preliminary condition Article 2-14 that PG&E pay BLM $15,000 annually to provide a Project recreation brochure/map and an interpretive, education, and public information plan. We conclude that PG&E should identify the available whitewater recreational facilities and make the public aware of when and how they can access these facilities; however PG&E can choose to have BLM prepare and distribute the brochure and associated public information. We do not recommend adopting a cost limit. Such cost caps, as noted above, are contrary to Commission policy.

The following discussion summarizes our recommendations and some of our rationale for these recommendations. We first list the recommended measures by Project, and then we discuss our rationale.

5.1.1 Upper American River Project

We evaluate numerous recommendations in the resource sections of this final EIS and, given the environmental benefits, we recommend including the following measures that SMUD proposes in any license issued by the Commission for the UARP. Our recommended modifications to SMUD's proposed measures are *italicized.*

1. Maintain minimum streamflows in Rubicon River below Rubicon dam, Little Rubicon River below the Buck Island dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, Brush Creek below Brush Creek dam, SFAR below Slab Creek dam, SFAR (as shown in tables 3-4 through 3-10) within 3 days of determining base water year types and operations consistent with DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. (Proposed Article 1-1)
2. Release an additional block of water into Silver Creek below Junction dam and below Camino dam annually in the months of July, August, and

September in Wet water years and not to exceed 1,044 acre-feet in July, 491 acre-feet in August, and 475 acre-feet in September as directed by the Agencies. (Proposed Article 1-1)

3. Provide annual pulse flow events within 3 months after license issuance but not before implementation of the proposed minimum flows in the Rubicon river below the Rubicon dam during BN, AN, and Wet water years, using the existing flashboards at the Rubicon tunnel headworks. The goal is to provide 600 cfs for 3 days that coincides with winter storm events or spring snowmelt runoff in the Rubicon River Watershed if a natural spill of 3,600 acre-feet or more within 3 consecutive days does not occur. Parties will meet annually to coordinate tunnel gate operation, and may develop a tunnel gate operation plan for future pulse flows. *File a report with the Commission by July 31 of each year stating the dates when the pulse flows were provided or an explanation of why they were not provided that year.* (Proposed Article 1-2)

4. Provide annual pulse flow events (as shown below) in Gerle Creek below Loon Lake dam. Schedule pulse flows to coincide with spring snowmelt runoff as specified based on month and water year type, below. *File a report with the Commission by July 31of each year, stating the dates when the pulse flows were provided or an explanation of why they were not provided that year* (Proposed Article 1-2)

Day	**BN**	**AN**	**Wet**
Day 1	125	200	600
Day 2	125	200	600
Day 3	180	250	740*
Day 4	125	200	600
Day 5	125	200	600

* or maximum capacity of outlet works, whichever is less.

5. Prior to implementing pulse flows in Gerle Creek below the Loon Lake reservoir dam, complete a sensitive site investigation that includes additional permanent cross-sections that characterize the upper and middle Rosgen Level 3 analysis reaches, and mapping unstable banks and downed logs that are obstructing streamflow and test pulse flows at levels up to 740 cfs, or the maximum capacity of the outlet works, to determine the appropriate pulse flows to meet desired channel conditions. (Proposed Article 1-2)

6. Provide annual pulse flow events within 3 months after license issuance, but not prior to the implementation of the new minimum streamflows, as shown below in SFSC below Ice House dam. *File a report with the Commission by July 31 of each year, stating the dates when the pulse flows were provided or an explanation of why they were not provided that year.* (Proposed Article 1-2)

Day	BN	AN	Wet
Day 1	450	550	600
Day 2	450	550	600
Day 3	550	650	780*
Day 4	450	550	600
Day 5	450	550	600

* or maximum capacity of outlet works, whichever is less.

7. Implement a ramping rate of 1 foot per hour for pulse flow releases in Gerle Creek below Loon Lake dam and SFSC below Ice House reservoir dam; minimum streamflow releases in Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam; and recreational streamflow releases in SFSC below Ice House dam and SFAR below Slab Creek dam. (Proposed Article 1-3)

8. Develop and file a plan to coordinate operations with the licensee of the Chili Bar Project to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects. Consult and coordinate with the licensee of the Chili Bar Project in the implementation of Proposed Articles 2-1 (minimum streamflows), 2-2 (ramping rates), 2-4 (monitoring program), 2-5 (adaptive management program), 2-6 (sediment management plan), 2-14 (public information services), and 2-15 (recreational streamflows). (Proposed Article 1-4)

9. Implement a monitoring program including filing a final monitoring plan for each element listed in items 10 through 22 below and filing an annual report describing the monitoring efforts by June 30 of each year. (Proposed Article 1-5)

10. Develop a plan to (a) monitor rainbow trout fish populations by electrofishing and/or snorkeling during late summer/fall in 10 river reaches; (b) monitor hardhead by snorkel surveys in SFAR below Slab Creek reservoir dam, only, from immediately downstream of Mosquito Road Bridge to, and including site SCD-F2; and (c) monitor brown trout in the Gerle Creek below Loon Lake reservoir dam. (Proposed Article 1-5)

11. Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at: Rubicon river below Rubicon dam, Gerle Creek below Loon Lake dam, Gerle Creek below Gerle dam, SFFR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Junction dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam. (Proposed Article 1-5)

12. Develop a plan to (a) monitor foothill yellow-legged frogs in Silver Creek below Junction dam, Silver Creek below Camino dam, SFAR below Slab Creek dam, and Rock Creek (tributary upstream of White Rock powerhouse) and (b) monitor mountain yellow-legged frogs in Rubicon reservoir, Rockland lake, and Buck Island reservoir. (Proposed Article 1-5)

13. Develop a plan to visually monitor for foothill yellow-legged frogs in Silver Creek below Camino dam in June through September when streamflows are 100 cfs or less and flows fluctuate more than 40 cfs or more over 1 week's time. (Proposed Article 1-5)

14. Develop a plan to conduct aerial photo flights and Greenline method at the 15 intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community. (Proposed Article 1-5)

15. Develop a plan to collect, identify, and archive samples of the species of algae in Silver Creek below Junction reservoir dam and additional baseline samples in SFRR below Robbs Peak dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam and add additional sites or reaches if it is determined that the algal species have negative effects on the aquatic ecosystem. (Proposed Article 1-5)

16. Monitor Gerle Creek fluvial, geomorphic properties below Loon Lake dam at LL-DG1 and LL-G2 in years 1 and 2 and develop a Gerle Creek geomorphology mitigation plan that includes channel stabilization recommendations. (Proposed Article 1-5)

17. Develop a geomorphology monitoring plan providing for establishing permanent transects and monitoring channel cross-sections, longitudinal profiles, substrate composition, and other geomorphic properties (Rosgen Level 3) in representative areas, including the in Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, SFRR below Robbs Peak dam, SFSC below Ice House dam, Silver Creek below Camino dam, and SFAR below Slab Creek dam. (Proposed Article 1-5)

18. Develop a water temperature monitoring plan to install and maintain continuous recording devices as soon as weather and flow conditions allow at 17 locations immediately above and below Project dams and at the confluence with tributaries and monitor stream temperatures from March 15 to September 30 in all years or until it can demonstrated that operation of

the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies. (Proposed Article 1-5)

19. Develop a water quality monitoring plan addressing water chemistry, bacterial content, and metal bioaccumulation, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. (Proposed Article 1-5)

20. Develop a Robbs Peak powerhouse entrainment monitoring plan to determine when and at what flows flow migration is occurring. (Proposed Article 1-5)

21. Develop a bear management plan. (Proposed Article 1-5)

22. Develop a bald eagle monitoring plan. (Proposed Article 1-5)

23. Implement an Ecological Resources Adaptive Management Program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Proposed Article 1-5, above) and specific adaptive management measures. (Proposed Article 1-6)

24. Develop and implement a stabilization plan for the Gerle Creek channel below Loon Lake dam. (Proposed Article 1-7)

25. *Develop and implement a Gerle Creek fish passage plan with measures to* maintain the reservoir level at Gerle Creek at an elevation sufficient to provide fish passage into Gerle Creek from August through October 31, *and implement channel modifications within the delta, if needed, to maintain passage for brown trout.* (Proposed Article 1-8)

26. Continue to move mobile, instream large woody debris greater than both 20 centimeters wide and 12 meters in length downstream beyond Robbs, Junction, Camino, and Slab Creek reservoir dams. (Proposed Article 1-9)

27. Develop and file a Streamflow and Reservoir Elevation Gaging Plan that meets USGS standards and includes include a minimum of 10 streamflow gage locations, 9 reservoir elevation compliance gaging locations, and provides for simple staff gages at the Slab Creek and Ice House recreational boating put-ins and the installation of telemetry equipment if such equipment is economically and technologically feasible, and can be installed in a manner consistent with the laws, regulations, and policies applicable to the congressionally-designated Desolation Wilderness. (Proposed Article 1-10)

28. Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points to determine if improvements can be made

to minimize potential adverse water quality impacts when the release points are used. (Proposed Article 1-11)

29. Maintain and operate in working condition all devices and measures for wildlife protection along Project canals, provide an annual report of deer or other wildlife found in Project canals, and, should wildlife mortality exceed 3 individuals, develop and implement a wildlife exclusion plan. (Proposed Article 1-12)

30. Before commencing any new construction or maintenance (including but not limited to proposed recreational developments), ensure that a *draft* biological assessment is prepared for the relevant federal agency (FWS or NMFS) *and filed with the Commission*. (Proposed Article 1-12)

31. Immediately notify agencies if occurrences of sensitive plants or wildlife species are detected prior to or during ongoing construction, operation, or maintenance of the Project and develop and implement appropriate protection measures if directed by the responsible agencies. (Proposed Article 1-12)

32. Annually review the current list of special status plant and wildlife species (federal ESA or Eldorado National Forest Watch List) and develop and implement a study plan to assess the effects of the Project on the species as necessary. (Proposed Article 1-12)

33. Consult with BLM, FWS, and CDFG prior to undertaking maintenance under transmission lines within the Pine Hill Rare Plant Preserve. (Proposed Article 1-12)

34. Develop and implement an avian protection plan that addresses retrofitting transmission lines as described in the Bird-Powerline Associations Technical Report to meet APLIC design and siting standards. (Proposed Article 1-12)

35. Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations *for all land within the Project boundary affected by Project activities.* (Proposed Article 1-13)

36. Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed *for all land within the Project boundary affected by Project activities.* (Proposed Article 1-13)

37. Annually schedule and facilitate a meeting with the Agencies to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year. (Proposed Article 1-14)

38. Develop and implement a recreation implementation plan including a construction schedule for the recreational facilities specified in Proposed Article 1-19, and other issues including but not limited to signing and sign placement, dissemination of public information, and a schedule for the design of facilities to be reconstructed. (Proposed Article 1-15)

39. Conduct a recreational survey and prepare a report on recreational resources every 6 years from the date of license issuance, including, but not limited to, changes in use and use patterns, levels of use, user preferences, kinds and sizes of recreational vehicles, carrying capacity information sufficient to indicate change in capacity and recreational user trends in the Project area. (Proposed Article 1-16)

40. *Identify* an individual for liaison with the Forest Service whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place with the National Forest. (Proposed Article 1-17)

41. Schedule a meeting with the Forest Service every 6 years to review all Project recreational facilities described in Proposed Articles 1-18 and 1-19 and to agree upon the need and timing for maintenance, rehabilitation, construction, and reconstruction work. (Proposed Article 1-18)

42. Keep or include Project recreational facilities within the Project boundary as shown in Attachment 1 and include the listed 34 recreational facilities constructed or reconstructed by SMUD in the future within the Project boundary. (Proposed Article 1-18)

43. Complete the construction, reconstruction, and restoration to meet current Forest Service design standards and the requirements of the ADA including all the pre-construction survey, design, permitting, analysis, and specifications for the initial recreational Projects identified at the time of license issuance, including Buck Island development; High Country area trails; formal recreational facilities in Crystal Basin at Loon Lake, Gerle Creek, Union Valley, and Ice House reservoirs; recreational facilities in the Canyonlands at Junction, Brush Creek and Slab Creek reservoirs (as shown in table 3-65, in section 3.3.6.2, *Recreational Resources*). (Proposed Article 1-19).

44. Develop and implement a plan to install bear-proof food storage lockers and bear-proof trash receptacles at all recreational facilities identified as lacking such facilities. (Proposed Article 1-19)

45. Maintain, rehabilitate, and reconstruct, including the costs of design and administration, and otherwise provide the heavy maintenance necessary to keep existing Project recreational facilities in serviceable condition as determined through the Review of Recreation Developments. (Project Article 20)

46. Provide for the operation, maintenance, and administration of those developed recreational sites, facilities, or uses that are adjacent to or in the vicinity of the Project reservoirs and facilities listed in Proposed Articles 1-18 and 1-19. (Proposed Article 1-21)

47. Provide *recreation use* data *on* carrying capacity on lands affected by the Project, including, but not limited to: visitor perceptions of crowding, user perceptions of "desired conditions," user preferences for amenities, capacity conditions at developed facilities within or affected by the Project, and resource impacts and social experience. (Proposed Article 1-22)

48. Meet or exceed the end-of-month reservoir elevations for Loon Lake, Union Valley, and Ice House reservoirs (as shown in table 3-25, section 3.3.2.1. *Water Resources*, *Reservoir Levels*). (Proposed Article 1-23) and follow procedures and protocols for super dry water years, interim modification, conferences on abnormal water years, and reservoir level monitoring and adjustments. (Proposed Article 1-23)

49. Based on the determination of water year type, provide recreational streamflows in the SFAR below Slab Creek in BN, AN, and wet water years and in Silver Creek below Ice House dam (as shown in table 3-65 in section 3.3.6.2, *Recreational Resources, Whitewater Boating*) and in Slab Creek below Slab Creek reservoir dam, and if construction of Iowa Hill development has not commenced within 5 years of license issuance, prepare and implement a whitewater boating recreation management plan to address the whitewater recreation needs in reach from the Slab Creek dam to White Rock powerhouse. Provide enhanced recreation boating flows downstream of Slab Creek dam after year 15 *with or without the construction of the Iowa Hill development only* if environmental and use triggers are met. (Proposed Article 1-24)

50. Provide real-time streamflow information for 10 reaches via a toll-free telephone number and web site and real-time reservoir level information 10 reservoirs including two simple staff gages for use by the public at each reservoir. (Proposed Article 1-25)

51. Provide a Project recreation brochure/map that describes the recreational opportunities, facilities, rule, and responsibilities for the Project area. (Proposed Article 1-25)

52. Develop and implement an interpretive, education, and public information plan. (Proposed Article 1-25)

53. Provide up to a total of 50,000 pounds of fish per year but not less than 25,000 pound of fish per year to be distributed among Loon Lake, Union Valley, and Ice House reservoirs as determined by CDFG. (Proposed Article 1-26)

54. Meet every 5 years with the Forest Service to review opportunities to improve how well Project facilities blend in with the surrounding landscape and prior to any new construction or maintenance of facilities, prepare and implement a plan for the protection and rehabilitation of National Forest System visual resources affected by the Project as directed by the Forest Service. (Proposed Article 1- 27)

55. Implement 10 specific enhancement measures (e.g., painting) to existing facilities to improve visual quality. (Proposed Article 1-27)

56. Implement the final HPMP including unanticipated discovery protocols. (Proposed Articles 1-28 and 1-29)

57. Develop and implement a transportation system management plan for *Project* roads *used primarily for Project purposes* on or affecting National Forest System lands addressing SMUD's primary responsibility for non-*National Forest S*ystem roads and for maintenance level 1 and 2 roads and the shared levels of responsibility for maintenance level 3, 4, and 5 roads. (Proposed Article 1-30)

58. Develop and implement a trails system management plan for trails that are needed for Project *purposes* and are located on or affect National Forest System lands, including a map; the seasons and amount of SMUD's use of the trails, trail conditions of the trails, and a provision for identifying maintenance and reconstruction needs for trails required for Project operations every 5 years. (Proposed Article 1-31)

59. Develop and implement a facility management plan including a map showing all Project facilities, the type and season of use of each structure; the condition of each structure, and (4) provision for a plan every 5 years identifying the maintenance, reconstruction, and removal needs of Project facilities. (Proposed Article 1- 32)

60. Prepare vegetative management plan prior to any ground disturbing activities. (Proposed Article 1-33)

61. Develop and implement a fire prevention and response plan developed in consultation with appropriate state and local fire agencies that sets forth SMUD's responsibility for the preventing, reporting, control, and extinguishing of fires in the vicinity of the Project resulting from Project operations. (Proposed Article 1-34)

62. Reserve the Commission's authority to require fishways as may be prescribed by NMFS and FWS under Section 18 for the construction, operation, and maintenance of fishways including measures to determine, ensure, or improve the effectiveness of the fishways. (Proposed Article 1-35)

63. Develop a schedule for implementing the articles included in any license issued for the Project. (Proposed Article 1-37)

64. Protect hardhead in the Slab Creek reservoir from the Iowa Hill development operations by monitoring populations and entrainment, monitoring edgewater temperatures between May and September, maintaining a temperature of at least 12°C during the months of June and August in the SFAR Slab Creek dam reach below Mosquito Bridge, preventing pumped storage related flow fluctuations in the SFAR below Slab Creek. (Proposed Article 1-40)

65. Prior to initiating construction of the Iowa Hill development, purchase an equivalent acreage of land (or a conservation easement for an equivalent acreage of land) to be managed as wildlife habitat over the term of the license (Proposed Article 1-41)

66. File a storm water pollution prevention plan at least 90 days prior to ground-disturbing activities for construction of the Iowa Hill development. (Proposed Article 1-42)

67. Develop and implement a plan for managing groundwater inflows during construction and for groundwater monitoring and management once construction is completed. (Proposed Article 1-43)

68. Develop a design for the Iowa Hill development that meets the VQOs or the Eldorado National Forest Land and Resource Management Plan. (Proposed Article 1-44)

69. Develop and implement a plan to address construction noise to vehicle idling and advance notification of any material transport and construction activities within 0.5 mile of the parcels, including a noise hot line telephone system for reporting construction noise disturbances and monitoring compliance with the provision of the plan. (Proposed Article 1-48)

70. Develop and implement a plan for recreational access to the Slab Creek reservoir during the construction of Iowa Hill reservoir and the tunnel

connecting to Slab Creek reservoir and when Iowa Hill is operational. (Proposed Article 1-49)

71. Development and implement a final transportation management plan for the Iowa Hill development *in consultation with the Advisory Committee that identifies preferred access routes for construction traffic and heavy equipment to access the upper and lower reservoir construction sites using the criteria or similar criteria employed in the Transportation Route Technical Report.* (Proposed measure not included in the Settlement Agreement)

In addition to the applicant-proposed Project-related environmental measures listed above, we recommend including the following staff-recommended environmental measures in any license issued for the UARP.

- Provide an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats in the vegetation management plan.
- Develop and implement a wildlife lands mitigation plan for the construction of the Iowa Hill development that identifies the locations of wildlife mitigation lands, management goals and objectives, management activities that would be implemented and measures to ensure that the management goals would be met and include these lands in the Project boundary.

5.1.2 Chili Bar

We evaluate numerous recommendations in the resource sections of this final EIS and, given the environmental benefits, we recommend including the following measures that PG&E proposes in any license issued by the Commission for the Chili Bar Project. Our recommended modifications to PG&E's proposed measures are *italicized.*

1. Maintain minimum streamflows in the SFAR below Chili Bar dam provided that of inflow to the Chili Bar Project reservoir and the Chili Bar reservoir elevations are sufficient, within 3 days of determining base water year types and operations consistent with DWR Bulletin 120 forecast each February through May until 2 days after issuance of a subsequent monthly forecast. The minimum streamflow schedule, the specific factors to be applied, and the compliance point for measuring minimum streamflows are provided in section 3.3.3.2, *Aquatic Resources*. (Proposed Article 2-1)

2. When the inflow to the Chili Bar Project and the Chili Bar reservoir elevations are sufficient, implement up ramping rates for licensee-controlled streamflow releases of 500 cfs per hour for flows between 150 cfs and 1,000 cfs and 1 foot per hour for flows between 1,000 cfs and 1,950 cfs and

down ramping rates of 1 foot per hour for flows between 1,950 and 1,000 cfs, 500 cfs per hour for flows between 1,000 cfs and 600 cfs and 250 cfs for flows between 600 cfs and 150 cfs. (Proposed Article 2-2)

3. Develop and file a plan to coordinate operations with the licensee of the UARP to enable PG&E to comply with the minimum streamflows, pulse flows, ramping rates, and recreational streamflows for both Projects. (Proposed Article 2-3)

4. Implement a monitoring program including a final monitoring plan for each element as described in items 5 through 10 below and file annual report describing the monitoring efforts by June 30 of each year. (Proposed Article 2-4)

5. Develop a plan to (a) monitor rainbow and brown trout populations by electrofishing and/or snorkeling at SFAR below Chili Bar dam and note any hardhead detected. (Proposed Article 2-4)

6. Develop a plan to conduct aquatic benthic macroinvertebrate monitoring at SFAR below Chili Bar dam. (Proposed Article 2-4)

7. Develop a plan to monitor foothill yellow-legged frogs, western pond turtles, and California red-legged frogs in the SFAR below Chili Bar dam (entire reach from CB-AI5 to Ponderosa Campground on right and left banks). (Proposed Article 2-4)

8. Develop a plan to conduct aerial photo flights and Greenline method at the five intensive field study sites and collect data to document species composition, percent cover, and length and width of riparian community. (Proposed Article 2-4)

9. Develop a water temperature monitoring plan to install and maintain continuous recording devices at four locations in the SFAR immediately below Chili Bar dam, upstream of Dutch Creek confluence, upstream of Camp Lotus, and upstream of Greenwood Creek and monitor stream temperatures from March 15 to October 15 in all years or until it can demonstrated that operation of the Project reasonably protects the "cold freshwater" beneficial use as determined by the Agencies. (Proposed Article 2-4)

10. Develop a water quality monitoring plan addressing water chemistry, bacterial content, metal bioaccumulation and algae, field sampling locations, sampling frequency, handling methods, quality assurance/quality control methods, and define the laboratory analyses and associated method detection limits for all constituents and parameters to be monitored in the monitoring program. (Proposed Article 2-4)

11. Implement in coordination with SMUD an adaptive management program as early as reasonably practicable within 3 months after license issuance generally consisting of implementation of a monitoring program (Article 2-4, above) and specific Commission-approved adaptive management measures. (Proposed Article 2-5)
12. Develop a geomorphology monitoring plan in coordination with SMUD including profile measurements at three cross-sectional transects, longitudinal profiles, substrate composition, and other geomorphic properties three sampling sites (CB-G1, CB-G2, and CB-G3) to be performed every 5 years. (Proposed Article 2-6)
13. Ensure that mobile instream large woody debris in Chili Bar reservoir of sizes greater than both 20 centimeters wide and 12 meters in length continues downstream beyond Chili Bar dam using reasonable means that include short-term spill flows at the dam (Proposed Article 2-7)
14. Develop and implement a streamflow and reservoir elevation gaging plan that meets USGS standards and approved by the Water Board at a minimum addressing compliance gaging at SFAR below Chili Bar dam (existing USGS gage no. 11444500 or its successor) and in the Chili Bar reservoir. (Proposed Article 2-8)
15. Annually review the current list of special status plant and wildlife species (federal ESA or BLM sensitive) and develop and implement a study plan to assess the effects of the Project on the species as necessary. (Proposed Article 2-9)
16. Develop and file an invasive weed management plan that provides for inventory and mapping of new populations and actions and/or strategies to prevent and control known populations or introductions of new populations *for all land within the Project boundary affected by Project activities.* (Proposed Article 2-10)
17. Develop and implement a vegetation management plan that addresses hazard tree removal and trimming, transmission line clearing, habitat improvement, revegetation of disturbed sites, soil protection and erosion control, revegetation with culturally important plant populations, and use of clean, weed free, and preferably locally collected seed *on all land within the Project boundary affected by Project activities.* (Proposed Article 2-10)
18. Annually schedule and facilitate a meeting with the Agencies and BLM to review and discuss the results of implementing license conditions and other issues related to preserving and protecting the ecological values affected by the Project and provide, 2 weeks prior to the meeting, an operations and maintenance plan for the year. (Proposed Article 2-11)

19. *Identify* an individual for liaison with the BLM whenever planning or construction of recreational facilities or other Project improvements and maintenance activities are taking place on BLM lands with the Chili Bar Project boundary. (Proposed Article 2-12)

20. Construct or install *and maintain* (1) a gravel parking area for three to four vehicles off Rock Creek Road, (2) a 36-inch-wide trail that meets a grade of 5 percent or less from the parking area to Chili Bar reservoir, (3) a kiosk sign along the trail near the beginning, explaining the rules of the area, and (4) one picnic table of coated wire mesh material in a level upland area that is outside of the floodplain. (Proposed Article 2-13)

21. In conjunction with SMUD, provide real-time lake stage height and storage information for Chili Bar reservoir, install up to two simple staff gages for use by public, real-time streamflow and reservoir level information via a toll-free telephone number and web site, and collect streamflow information consistent with the standard USGS gaging practices for the existing stream gage facilities downstream of Chili Bar reservoir dam. (Proposed Article 2-14)

22. Provide a Project recreation brochure/map and an interpretive, education, and public information plan. (Proposed Article 2-14)

23. Based on the determination of water year type, provide recreational streamflows in the SFAR below Chili Bar dam (as shown in table 3-67 in section 3.3.6.2, *Recreational Resources, Whitewater Boating*), provided that inflows to the Project are sufficient. (Proposed Article 2-15)

24. Meet every 5 years with BLM to review opportunities to improve how well Project facilities blend in with the surrounding landscape and prior to any new construction or maintenance of facilities, prepare and implement a plan for the protection and rehabilitation of BLM visual resources affected by the Project as directed by BLM. (Proposed Article 2-16)

25. *Finalize* and implement a HPMP including unanticipated discovery protocols *within1 year of license issuance*. (Proposed Articles 2-17 and 2-18)

26. Reserve the Commission's authority to require fishways as may be prescribed by NMFS and FWS under section 18 for the construction, operation, and maintenance of fishways, including measures to determine, ensure, or improve the effectiveness of the fishways. (Proposed Article 2-19)

27. Develop a schedule for implementing the articles in any license issued for the Project. (Proposed Article 2-21)

In addition to the applicant-proposed Project-related environmental measures listed above, we recommend including the following staff-recommended environmental measures in any license issued for the Chili Bar Project.

- Provide an annual employee environmental awareness program to educate employees and key personnel about the known locations of special status species and habitats in the vegetation management plan.
- Develop and implement a recreation plan.

5.1.3 Rationale for Staff Recommendations

This section describes the rationale for some of our recommendations on measures that we conclude should be included as conditions of any licenses issued, as well as any measures that we do not recommend as license conditions. This section is arranged by major resource topic, and within each topic we discuss each of the Projects or provide our rationale for recommending or not recommending specific measures.

Aquatic Resources

Project operations could affect aquatic habitats and sediment transport in the stream reaches. The Settlement Agreement includes a set of measures (Proposed Articles 1-1 through 1-6 for the UARP and 2-1 through 2-5 for the Chili Bar Project) focused on the ecological health and suitability of reaches downstream of the Project dams to support native fish, amphibian, and reptile populations. A major goal of the proposed streamflows and pulse flows is to simulate the natural hydrograph as much as possible during important times of the years to benefit species that are cued to spring/early summer snowmelt runoff patterns, lower base flows in the late summer/early fall, and winter flows that would provide habitat in most years.

Minimum Flows

The minimum streamflow schedules in Proposed Articles 1-1 for UARP and 2-1 for the Chili Bar Project are major parts of the Settlement Agreement and would enhance native fisheries in the stream reaches. In most reaches where accretion flows are low and spawning gravels are present, the proposed increase in minimum stream flows and associated reduction in water temperature (mean temperatures below 20°C in the summer months) are expected to benefit the native fish populations by creating either more available spawning habitat or juvenile habitat during critical life stages in the spring or fall. Increasing flows and lowering temperatures during these seasons should also result in habitat conditions that are less favorable for California roach and speckled dace consistent with Agency objectives.

The most significant increases in WUA for various life stages of rainbow and brown trout would occur in the five reaches already having plentiful or modest amounts of spawning gravels. The proposed minimum flows in the Rubicon River downstream of Rubicon dam, where spawning gravels are plentiful, would result in 84 percent of available WUA for rainbow trout spawning in BN water years and 48 percent in CD water year. The slightly reduced temperature in May and June would benefit the preferred trout species while creating less favorable habitat for California roach and speckled dace, consistent with resource agency objectives. In the Gerle Creek reaches downstream of Loon Lake dam and Robbs Peak dam, where the trout fishery is robust, the proposed minimum flows would increase the WUA for all life stages, with the greatest increase in spawning habitat for trout. In the SFSC downstream of Ice House dam, the increased minimum flows would increase WUA for trout adult and spawning life stages and the cooler temperatures would benefit rainbow trout population in this reach. Finally, in Brush Creek downstream of Brush Creek dam, the proposed minimum flows will increase the WUA for all life stages of rainbow and brown trout.

The Settlement Parties indicate that the proposed minimum streamflows would benefit a variety of amphibians, including the foothill yellow-legged frog. However, we question some of these potential benefits. In the upper reaches, including Rubicon, Gerle Creek, and Robbs Peak, the cooler temperatures that would result from the increased streamflow would increase potential habitat for mountain yellow-legged frog populations. The proposed minimum streamflows may also provide potential habitat for foothill yellow-legged frogs in the lower end of these reaches. However, these reaches are not within the optimal elevation ranges for these species (too low for mountain yellow-legged frogs and too high for foothill yellow-legged frogs) and the proposed minimum flows would also provide more habitat for predatory trout.

Further, the colder temperatures that would result from increased minimum streamflows in the lower elevation reaches, including Camino, Slab Creek, and Chili Bar, may not be beneficial to foothill yellow-legged frog tadpole development and would also provide more habitat for predatory trout. However, the increased minimum streamflows in the spring could benefit foothill yellow-legged frogs and western pond turtles by dislodging second-year bullfrog tadpoles from pools. Bullfrogs are natural predators of foothill yellow-legged frogs and young western pond turtles. Therefore, if higher spring flows reduce the survival of over-wintering bullfrog tadpoles, foothill yellow-legged frog and western pond turtle habitat conditions would improve.

Increased minimum streamflows during the spring months would also result in inundation of stream margin habitats and primary floodplain terraces that would occur under an unimpaired flow regime. These variations in streamflows and inundation would improve the health of riparian vegetation and increase the functioning of the riparian ecosystem by promoting stream bank stability and improved water quality, reducing the potential for erosion, increasing storage of nutrients and water, and providing forage and habitat for wildlife.

Reserving a block of water, monitoring water temperatures at the lower end of the Junction dam reach and Camino dam reach, and developing a plan for notification protocols and ecological monitoring needs associated with the block of water would facilitate informed decision-making of how best to manage the block of water to provide the most cost-effective improvement of ecological resources, if necessary.

Pulse Flows and Ramping Rates

Based on geomorphology studies, SMUD and the Agencies identified reaches that would benefit from periodic pulse flows (Proposed Article 1-2) to mobilize and flush sediments downstream. Coordinating the provision of pulse flows with natural high flow events is reasonable. Our analysis shows that in the reaches where pulse flows are proposed (the Rubicon River below Rubicon dam, Gerle Creek below Loon Lake dam, and SFSC below Ice House dam) naturally occurring spring storm events would be mimicked, scouring floodplain soils, redistributing sediment, and reducing encroachment. We conclude that implementation of the pulse flows would help improve instream habitat for fish and facilitate increased production toward the desired biomass goals.

Effects associated with ramping are variable, depending on species, life-stage, and, in some case, time of day of the ramping event. The proposed minimum flows, in conjunction with the controlled up- and down-ramping rates, would attempt to provide stable flow regimes in the Chili Bar dam reach to protect foothill yellow-legged frogs during the reproductive season. Stable flows during the breeding season are optimal to avoid egg mass desiccation from decreasing flows, egg mass scouring from increasing flows, and tadpole stranding from flows receding and draining from isolated pools. When controlled ramping rates are successfully implemented, they would minimize the potential for foothill yellow-legged frog egg mass scouring and tadpole and juvenile stranding and displacement. Implementation of the proposed ramping rates in Proposed Articles 1-3 for the UARP and 2-2 for the Chili Bar Project would also reduce the effects of flow fluctuations on other sensitive aquatic species that are vulnerable to sudden changes in flow and would reduce the potential for stranding of fish.

For the UARP, the major costs for these aquatic resource measures include the physical modifications and installation of a larger valve at Rubicon dam and Slab Creek dam to facilitate the provision of minimum streamflows, pulse flows, and ramping rates. The total annual costs for implementing the minimum flow releases, including the capital cost for the modification to the two Project dams and periodic adjustments to the minimum release valves at all 10 Project dams, would be about $185,100 and implementation of the pulse flows would cost about $26,000 annually. The proposed minimum streamflow schedule for the UARP would result in a total foregone power production cost of $7,821,000. The proposed pulse flows for the UARP would result in an additional foregone power cost of $478,000. The improvements to the 60 miles of riverine aquatic and riparian habitat and native fish and amphibian populations in the eleven downstream reaches would be worth the cost. For the Chili Bar Project, we estimate that the annual capital cost and energy losses for the implementation of the proposed minimum flow regime and ramping rates would be $19,400 and a foregone power production cost of $56,300; the improvement to the aquatic habitat in the Chili Bar reach would be worth the cost.

Large Woody Debris

The lack of woody debris could affect aquatic habitat in the stream reaches. Currently, SMUD collects and stockpiles woody debris to reduce interference with recreational boating and prevent debris jams at the dams. Proposed Articles 1-9 for the UARP and 2-7 for the Chili Bar Project provide for transporting woody debris that collects in the Project reservoirs to the natural stream downriver. Ensuring that large woody debris is allowed to move downstream through the Projects would enhance the aquatic habitat for native fish populations in each of the Project reaches included in the plans. The measures to pass large woody debris downstream of the dams also would benefit foothill yellow-legged frogs and other amphibians and reptiles by providing substrate for macroinvertebrates, trapping organic material and sediment, creating pools, and slowing the water velocity during peak flows. We estimate that the annual cost for implementing the woody debris plan for the UARP would be about $14,000 and $10,000 for the Chili Bar Project. Implementation of woody debris plans at both Projects would be reasonable measures and worth the cost to ensure boater safety and improve the habitat for fisheries and sensitive amphibian species in the downstream reaches.

Coordination between the UARP and Chili Bar Project Operations

Better coordination of Project operations between SMUD and PG&E could result in fewer spills downstream of the Chili Bar Project and positive effects on special status amphibians. Proposed Articles 1-4 and 2-3 provide for coordination between the UARP and Chili Bar Project. The whitewater runs between Chili Bar dam and Folsom reservoir are of regional, if not national importance. These river sections are the most heavily boated in California, in part because the flows are relatively dependable and extend well into the summer and fall months and because of their proximity to large population centers. Historically, SMUD and PG&E have had limited coordination, where PG&E calls SMUD plant operators shortly before upstream releases for PG&E to decide how low to draw down Chili Bar reservoir. Often, this coordination has not worked well, causing Chili Bar reservoir to spill and providing unpredictable flows in the whitewater runs downstream of the Chili Bar dam. As proposed, coordination would occur more frequently and would allow PG&E to improve access to its recreational facilities by allowing boaters and other recreational users to more closely predict the timing and magnitude of flows and would help PG&E avoid losing opportunity to generate. Coordination between UARP and Chili Bar Project would also help ensure effective implementation of the Proposed Articles and protection of special status amphibians in the Chili Bar dam reach. Development and implementation of the plan with detailed protocols to coordinate operations and implement license conditions affecting both Projects would have annual cost of $13,100 for SMUD and $10,000 for

PG&E. Implementation of the plan would be worth the cost because it would not only enhance whitewater boating opportunities in the Chili Bar reach and avoid unnecessary harm to special status amphibians but also would increase the power generation at Chili Bar.

Reservoir Levels

UARP water level fluctuations affect both boaters and fisheries resources in Project reservoirs. Proposed Articles 1-1, *Minimum Streamflows,* 1-8, *Fish Passage at Gerle Creek*, and Proposed Article 1-23, *Reservoir Levels,* for the UARP provide for specific water level elevations for protecting fish populations, ensuring the availability of boat launch facilities, or enhancing the visual experience at these Project reservoirs. Loon Lake, Ice House, and Union Valley reservoirs are large lakes with heavy recreational use in the summer months. Meeting end-of-month water surface elevation targets at these reservoirs in July, August, and September, as called for in Proposed Article 1-23, would ensure that at least one public boat launch would be available at each reservoir during the peak recreation season and would enhance the overall recreational experience of users of these popular reservoirs. Our analysis shows that water surface elevation targets proposed in the Settlement Agreement are within the historical range of water surface elevations at these large reservoirs for all except SD water years, and we conclude that SMUD would be able to meet the end-of-month elevations. Therefore, we recommend inclusion of the proposed elevations along with the proposed procedures for agency consultation in SD water years, when SMUD would have difficulty meeting the end-of-month water surface elevations. Operating the Project to attain the end-of-month target elevations at Loon Lake, Ice House, and Union Valley reservoirs as specified in the Settlement Agreement would not involve any additional cost to SMUD because they are within the existing range of reservoir fluctuations.

Although our analysis indicates that SMUD could meet the proposed end-of-month elevations at the larger reservoirs, our analysis of water surface elevations at smaller storage reservoirs (Rubicon and Buck Island) indicates that SMUD might have difficulty controlling water surface elevations during May and June. The high elevation Rubicon and Buck Island reservoirs have limited storage capacity and are greatly affected by changes in the inflow to the reservoirs, normally driven by snowmelt. Further, the manual control gates are not typically installed until June or early July because these high elevation reservoirs are remote and difficult to access. The conditions make it difficult for SMUD to control water levels for part of the summer. However, once the gates are installed, they can maintain a relatively stable water surface elevation during low inflow conditions, which normally start during July and extend through the recreation season. We also conclude that SMUD would be able to maintain an overwintering minimum pool at elevation 6,527 feet in the Rubicon reservoir.

Fluctuations of the water levels of Gerle Creek reservoir would still occur, partly because this reservoir operates as a afterbay for Loon Lake powerhouse and as a forebay for the canal leading to Robbs Peak reservoir and powerhouse. Again, many of the variations in the early part of the May 1 to September 10 period are the result of limited storage capacity and rapid variations in inflow similar to the Rubicon and Buck Island reservoirs. However, we expect that SMUD would use the Gerle Creek canal headworks gates to maintain the elevation of Gerle Creek reservoir at or above elevation 5,225 feet during the summer recreation season. In the draft EIS we recommended that SMUD operate Gerle Creek reservoir to maintain water levels at 5,228 feet in the fall to allow upstream passage of brown trout. In comments on the draft EIS, SMUD, the Forest Service, Interior, and American Rivers all stated that upstream fish passage into Gerle Creek may not be a function of reservoir levels and could be affected by sediment barriers at the upper end of Gerle Creek reservoir. SMUD also commented that maintaining Gerle Creek reservoir at elevation 5,228 feet in the fall would constrain operations and would not guarantee fish passage. Instead, SMUD proposed that continued studies and consultation with the agencies would result in a more practical solution. Therefore, we now recommend that SMUD develop and implement a Gerle Creek fish passage plan because the new information that SMUD provided indicates that fish passage would not be guaranteed even if Gerle Creek reservoir were maintained at elevation 5,228 feet in the fall. The plan could involve measures, such as channel modifications, if needed, to ensure continued fish passage into Gerle Creek during the August through October period so that brown trout can access spawning areas in Gerle Creek. Our recommended Gerle Creek fish passage plan would allow SMUD to determine in consultation with the Agencies how they will ensure fish passage given the potential barriers that they identified at the upper end of Gerle Creek reservoir The estimated annual cost of preparing and implementing the plan to allow fish passage into Gerle Creek would be $6,800 and the benefit to fisheries would be worth the cost.

We also note that the terminology in the Settlement Agreement to make a "good faith effort" or "to make every reasonable effort" or implement a measure "as early as reasonably practicable" relative to water surface elevations at the smaller reservoirs (Rubicon, Buck Island, and Slab Creek) is difficult for the Commission to enforce. Attempting to maintain water surface elevations within an historical range (1975 to 2000) as proposed for the Junction and Brush Creek reservoirs would also be difficult for the Commission to enforce. Further, other than noted above, we do not find any biological or recreational use basis for meeting the proposed elevations at these small reservoirs. For these reasons, we do not recommend including these measures in any license issued for the UARP.

Streamflow and Reservoir Elevation Gaging

Proposed Articles 1-10 for the UARP and 2-8 for the Chili Bar Project, *Streamflow and Reservoir Elevation Gaging*, provide for a plan to monitor streamflows and reservoir elevations. SMUD and PG&E already monitor or, in some cases, provide assistance to USGS for monitoring and recording many hydrological indicators, such as reservoir water level and stream gaging sites, in the Project area. Daily and, in many cases, hourly or shorter interval data recordings allow SMUD and PG&E to manage their facilities for hydroelectric generation and document environmental compliance within the terms of its existing license.

As discussed in section 3.3.2.2, SMUD would install new gages or otherwise find a means to measure the increased minimum streamflows downstream of Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Junction dams. Developing a coordinated gage installation plan, in consultation with resource and land management agencies, as well as USGS, would ensure that any new gages necessary to measure the flows and water levels that may be specified in a new license would provide accurate data consistent with applicable USGS standards. SMUD's and PG&E's proposals, including gaging and publication of flow information, would provide current flow and lake level data for the benefit of recreational visitors in planning flat water, whitewater boating, and fishing trips. Flow data would also be used to monitor the potential effects of Project operations on foothill yellow-legged frogs that are vulnerable to sudden changes in flow. We estimate that the annual cost for upgrading the gaging stations would be $98,200 for SMUD and $6,500 for PG&E. Implementation of streamflow and reservoir elevation gaging plans would be worth the cost to ensure compliance with recommended minimum flow and water surface elevation provisions.

Currently, real-time reporting is not available on any Project tunnel or powerhouse or on any non-project diversion structures located within the upper Rubicon River watershed. Proposed Article 1-10, *Streamflow and Reservoir Elevation Gaging*, does not include gaging at these diversion structures as recommended by the Placer County Water Agency. Gaging of these diversion structures is not necessary to ensure compliance with proposed minimum streamflow schedules or reservoir levels; therefore, we do not recommend it.

Wildlife and Plant Protection Measures

Project operations could potentially affect special status plant and wildlife species such as black bear, mule deer, osprey, and northern goshawk within the UARP Project boundaries. Proposed Article 1-12 provides for the protection of these wildlife and plant species through the implementation of wildlife safety measures at UARP canals and transmission lines and rare plant protection measures within the Pine Hill Preserve. Additionally, Proposed Articles 1-12 for the UARP and 2-9 for the Chili Bar Project provide for review, notification, and/or evaluation of potential effects of the UARP and Chili Bar Project on special status species, in consultation with the Forest Service or BLM, depending upon which agency lands would be affected. Although it appears that Project facilities do not directly cause deer mortality or impede migration, monitoring wildlife mortality would identify any future need for preventive measures at Project canals and ensure that any fencing or crossing structures are functional and would minimize potential harm to mule deer and other small game in the Project area. Implementation of the wildlife and plant measures specified in Proposed Article 1-12 for the UARP would cost $29,900 annually and the benefit to wildlife would be worth the cost. An Avian Protection Plan that would address retrofitting UARP transmission lines so that they meet the current APLIC standards would minimize avian electrocution or collision once all transmission lines meet these standards. The development of the plan and retrofitting of existing transmission lines would cost $20,300 annually, and the benefit to raptors would be worth the cost.

UARP transmission lines, which require occasional maintenance clearing, cross through sections of the Pine Hill Preserve. Because transmission line right-of-way maintenance includes occasional disturbance to vegetation and soils, the proposed measure to consult with BLM, FWS, and CDFG prior to conducting maintenance activities within the Pine Hill Preserve would ensure that the locations and methods of maintenance are designed to minimize effects to rare plant species. Additionally, consultation with the Forest Service, FWS, and CDFG prior to any new construction or maintenance and identifying any potential effects, would protect any special status species that occur either within the Pine Hill Preserve or elsewhere within the Project boundary. To protect sensitive species, we would add to both SMUD's and PG&E's proposed measures annual employee awareness programs to educate employees and key personnel about the known locations of special status species and habitat. Although not specifically included, including an awareness program as part of the vegetation management plan in Proposed Articles 1-13, *Vegetation and Invasive Weed Management Plans*, for the UARP would effectively protect species, such as valley elderberry longhorn beetles and elderberry shrubs, within the Project boundary from any transmission line maintenance activities by clearly delineating them as areas to be excluded from maintenance. We estimate that the annual cost for development and implementation of the invasive weed and vegetation management plans to be $57,600 for the UARP and $6,500 for the Chili Bar Project. The benefits of protecting sensitive plant and wildlife species, reducing noxious weeds, and educating personnel about protocols for identifying and protecting Project-related sensitive species would be worth the cost of these plans.

No known special-status species would be affected by the Chili Bar Project. Consulting with the BLM, however, annually to update the special-status species list and prior to any ground-disturbing activity, as discussed in Proposed Article 2-9, would ensure that special status plant or wildlife species that either currently occur or could occur in the Project boundary are protected. The benefit of protecting special status species would be worth the estimated annual cost of $5,000.

Monitoring Programs

Aquatic Resources

Proposed Articles 1-5 for the UARP and 2-4 for the Chili Bar Project, *Monitoring Program,* set forth a comprehensive program of monitoring to document the effects of the increased minimum streamflows, pulse flows, and ramping rates on native fish populations, aquatic macroinvertebrates, amphibians and reptiles, riparian habitat, algae species, geomorphology, water temperature, and numerous water quality parameters in the reservoirs and stream reaches. The Settlement Parties have agreed to use trout biomass as an indicator of the ecological health of stream reaches and would use the baseline biomass values for monitoring the effectiveness of the proposed flows in achieving the trout biomass objectives for each stream reach. They also have established permanent monitoring transects for the channel geomorphology monitoring to determine the long-term effects of the increased flow in sediment transport and channel width.

Fish, Amphibians, and Aquatic Reptile Populations

Project operations could affect fish and amphibian populations in the stream reaches. Monitoring the response of native fish populations to the increased minimum streamflows over the term of the license would provide information that can be used to inform resource managers whether or not the stated resource goals are being met. Monitoring the response of all life stages of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles over time would be necessary to evaluate potential effects of the proposed flow changes, along with effective adaptive management changes, as needed. Mountain yellow-legged frogs have not been found in the Project-affected reaches or reservoirs despite suitable habitat, perhaps due to populations of predatory fishes and bullfrogs. However, mountain yellow-legged frogs may use Project-affected reaches as migratory corridors. Monitoring would determine the presence/absence and distribution of foothill yellow-legged frogs, mountain yellow-legged frogs, and western pond turtles in Project-affected reaches, and help identify potential migration/dispersal barriers. The proposed monitoring would also document the potential effects of the proposed changes in minimum flows, operational spills, channel maintenance pulse flows, ramping rates, and the recreational streamflow releases on all foothill yellow-legged frog life stages.

Riparian Habitats and Algae

Riparian habitat could be affected by flow alterations and large water level fluctuations resulting from the proposed Projects' operations. Monitoring riparian vegetation every 5 years for the first 15 years of a new license, followed by subsequent monitoring every 10 years, as proposed, would allow the riparian vegetation to respond to the proposed flow regimes without being confounded by short-term changes caused by rare events such as a large flood. The algal species identification and monitoring plan for the Junction dam, Camino dam, Slab Creek dam, and Robbs Peak dam reaches would assess the distribution and possible adverse affects of alga(e) in the Project-affected reaches. Because of the extent of algae growth in the Junction dam reach and the potential for *D. geminata* to adversely affect water quality and the aquatic community, including preventing successful reproduction of foothill yellow-legged frogs, it is important to establish baseline information for the new flow regime as to species and potential adverse effects that could result from abnormally high densities of algae. This information could be used to determine whether the new streamflow releases effectively reduce the extent of algae in the Junction dam reach and help determine whether there are algae-related problems in other UARP-affected stream reaches. Because of the extent of algae growth in the Chili Bar dam reach and the potential for *D. geminata* to adversely affect water quality and the aquatic community, it also is important to periodically evaluate whether *D. geminata* has become established in this reach.

Geomorphology

Project operations could affect sediment deposition in some of the Project stream reaches. Monitoring changes in sediment deposition as specified in Proposed Article 1-5 for the UARP and 2-6, *Sediment Management Plan*, for the Chili Bar Project would allow SMUD and PG&E, in consultation with the Agencies and BLM, to determine if and when to dredge the reservoirs and where to deposit the dredged materials. Based on our review of the studies, we conclude in section 3.3.1.2 that pulse flows in the reaches where sediments are trapped or deposited would help to transport these sediments downstream. The downstream reaches are where sediment most likely would have traveled if the impoundment did not exist; however, because any added material could threaten the resources of the reach, the development of a sediment management plan for the Chili Bar Project would minimize these potential effects and would be worth the estimated annual cost of $800 for PGE and $6,500 annual cost for SMUD. This is one of several monitoring programs where SMUD would share the cost of implementation.

Water Quality

Development and implementation of the water temperature monitoring plan in Proposed Articles 1-5(9) and 2-4(5) would document spring through summer water temperatures in the UARP bypassed reach and temperatures of water passing through or over Chili Bar dam and facilitate a determination of whether the fish and amphibian communities are supported. Monitoring water temperature immediately downstream of the dams, as proposed, would document thermal conditions at the upper end of the bypassed reaches and provide insight into conditions throughout reaches that experience little change in temperature (e.g., Buck Island dam). Monitoring at the other sites listed in table 3-27 along with up to five additional UARP sites and two additional Chili Bar Project sites would document thermal conditions downstream of confluences, and in critical locations within the Ice House dam, Camino dam, Slab Creek dam, and Chili

Bar dam reaches where it is not clear whether the proposed minimum streamflow schedule would achieve the temperature objectives.

Monitoring temperature in the Ice House dam reach just upstream of Junction reservoir and in the SFAR immediately downstream of Slab Creek dam would provide the temperature data necessary to determine whether scheduled high flow releases to these reaches may need to be adaptively managed.

The results of SMUD's 2002 to 2004 monitoring of reservoir temperatures provides evidence that there is virtually no cold water available in the Rubicon, Buck Island, Gerle Creek, Robbs Peak, and Camino reservoirs. Because substantial temperature data were collected within the past 10 years, sufficient data likely already exist to answer most questions about coldwater availability in the other UARP reservoirs. Therefore, the existing temperature data could be used, as appropriate, to evaluate the availability of cold water prior to collecting any additional reservoir temperature data. We conclude that development and implementation of the water temperature monitoring plan referred to in Proposed Article 1-5(9), *Monitoring Program*, would document spring through summer water temperatures in UARP bypassed reaches under any new Project operations and help confirm that desired fish and amphibian communities are supported, although we question the benefit of monitoring temperatures in UARP reservoirs.

Monitoring water temperature immediately downstream of the Chili Bar dam, as proposed in Proposed Article 2-4(5), *Monitoring Program*, would document thermal conditions at the upper end of the Chili Bar reach under any new Project operations. Monitoring at the other three designated sites downstream of the Chili Bar dam with up to two additional sites would document thermal conditions in critical locations within the Chili Bar dam reach. Because this reach is not managed for coldwater fishes and results of PG&E's 2002 to 2004 temperature monitoring study show that little cold water is available in Chili Bar reservoir, we question the need for additional monitoring of Chili Bar temperatures. However, development and implementation of the water temperature monitoring plan referred to in Proposed Article 2-4(5), *Monitoring Program*, would confirm that desired fish communities and amphibians are supported under any new Project operations.

Proposed Articles 1-5(10) and 1-6(8) for the UARP and 2-4(6) for the Chili Bar Project would provide data to document consistency with water quality standards. We conclude in section 3.3.2.2 that geologic and hydrologic characteristics primarily control the concentrations of minerals, and many of the waters affected by the UARP and Chili Bar Project have little potential for contamination from petroleum products. Therefore, we question the need for these parameters at each monitoring location. SMUD and PG&E's proposed approach to select and monitor bioaccumulation of the specified metals in aquatic organisms at 5-year intervals would ensure that results of this sampling effort are consistent with the Water Board's approach and would facilitate evaluation of changes in fish body burdens of these metals. However, we conclude that the proposed UARP and Chili Bar Project operations would not likely have any significant effect on mercury methylation or bioaccumulation in the Projects reservoirs.

Sampling near swimming beaches at the popular recreational sites, such as those at Union Valley reservoir and in the whitewater reach downstream of the Chili Bar dam, shows exceedances of bacteria. SMUD and PG&E's proposed approach to select and monitor 15 shoreline recreational locations within the Project boundary would document near worst-case bacteria concentrations at locations of greatest concern.

Once data have consistently documented that specific water quality parameter(s) support the corresponding desired aquatic resources, there may no longer be a need for monitoring those parameters/sites. Proposed Articles 1-5(10) and 2-4(6), *Monitoring Program*, include clauses that address this issue and would potentially allow SMUD and PG&E to reduce monitoring of minerals, nutrients, metals, petroleum products, hardness, and bacteria. We conclude that Proposed Articles 1-5(10) and 2-4(6) would provide data to document any unanticipated effects on water quality under any new Project operations and identify any trends in risks to the health of humans and wildlife. We note that monitoring through the entire new license term may not be necessary and recommend reducing or ceasing monitoring of water quality parameters and sites where data consistently demonstrate little or no effect on water quality standards.

Entrainment at Robbs Peak

Proposed Article 1-5(12) provides for monitoring entrainment at the Robbs Peak development. We conclude in section 3.3.4.2 that there is little evidence of fish entrainment at the Robbs Peak powerhouse. Studies performed by the licensee showed that the population of rainbow trout in the SFFR upstream of the powerhouse is naturally limited by intermittent summer flow, sub-optimal water temperatures, and unfavorable winter conditions. Fish that transit the Gerle Canal from Gerle reservoir may also become entrained in the powerhouse. However, the canal provides very little suitable habitat for trout. Although studies performed during relicensing showed that the potential for fish to become entrained at Robbs Peak Powerhouse is extremely low, the adaptive management program nevertheless calls for development of mitigation measures if monitoring indicates fish are being entrained there. The development of mitigation to minimize any entrainment at the Robbs Peak afterbay through the adaptive management program would likely protect the few native trout currently in the SFRR, where populations appear to be declining.

Terrestrial Resources—Bear Interactions and Bald Eagles

Human-bear interactions are infrequent but are increasing in the UARP area. The proposed upgrades at many of the recreational facilities include bear-resistant containers. Implementation of the bear management plan monitoring plan proposed in Articles 1-5(13) for the UARP would determine if the proposed bear-proof lockers and trash bins are successfully keeping bears away from campgrounds or if additional measures would be needed.

Bald eagles nest at UARP's Union Valley and Loon Lake reservoirs and wintering eagles occur throughout the UARP area. Neither nesting nor wintering bald eagles have been observed at the Chili Bar Project. UARP operations, maintenance, and recreation all have the potential to disturb or injure the federally threatened bald eagle. Proposed Article 1-5(13) for the UARP, which calls for SMUD to continue to monitor bald eagle nest sites in coordination with the Forest Service and FWS, would allow nest productivity numbers to be assessed to determine if Project recreation is adversely affecting bald eagle fledging success. If monitoring shows Project activities are adversely affecting the bald eagle, the adaptive management program proposed in Proposed Article 1-6 would allow Project activities to be changed.

Summary

The overall Monitoring Program for the UARP is expensive, totaling about $448,100 annually, with the development and implementation of most of the individual monitoring plans ranging from $6,200 for the monitoring plan for bioaccumulation in fish to $110,000 for water quality monitoring. However, noting some exceptions, the monitoring program is well-designed, provides specific metrics on which to base the effectiveness of proposed fish and wildlife protection measures, and ties directly to adaptive management measures by showing whether proposed measures are having the intended results.

We estimate the cost of the monitoring programs specified for the Chili Bar Project would be $12,700 annually for PG&E and $102,000 for SMUD's share of the costs of monitoring programs resulting from the overlapping studies. We would expect some of these costs to be reduced if the monitoring results demonstrate that Project operations consistently meet water quality standards or other monitoring objectives and monitoring is no longer required.

Adaptive Management Programs

Proposed Articles 1-6 and 2-5, *Adaptive Management Programs,* provide specific steps that would be taken if the monitoring program and other scientific information indicate that it is likely the intended results of the fish and wildlife measures would not be met without adaptive management changes. The specific adaptive management changes identified in the Settlement Agreement mostly represent a balancing of interests between the protection of native fish, amphibian, and reptile populations and recreational boating use within the framework of maintaining good water quality in several reaches. Overall, the Proposed Articles provide a reasonable set of steps that could be implemented if the proposed measures fail to achieve intended results in these reaches. In some cases, implementation of the adaptive management measures would reduce energy losses, and in other cases, costs would depend on the specific measures developed in response to the monitoring results (e.g., measures to address entrainment).

Vegetation and Invasive Weed Management

Invasive weeds occur throughout both Project boundaries. For both Projects, operations, maintenance, and recreation can act as a method of seed dispersal and create disturbed areas favorable to the spread of invasive weeds. Proposed Articles 1-13 for the UARP and 2-10 for the Chili Bar Project, *Vegetation and Invasive Weed Management Plans,* provide for the control of noxious weeds and address vegetation management, including soil and erosion control, revegetation, and transmission line vegetation maintenance. Implementing these plans would control current populations and future infestations of noxious weeds within the Project boundary on Forest Service and BLM lands at the UARP and Chili Bar Project, respectively.

We understand the proposed invasive weed management plan for UARP to be intended for lands within the Project boundary that are adjacent to Project features directly affecting National Forest System lands, including about 150 miles of transmission lines upstream of the proposed Iowa Hill development. Because not all Project-related noxious weed infestations occur on Project lands that affect National Forest System lands, expanding the invasive weed and vegetation management plan to all lands that are affected by Project operations or maintenance within the Project boundary would result in more complete control of noxious weeds that are affected by the proposed Projects. This expansion would benefit local plants and wildlife, including rare plants such as the federally listed Pine Hill endemic species that occur outside of National Forest System lands. In its comments on the draft EIS, SMUD indicated that the lower 30 miles of transmission lines traverse private lands making it difficult to determine which infestations result from project activities. SMUD says that these uncertainties could potentially increase SMUD’s responsibilities and would increase the cost of its proposed invasive weed management plan. We now recognize that about 30 miles of Project transmission line from the proposed Iowa Hill development downstream to the Folsom Junction are outside of National Forest System lands, which would result in an additional cost to SMUD. To minimize this additional cost, we recommend conducting annual monitoring in conjunction with annual inspections and Project maintenance in the transmission line rights-of-way. We now estimate the annual cost of SMUD's vegetation management plan and invasive weed plan with our expansion to include the 30 miles of transmission lines on non-National Forest System lands to be $87,900, or about $30,000 more than SMUD’s more limited plan. Overall, increasing the invasive management and vegetation management plans to include infestations on Project lands would be worth the added cost.

Significant populations of the noxious weeds Scotch broom and Himalayan blackberry occur on the Chili Bar reservoir shoreline and along roadsides. Project operations and maintenance activities create conditions that are favorable to the existence of noxious weeds. Implementing the proposed invasive weed and vegetation management plans as proposed by PG&E at the Chili Bar Project would control current populations and future infestations of noxious weeds within the Project boundary on BLM lands. Because not all Project-related noxious weed infestations occur on BLM lands, expanding the invasive weed and vegetation management plan to all lands within the Project boundary would result in more complete control of noxious weeds that are affected by Project operations and maintenance. The proposed vegetation management plan would establish practices that would minimize conditions favorable to the establishment of noxious weeds. The costs associated with these plans for PG&E would be $6,500. The benefit of controlling noxious weeds at the UARP and Chili Bar Project would justify the costs of these plans.

Recreation Enhancements

Recreation Implementation Plan

The Settlement Agreement includes a suite of proposed articles (Proposed Articles 1-15 through 1-26 for UARP and 2-13 through 2-15 for the Chili Bar Project) that focus on upgrading, expanding, operating and maintaining recreational facilities and services in response to user demands; monitoring future use; providing additional whitewater boating opportunities; providing public information; and fish stocking (at the UARP) within the framework of a recreation plan. Proposed Article 1-15, *Recreation Implementation Plan*, would increase and formalize SMUD's responsibilities to provide and update formal and dispersed recreational facilities that provide access to the Project lands and waters. The proposed plan reflects the unique character and management responsibilities of public recreational sites around the Projects and recognizes that although SMUD has no legal authority to redevelop public access sites owned or managed by others, it has the responsibility to ensure reasonable public access to Project lands and waters for those portions of the recreational sites currently within the Project boundary or proposed to be within the Project boundary. The assistance and funding included in the plan would improve delivery of recreational services by streamlining implementation of the improvement measures and providing a mechanism for earmarking licensees' funds to specific Project-related improvements.

Monitoring recreational use over time in a manner consistent with the Commission's recreational use and needs assessment (Form 80) would provide environmental and recreational use data that would allow SMUD to modify the type and quantity of recreational facilities to be commensurate with demonstrated users preferences and demand. As proposed, the recreational measures would provide substantial benefits to recreational visitors and the proposed recreational streamflows are generally planned to mimic natural conditions and enhance terrestrial and aquatic resources within and downstream of the Project developments. Based on what is known about the Projects, the proposal appears to simultaneously protect and enhance environmental resources while continuing to provide and enhance recreational opportunities. However, as with any complex system, changes in recreational use patterns or Project operations could have unanticipated adverse effects on aquatic or terrestrial resources. The proposed adaptive management measures would provide a means to address these effects over the term of any new license issued. As proposed, SMUD would file reports with the Commission summarizing monitoring results. If any recreation-related adaptive measures are required during the term of any new license, SMUD would file an amendment to the proposed recreation implementation plan with the Commission for approval.

The Settlement Agreement does not provide for a recreation plan for the Chili Bar Project nor does PG&E propose to prepare a plan. However, PG&E proposes a few specific recreational measures to improve recreational access to the Project. In its license application, PG&E contends that recreational use is low, safe public access is best achieved at the upstream end of the reservoir, and Project operations limit recreational opportunities near Chili Bar dam. In subsequent sections, we generally agree with this assessment. However, we expect that recreational use and needs would change over the term of any new license issued for the Chili Bar Project. Development of a recreation plan for the Project, based on periodic monitoring, would help the licensee manage these changes in recreational demand and provide a structure to evaluate the adequacy of Project recreational facilities to meet future recreational demand. Such a plan would be designed to achieve the following objectives: (1) promote public safety and increase public awareness of recreational opportunities at the Chili Bar Project; (2) maintain reasonable health and safety standards through a litter and sanitation management; (3) provide safe and reasonable access to the Project reservoir; (4) address congestion and conflicts among visitors and resources related to recreational activities, if any; (5) provide reasonable recreational facilities for a range of recreational opportunities; (6) reduce recreational effects on cultural, terrestrial, and aquatic resources; and (7) provide a forum for public and agency input into recreational facility needs at the Project. We estimate that the annualized cost for the development of a recreation plan for the Chili Bar Project would be $2,700, and the benefit of coordinating recreational enhancements through such a plan would be worth the cost.

Project Boundary and Recreational Facilities

Proposed Article 1-18, *Review of Recreational Developments,* lists 34 recreational facilities and specifies including these facilities within the Project boundary. Most of the recreational facilities proposed to be included in the Project boundary are immediately adjacent to the existing Project boundary and directly associated with recreational sites that provide access to the lands and waters used for hydroelectric operations. However, two of the sites—Airport Campground and Big Hill Communication Site—are well outside the current boundary.

SMUD built Airport Flat Campground in 1996 as part of the exhibit R amendment to the license, and it is one of the few licensee-developed facilities away from a main reservoir. SMUD developed the site in lieu of expanding Gerle Creek Campground as a result of concerns that an expanded Gerle Creek Campground would lead to crowding conditions and degradation of the recreational experience. As such, the Airport Flat Campground was developed to handle existing and future recreational demand associated with the Project. Big Hill Communication Site was also built by

SMUD under the existing license; it is primarily used as a communication, fire observation and fire staging area for the Forest Service and includes the Big Hill Vista. Visitors to the area often drive to the top of Big Hill to overlook Crystal Basin, a vista that includes UARP facilities, and the high Sierra Mountains to the east. Although the principal purpose of the site is for Forest Service operations, including those specific public accessible facilities on top of Big Hill within the Project boundary would ensure that the site is maintained for public use for the term of any new license issued. We find it reasonable to include these facilities within the Project boundary.

SMUD's proposal to enhance, expand and formalize the sites listed in table 3-65 (Proposed Article 1-19) would substantially improve public access in the Project area. The proposed improvements to recreational facilities within the Project boundary are site-specific, derived from a recreational needs assessment, prepared in consultation with the Forest Service and stakeholders, and targeted at either improvements to existing facilities or development of informal facilities. In addition, the proposal considers recreational needs from a geographical perspective and recommends site improvement measures based on the overall need in the Project area. The total annualized costs of SMUD's proposed upgrades at the 34 developed and proposed recreational sites would be $1,720,800. Although upgrading the Project recreational facilities would be costly, the improvements are scheduled to be implemented during the next 20 years, are supported by user data projecting increased use over the term of any new license, and would benefit the hundreds of thousands of annual visitors to the Project area.

PG&E's proposal to provide a parking area off Rock Creek Road, a trail that leads from the Rock Creek Road to Chili Bar reservoir, an informational kiosk along the trail, and a picnic table at the reservoir (Proposed Article 2-13) would address the demand for day-use recreation opportunities identified in the recreation needs study. The annual cost for providing this improved access to the Chili Bar reservoir and reach would $15,200 and would be worth the cost by formalizing the existing informal use of this popular area. PG&E also proposes to exclude about 152 acres of land from the existing Project boundary. Our preliminary analysis suggests that this proposed boundary change would have minimal environmental effects; however PG&E has not demonstrated that the lands it proposes to exclude are no longer needed for Project purposes and therefore, absent this, we recommend these lands remain in the Project boundary.

Recreation Operation, Maintenance, and Administration

Operation and maintenance are essential components of any recreational development to ensure that the facilities are maintained at a level that provides reasonable public access for the term of any new license issued. In addition to the proposed maintenance activities included in Proposed Article 1-20, Proposed Article 1-21 specifies that SMUD address sanitation along with other recreation use-related issues by annually paying the Forest Service $1,000,000 to provide operation, maintenance, and administration of developed recreational sites, facilities, or activities that are within, adjacent to, or in the vicinity of UARP reservoirs and facilities. These activities include picking up litter, providing public information, enforcing rules and regulations, maintaining signage, and other activities associated with the effects of recreational use at Project recreation facilities within and on adjacent Forest Service lands. After examining the Settlement Agreement rationale document, we concluded in the draft EIS that the cost of work done by Forest Service for maintenance, operations, and administration of project recreation sites equals or exceeds the $1,000,000 annual cost in the Settlement Agreement. However, following the Commission's policy on setting caps, we did not recommend SMUD's share of these costs be set at a maximum of $1,000,000 as specified in the Settlement Agreement.

In comments on the draft EIS, SMUD expressed concern that without the cap specified in the Settlement Agreement that the cost to SMUD to off-set Forest Service's administering developed recreation sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities could be far higher. The Forest Service suggests that the annual collection agreement with SMUD would be the appropriate document to provide clear direction and definition to ensure SMUD's payments to the Forest Service directly contribute to Project and Project-related operations, maintenance, and administration. We note that SMUD has been and continues to be responsible for the operation and maintenance costs associated with its recreation facilities within the project boundary. We agree with the Forest Service that the collection agreement between SMUD and the Forest Service described in preliminary section 4(e) Condition No. 47 (and associated annual amendments) would be an appropriate way to clearly define and direct what O&M tasks would be done, estimate the cost, and clarify which funds directly contribute to project related O&M.

At the same time we recognize some of the recreation occurs at undeveloped sites surrounding the reservoirs and that the Settlement Agreement includes SMUD's share of the Forest Service's cost of servicing these areas. The Forest Service comments that the costs associated with administering dispersed recreation adjacent to and in the vicinity of UARP reservoirs and facilities are very minor relative to the total costs to operation, maintain, and administer developed and project recreation on behalf of SMUD. Nevertheless, because these costs are incurred for tasks done outside the project's boundary, following the Commission's recent settlement policies on project boundaries, we would not recommend the Commission require SMUD to reimburse the Forest Service for these costs.

Recreational Streamflows

The whitewater run below Slab Creek reservoir of Class IV rapids is currently used between Ice House and Chili Bar. The Settlement Agreement proposes that SMUD use existing facilities and spill at Slab Creek dam to make whitewater flow releases in the spring. The Settlement Agreement also calls for more extensive releases[46] if: (1) the Iowa Hill development is built, or (2) Iowa Hill is not built and the trigger for use of the whitewater flows is met by year 10 after license issuance. If SMUD does not commence construction of Iowa Hill, it would monitor whitewater use during the first 10 years after the license issuance to determine if the use triggers set in year 5 are exceeded. The Settlement Agreement notes that the proposed October flow releases would not occur if after 5 years of monitoring the data shows that releasing the whitewater flows would have significant effect on environmental resources. If October flows cannot be provided because of operational, aquatics, or other reasons, then the equivalent flow volume would be added to the spring flow releases.

Given that the reach already draws visitation at the expert level (Class IV), we would expect, with interest by outfitters, more use in the reach. However, currently there are no recreational use data available to gage how much use would occur. The cost of providing the more extensive recreational boating flows below Slab Creek would be considerable. While SMUD says that the use of the Iowa Hill development would help them make these releases without the expensive reconfiguration of White Rock tunnel adit, the recreational streamflow releases would result in $322,000 in foregone energy production annually at the UARP. The estimated cost for providing recreational streamflow releases downstream of Ice House dam would be an additional $108,000, for a total cost of $430,000 in forgone energy.

If the construction of the Iowa Hill development has not commenced by year 5 after license issuance, the Settlement Agreement calls for SMUD to consult on a Whitewater Boating Recreation Plan describing whitewater recreational use and impacts and setting triggers that would determine if SMUD should modify Project facilities to allow SMUD to deliver the more extensive recreational flows set in the agreement. We agree with the Settlement Agreement's use of triggers to help the parties decide if the more extensive whitewater releases should be provided. The estimated annual cost for preparing and implementing the Whitewater Boating Recreation Plan including the necessary access and support facilities would be $48,600.

Because of the foregone energy that would result from releasing the more extensive recreational flows set in the Settlement Agreement and the unknown level of whitewater use this stretch of the river will get, we recommended in the draft EIS that in year 10 after license issuance, and based upon the Whitewater Boating Recreation Plan, SMUD, after consulting with the interested parties, file for Commission approval the whitewater releases they recommend for the remainder of the license, with or without the Iowa Hill development. In comments on the draft EIS SMUD, the Forest Services, and many others requested that we adhere to the streamflow releases provided for in the

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[46]The more extensive table of releases would require boating releases during both dry and critically dry water years and include up to12 springtime releases and 6 October releases.

Settlement Agreement as representing a hard fought balancing of interests between the development and nondevelopment uses of the river. We recognize the effort that went into determining the proposed streamflow releases and agree that little would gained from revisiting or renegotiating the proposed streamflow releases. However, we continue to recommend that the more extensive recreational streamflow be provided only if the recreational demand triggers are met. If after 10 years of monitoring in year 15, the recreational use is sufficient to justify the additional cost, then we would agree that the flow volume should be consistent with Settlement Agreement.

Public Information Services

The proposed brochures and map and the interpretive, education, and public information plan (Proposed Articles 1-25 for the UARP and 2-14 for the Chili Bar) would improve upon existing public education and interpretation information with updated materials that complement the Forest Service and BLM publications. The proposal would help expand recreational opportunities by providing visitors with easily accessible information about Project resources. Real-time information for all streamflow and reservoir elevation locations normally can be easily and inexpensively be collected in either 1-hour or 15-minute intervals and be made available to the public. Based on this information, the public, operators of downstream projects, such the Middle Fork American River Project, and others would be able to coordinate their activities and operations. Providing the public with this information to enable them to coordinate whitewater activities and having real-time flow data would benefit public recreation use and would justify our estimated annual cost of $34,600 for the interpretive, education, and public information plan and brochures and $13,100 for the upgrading gages and providing real-time flow data.

Flow compliance monitoring for releases from Chili Bar reservoir would necessitate the continuing operation of gage no. 11444500, located downstream of Chili Bar dam. Currently, this is not a real-time USGS gage, but flows and gage heights are available at 1-hour intervals on the CDFG web site for this streamflow gage. Reservoir level compliance would likely entail upgrading the current system that PG&E uses to monitor the water level within Chili Bar reservoir. The annual cost associated with public information services as specified in Proposed Article 2-14 would be $1,700 for PG&E, plus SMUD's share of $14,200, and would be worth this modest cost.

Fish Stocking

Reservoir-related angling is one of the most important recreational activities associated with the Project, particularly in the large storage reservoirs, including Loon Lake, Union Valley, and Ice House reservoirs. Assisting CDFG in fishing stocking (Proposed Article 1-26 for the UARP) would help ensure that the recreational fishery is maintained for the term of any license issued. We note that recreational fish stocking could adversely affect mountain yellow-legged frogs if populations were to become established in Loon Lake (elevation 6,410 feet) and may also adversely affect foothill yellow-legged frogs in the reaches downstream of these reservoirs, particularly Ice House dam reach, due to escapement. However, the level of proposed stocking, which is similar to the existing CDFG stocking program, would not be expected to result in any additional effect on frogs over existing conditions. The $106,100 annual cost of fish stocking is justified based on the large angler demand at these popular reservoirs.

Trails System Plan

As proposed by SMUD and PG&E, the trail-specific measures in Proposed Article 1-31 would allow SMUD to continue to access the Project developments at the higher elevations in Crystal Basin where there are no access roads. Although the proposed measure would substantially benefit recreational visitors by extending and formalizing trial access to Project facilities, we would limit SMUD's responsibility to those trails that are used primarily for Project operations and that are within the Project boundary. SMUD's proposed trail plan as modified by staff would help to ensure that the condition of the portion of the trail system used by SMUD is maintained at an adequate level over time. In addition, the plan would help ensure that trail users are educated about allowed and prohibited activities and that use is zoned in a manner to avoid adverse effects on aquatic and terrestrial resources in the area.

PG&E's proposal to develop a trail on BLM lands to access the Chili Bar reservoir in Proposed Article 2-13 would formalize recreational use that already occurs on these lands. Currently, anglers, picnickers, and other visitors follow an old logging road part way into the canyon and follow a user-made trail to the water's edge. Formalizing this trail would help ensure that it is designed to follow natural contours and would reduce erosion and other effects that can be associated with informal trials. The estimated annual cost of $15,200 would be justified based on existing use of the informal trail.

Transportation Management System

Proposed Article 1-30 for the UARP, *Transportation Management System,* provides for a plan to establish SMUD's level of responsibility for improving and maintaining Project access roads and perform several specific improvements, including reconstructing and surfacing several Forest Service roads that provide access to Project recreational facilities. Upgrading drainages to meet 100-year storm events and implementing erosion control measures during maintenance activities, including snow removal, would minimize the potential for road erosion into streams. Upgrading existing roads used for access to Project facilities and Project recreational facilities would enhance public safety and access at several highly used recreation facilities. Developing and implementing the plan, including annual snow plowing, would cost about $279,800 annually. Reconstructing Forest Service access roads would be relatively expensive with an annual cost of $290,900 annually but would address several public safety concerns affecting thousands of visitors to the recreational facilities at Union Valley and Ice House reservoirs. We note that it is the Commission's practice to include only those roads used primarily for Project purposes that are located within the Project boundary. Therefore, the transportation management system plan should clearly identify the roads either already within or proposed to be included in the Project boundary that are necessary to access the Project recreational facilities and limit SMUD's responsibilities to those access roads or portions of roads that are primarily used for Project purposes. If the identification of the roads or portions of roads that SMUD would be responsible for involves fewer roads than envisioned in the proposed measure, we would expect a corresponding reduction in the annual cost for repair and maintenance.

Visual Resource Protection

Proposed Articles 1-27 for the UARP and 2-16 for the Chili Bar Project provide for the development and implementation of visual management plans consistent with the Forest Service VQCs for the UARP as well as the BLM visual resource standards for the Chili Bar Project. The Proposed Articles also provide for meetings with the land managing agencies every 5 years to review opportunities to improve how the facilities blend with the surrounding landscapes. These plans would provide for short-term maintenance activities including painting facilities and for review of future maintenance activities to ensure that the facilities do not significantly detract from the natural landscape of the area. The annualized capital cost associated with the measures to improve the visual quality of existing facilities at the UARP would be $77,200 and the annualized for preparation and implementation of the visual resources plan would be $5,500 for the UARP. The benefit to the aesthetic resources of the Project of implementing both the capital measures and the plan would be worth the costs.

Cultural Resources

Proposed Articles 1-23 for the UARP and 2-17 for the Chili Bar Project provide for the continued protection of cultural resources through finalization of HPMPs for the UARP and Chili Bar Project. Proposed Articles 1-24 for the UARP and 2-18 for the Chili Bar Project provide protocols for unanticipated discoveries over the term of any licenses issued for the Projects. SMUD drafted an HPMP in 2005 that was reviewed by the Forest Service in June 2006. On February 11, 2008, the Commission issued the draft PA and draft HPMP for review within a 30-day comment period and directed SMUD to file a revised HPMP within 90 of the close of the comment period. Finalization and implementation of SMUD's or PG&E's HPMP in consultation with the SHPO, Tribes, and the Forest Service in the case of UARP or BLM in the case of Chili Bar would ensure that adverse effects on historic properties arising from UARP or Chili Bar Project operations or Project-related activities over the term of the licenses would be avoided or satisfactorily resolved. We estimate that implementation of the final HPMPs would cost SMUD about $6,600 annually and PG&E about $3,500 annually and the benefit of protecting cultural resources would outweigh the costs of these plans.

Iowa Hill Development

The Settlement Agreement includes a series of Proposed Articles (1-37 through 1-50) that set forth SMUD's commitments for resource protection during the construction and operation of the proposed Iowa Hill development. These measures would address potential effects of the proposed development on native fish in Slab Creek reservoir and other environmental resources of the Eldorado National Forest and surrounding landscape. In written and oral comments on the draft EIS, many local residents expressed concerns about traffic congestion and the damage that heavy equipment would cause on local roads, many of which are unimproved one-lane country roads. They also were concerned about the potential for fire and the damage that a fire cause on Iowa Hill and in the adjacent canyon. Many of the individuals who commented on the draft EIS also attended meetings of the Advisory Committee and questioned why various mitigation measures being considered by SMUD were not included in the draft EIS. In response to these concerns, SMUD indicated that it was working on a Transportation Route Technical Report and an Addendum to the 2005 Visual Resources Technical Report. We asked SMUD to file these reports which they did on January 31, 2008. We have incorporated the results of these revised studies into the final EIS. We also note that the draft EIS did not provide a description of the draft transportation management plan that SMUD included in its license application. We have added information from this draft plan and include the measure in SMUD's proposed action in the final EIS.

Storm Water Pollution Prevention Plan and Erosion Control

Construction of the Iowa Hill development could affect water quality. Proposed Article 1-42, *Water Quality and Water Pollution*, provides for a plan identifying the best management practices for erosion and sediment control and the method of installation and removal of a temporary coffer dam in Slab Creek reservoir to prevent any construction disturbance to the water quality in the reservoir. We reviewed the technical reports and the physical conditions of the reservoir shoreline and conclude that the shoreline attributes and location of the intake combined with the use of an impermeable liner in the upper reservoir would minimize sediment mobilization and shoreline erosion in the Slab Creek reservoir. The proposed storm water pollution prevention plan would provide reasonable assurance that water quality and aquatic habitat are not directly or indirectly adversely affected by SMUD's construction activities. SMUD also would have an environmental monitor onsite to observe conditions. The annual costs associated with the storm pollution prevention plan would be $3,600 and would be necessary to protect aquatic resources.

Groundwater Monitoring

Proposed Article 1-43, *Groundwater*, provides for the development and implementation of a plan for monitoring groundwater during and after construction of the Iowa Hill development. Operation of the Iowa Hill development could result in seepage along the tunnel resulting in soil instability and affecting water quality in the water table. SMUD indicates that eliminating all groundwater from entering and exiting the water conveyance tunnels would be infeasible. Therefore, implementation of this plan would provide information on the effects of the development on groundwater and allow SMUD to recommend mitigation to remedy identified effects on groundwater. The annualize cost of the groundwater monitoring plan would be $3,600 and would be worth the cost to control the effects of the Project on groundwater.

Water Temperature and Fisheries in Slab Creek Reservoir

Proposed Article 1-40, *Aquatic Resources*, includes several provisions to protect native fish (hardhead) populations in Slab Creek reservoir. These provisions include monitoring hardhead populations before and after construction of the pumped-storage facilities, monitoring water temperatures in the shallow water areas of Slab Creek reservoir, ensuring that water surface fluctuations do not occur as a result of Project operations, and monitoring the entrainment of hardhead. Simulations of the operation of the proposed development suggest that the pumping operations could lead to slightly cooler conditions in Slab Creek reservoir. We would not expect increases of less than 1◦C to affect hardhead populations. Monitoring water temperatures along the edge of the reservoir would provide data that could be used along with information about the distribution of hardhead to document if pumped-storage operations are not affecting the distribution of hardhead.

Project operations would typical result in at least 35 feet of water above the Iowa Hill intake. As discussed in section 3.3.3.2, *Aquatic Resources,* because most of the hardhead are at shallower depths and/or near the reservoir margins, entrainment into the intake would likely be minimal. Furthermore, the highest frequency of occurrence of hardhead was at shallow depths near the reservoir margin and juvenile hardhead are not expected to occur at the depth of the intake. Monitoring hardhead distribution and whether entrainment of these fish (or others) occurs as a result of Project operations for 2 years as proposed by SMUD would be justified to document whether this expectation is borne out. The annualized cost of monitoring hardhead populations and monitoring temperature in the shallow water areas of Slab Creek reservoir would be $25,400 and $2,600, respectively.

Terrestrial

Construction of the Iowa Hill development would require the clearing of the majority of the 283-acre site, about 141.5 acres of land. Proposed Article 1-41, *Terrestrial Resources*, provides for in-kind replacement of permanently disturbed vegetation. The upper reservoir, berm, and switchyard would result in the loss of upland mixed-conifer forest, and the transmission line would result in the conversion of mixed conifer forest to non-forested montane shrubland habitat. No riparian vegetation or wetlands would be affected by construction of the proposed development.

Although we concur with the proposed measure, we note that the specific parcels of land that would be purchased, the habitat types they contains, or the wildlife management goals that would be applied to the properties have not yet been determined. Therefore, we recommend that SMUD develop a wildlife lands mitigation plan that identifies the locations of wildlife mitigation lands, management goals and objectives, management activities that would be implemented, and measures to ensure that the management goals would be met. In comments on the draft EIS, SMUD asked that our recommended plan allow for alternative approaches to land conservation such as transfer of lands to conservation organizations. We would have no problem with the inclusion of alternatives that would achieve the same objective to conserve these lands for the benefit of wildlife. Because the wildlife lands would be maintained for the life of the Project, whether managed by SMUD or a third-party, these lands should be included in the Project boundary. Our estimated annual cost of $1,300 for such plan would be justified to ensure that the objectives of the wildlife mitigation are met. In addition, the wildlife and plant protection measures for sensitive plant and wildlife species, bald eagles, vegetation, and invasive weed management would also apply to the Iowa Hill development. Implementing the proposed measure, with Staff's additional recommendation for a final plan, would ensure that the habitat lost due to construction of the Iowa Hill development would be mitigated. The annual cost associated with the acquisition of lands or easements to replace the permanently disturbed wildlife habitat at Iowa Hill would be $36,300.

Slab Creek Recreation Access Plan

Proposed Article 1-49 provides that SMUD address access to Slab Creek for recreation during and after construction. Public access the Slab Creek whitewater run is difficult. The steep terrain and landowner constraints limit suitable sites for parking at the put-in and potential take-out locations. Developing an access plan to help provide a reasonable level of public access to these facilities would help ensure that boaters could use recreational releases. We estimate that the annualized cost of the Slab Creek recreation plan would be $1,800, and the benefit of safe access to the proposed whitewater releases would be worth the cost.

Visual Quality Standards

Proposed Article 1-44 calls for SMUD to provide the Forest Service with the design specifications for the proposed Iowa Hill development that would meet the VQOs of the Eldorado National Forest. Provision of plan specifications and simulated views of the proposed facilities would help ensure that Project facilities, including the earthen berm of the upper reservoir, the intake/outtake structure, and the transmission lines, blend with the surrounding landscape of the Eldorado National Forest. In comments on the draft EIS local residents indicated that SMUD was performing additional visual resource simulations including more viewpoints and requested that the results be included in the final EIS. The study results reinforce our general conclusions that project facilities would introduce new linear elements to the landscape but would not dominate the landscape and do not cause use to change our recommendation for the development of a visual resources protection plan. The annualized cost associated with the visual resource protection plan for Iowa Hill would be $1,800, and the benefit of protecting the Project's aesthetic resources would be worth the cost.

Cultural Resources

Proposed Article 1-45 provides that SMUD comply with the NHPA, section 106, procedures prior to commencing construction on National Forest System lands and to follow unanticipated discovery procedures during the construction and operation of the Project. Unanticipated discovery protocols would protect sites that might be discovered during the construction and operation of the development from unnecessary damage or destruction. The annual cost for compliance with cultural resource regulations at the Iowa Hill development would be included in the cost for the UARP HPMP, and a separate plan for Iowa Hill would not be necessary.

Construction Noise

Proposed Article 1-48 provides measures to address construction noise. Although a large portion of the construction activities for the water conduits and the powerhouse cavern would take place underground, construction of the upper reservoir atop Iowa Hill would generate noise as earth-moving equipment clear the site and build the upper reservoir. SMUD states that most construction work at the Iowa Hill development would begin at 6:30 a.m. to avoid traffic congestion. Starting construction work at this time would reduce local construction-related traffic congestion and safety hazards and is allowed under El Dorado County General Plan. Development and implementation of a plan to control construction noise, as proposed by SMUD, to meet El Dorado County General Plan noise level limits and Forest Service standards would minimize, but not eliminate, the potential effects of noise during construction. Neighboring residents and visitors to the Iowa Hill area would hear the construction activities during the daytime but to a lesser extent than would occur without implementation of noise abatement techniques. The stationary noise source (the turbine/generating units) at the proposed Iowa Hills development would be placed in an underground powerhouse and would not affect noise levels on the surface. Therefore, noise effects associated with operation of the proposed Project would not be significant. Traffic noise, which would be limited to two employees and periodic deliveries and maintenance activities, would be minor. We estimate the annualize cost for the development of a noise abatement plan would be $3,600 and would be necessary to minimize adverse effects of Iowa Hill construction on noise levels.

5.2 CUMULATIVE EFFECTS SUMMARY

The relicensing of the UARP and Chili Bar Project and the licensing of the Iowa Hill development would cumulatively affect water resources, fish and wildlife, recreational opportunities, and cultural resources in the American River Basin and the SFAR Basin. In addition to the diversions in the UARP and Chili Bar Project, the EID operates the El Dorado Project No, 176, which diverts up to 165 cfs of water around a 22-mile section of the SFAR to its consumptive water system and the El Dorado powerhouse, located a short distance downstream of the SFAR's confluence with Silver Creek. This has resulted in an incremental increase in spring through summer temperatures in the river between the confluence and the El Dorado powerhouse. The UARP and Chili Bar Project-proposed increased minimum streamflows, along with the increased minimum streamflows at the El Dorado Project, would tend to reduce spring through summer temperatures in most of the UARP- and Chili Bar Project-affected stream reaches. The operation of the proposed Iowa Hill development would reduce water temperatures emanating from Slab Creek reservoir by less than 0.5°C. This change would have no observable effect on water temperatures in Chili Bar reservoir or the Chili Bar dam reach. Under the Proposed Action, these cumulative effects are expected to provide a thermal regime that would support the designated beneficial uses, including a coldwater habitat for resident fish and amphibians.

Water quality in the UARP and Chili Bar Project-affected reaches is generally good, although it currently does not always satisfy the Basin Plan water quality objectives for bacteria and some chemical parameters. Numerous factors, including land management, development, and water-oriented recreation, all have incrementally adversely affected water quality, particularly fecal coliform concentrations in heavily-used areas of reservoirs and in the Chili Bar dam reach. In contrast, expansion of the Hangtown Creek Wastewater Treatment Plant in Placerville is expected to somewhat reduce bacteria and nutrient loadings from Weber Creek to the SFAR. The cumulative effects of these actions would be an overall improvement in water quality.

Private land development, public land use, and hydropower development have cumulatively affected the California red-legged frog, foothill yellow-legged frog, and mountain yellow-legged frog in the American River Basin due to road construction, multiple land use practices, facilities and operations, and other development that fragment breeding populations and create habitat for species, such as bullfrogs, that prey on California red-legged frogs, foothill yellow-legged frogs, and mountain yellow-legged frogs. Flow releases to benefit coldwater fisheries during the summer and early fall and Project reservoirs may isolate foothill yellow-legged frog breeding populations. For example, it is likely that the foothill yellow-legged frog in lower Slab Creek dam reach and lower Camino dam reach are reproductively isolated by coldwater water releases in upper Slab Creek dam reach and the Slab Creek reservoir (Kupferberg, 2006). However, the proposed minimum flow releases would not increase or decrease the current population fragmentation.

The recreational measures proposed by SMUD and PG&E would improve recreational opportunities throughout much of the SFAR Basin. Each proposed measure is incrementally small. However, together, the recreational measures would improve opportunities in the region, allowing the Projects to adapt to change recreational use over time, better using existing recreational resources, and developing new resources that address current and foreseeable recreational activities, such as hiking and biking.

If SMUD uses Cable Road for access for construction traffic, improvements to this road could stimulate additional residential development in the vicinity of Iowa Hill and could cumulatively affect land use in combination with the land and resource management plan for Eldorado Forest. However, an alternative route suggested by SMUD in its Transportation Route Technical Study (SMUD, 2008x) on the southwest side of Iowa Hill for construction traffic to access the construction site could minimize use of other local roads and reduce the amount of road improvements that would be necessary for construction, thereby also reducing effects on the developmental potential.

The UARP and Chili Bar Project are among a large number of hydroelectric projects in central California that affect prehistoric and historic archaeological resources located along the American River and its tributaries. These projects attract recreational use around the reservoirs. The increased recreational use resulting from the availability of the reservoirs has contributed to both inadvertent and intentional destruction of prehistoric and historic archaeological resources and of TCPs. Although continued erosion and recreational use of the American River area would be expected to continue to affect archaeological resources and TCPs, the measures included in HPMPs for the UARP and Chili Bar Project, as well as measures being or already developed and implemented at other hydroelectric projects in the area, would cumulatively reduce the rate of destruction of these cultural resources.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the Project.

Section 10(j) of the FPA states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to the Commission's notice soliciting final terms and conditions for the UARP and the REA notice for the Chili Bar Project issued on July 28, 2006, as extended for both Projects by notice issued on November 16, 2006, NMFS, Interior, and

CDFG filed letters of comment that included section 10(j) recommendations.[47] These agencies are also parties to the Settlement Agreement.[48] In their letters containing their 10(j) recommendations, Interior, and CDFG recommend that the Commission approve the Settlement Agreement and all the provisions thereof. NMFS did not file revised section 10(j) recommendations. Commission staff also recommends that the Settlement Agreement provisions that are within the scope of section 10(j) be included as terms of any new licenses.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving waterways affected by a project. We reviewed 56 plans for the state of California that have been filed with the Commission and determined that the following 23 are relevant to the UARP and Chili Bar Project. The proposed Iowa Hill development of the UARP does not meet the VQOs of the Eldorado National Forest land and resource management plan. Under Proposed Article 1-44, SMUD would develop a visual resources protection plan that would include final designs for the Iowa Hill development that would meet the Forest Service VQOs for the Eldorado National Forest. There are no other conflicts with the proposed Projects:

- California Advisory Committee on Salmon and Steelhead Trout. 1988. Restoring the balance: 1988 annual report. Sausalito, California. 84 pp.
- California Department of Fish and Game. 1979. Rubicon River wild trout management plan. Sacramento, California. July 1979. 46 pp
- California Department of Fish and Game. 1979. South Fork Merced River wild trout management plan. Sacramento, California. July 1979. 26 pp.
- California Department of Fish and Game. 1979. Nelson Creek wild trout management plan. Sacramento, California. July 1979. 27 pp.
- California Department of Fish and Game. 1981. Yellow Creek wild trout management plan. Sacramento, California. August 1981. 18 pp. and appendix.
- California Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Bureau of Reclamation. 1988.

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[47] All three agencies filed letters in response to the initial notice dated October 18, 2006; October 17, 2006; and October 18, 2006. In its filing, NMFS indicated that Interior and CDFG filed revised terms and conditions on January 31, 2007.

[48] The Settlement Agreement was filed with the Commission on February 1, 2007.

Cooperative agreement to implement actions to benefit winter-run Chinook salmon in the Sacramento River Basin. Sacramento, California. May 20, 1988. 10 pp. and exhibit.

- California Department of Fish and Game. 1990. Central Valley salmon and steelhead restoration and enhancement plan. Sacramento, California. April 1990. 115 pp.
- California Department of Fish and Game. 1993. Restoring Central Valley streams: A plan for action. Sacramento, California. November 1993. 129 pp.
- California Department of Fish and Game. 1996. Steelhead restoration and management plan for California. February 1996. 234 pp.
- California Department of Parks and Recreation. 1998. Public opinions and attitudes on outdoor recreation in California. Sacramento, California. March 1998.
- California Department of Parks and Recreation. 1980. Recreation outlook in Planning District 2. Sacramento, California. April 1980. 88 pp.
- California Department of Parks and Recreation. 1980. Recreation outlook in Planning District 3. Sacramento, California. June 1980. 82 pp.
- California Department of Parks and Recreation. 1994. California outdoor recreation plan, 1993. Sacramento, California. April 1994. 154 pp. and appendices.
- California Department of Water Resources. 1983. The California water plan: Projected use and available water supplies to 2010. Bulletin 160–83. Sacramento, California. December 1983. 268 pp. and attachments.
- California Department of Water Resources. 1994. California water plan update. Bulletin 160–93. Sacramento, California. October 1994. Two volumes and executive summary.
- California Department of Water Resources. 2000. Final programmatic environmental impact statement/environmental impact report for the CALFED Bay-Delta Program. Sacramento, California. July 2000. CD Rom, including associated plans.
- California State Water Resources Control Board. 1975. Water quality control plan report. Sacramento, California. Nine volumes.
- California—The Resources Agency. Department of Parks and Recreation. 1983. Recreation needs in California. Sacramento, California. March 1983. 39 pp. and appendices.

- California—The Resources Agency. 1989. Upper Sacramento River fisheries and riparian habitat management plan. Sacramento, California. January 1989.
- Forest Service. 1988. Eldorado National Forest land and resource management plan. U.S. Department of Agriculture, Forest Service, Placerville, California. December 1988. 752 pp.
- State Water Resources Control Board. 1999. Water quality control plans and policies adopted as part of the state comprehensive plan. April 1999.
- U.S. Fish and Wildlife Service, California Department of Fish and Game, California Waterfowl Association, and Ducks Unlimited. 1990. Central Valley habitat joint venture implementation plan: A component of the North American waterfowl management plan. Department of the Interior, Portland, Oregon. February 1990.
- U.S. Fish and Wildlife Service. 2001. Final restoration plan for the anadromous fish restoration program. Department of the Interior, Sacramento, California. January 9, 2001.

5.5 RELATIONSHIP OF LICENSE PROCESS TO LAWS AND POLICIES

5.5.1 Water Quality Certification

Pursuant to 401(a)(1) of the Federal Water Pollution Control Act (Clean Water Act) and Commission regulations, SMUD and PG&E are required to file as part of their license application a copy of the water quality certificate provided by the state of California or proof that such a certificate has been applied for or the requirements waived. SMUD and PG&E applied for section 401 Water Quality Certification for their Projects on September 22 and 18, 2006, respectively, following the Commission's notice for final terms and conditions (UARP) and REA notice (Chili Bar), which were issued on July 28, 2006. Both applicants subsequently withdrew their applications for Water Quality Certification. PG&E submitted a new application for Water Quality Certification in a letter dated May 1, 2007, that was acknowledged as received by the Water Board on May 22, 2007. SMUD resubmitted its application on October 23, 2007. State action on the Water Quality Certification applications will be required before October 22, 2008, for the UARP and before May 1, 2008, for the Chili Bar Project. If the state does not act on the two applications by these dates, respectively, certification of the two Projects will be deemed waived.

5.5.2 Endangered Species Act

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or cause the destruction or adverse modification of the critical habitat of such species.

The FWS lists three plant and three wildlife species potentially occurring in vicinity of the UARP and Chili Bar Project that are federally designated as threatened or endangered and therefore protected under the ESA. These include the endangered Pine Hill ceanothus (*Ceanothus roderickii*) and Pine Hill flannelbush (*Fremontodendron decumbens*), as well as the threatened Layne's butterweed (*Seneco layneae*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and California red-legged frog (*Rana aurora draytonii*).

Our analyses of Project effects on these species are presented in section 3.3.5, *Threatened and Endangered Species*, and our final recommendations are presented in section 5.1, *Comprehensive Development and Recommended Alternative*.

We conclude that relicensing the UARP with the fish and wildlife habitat protection and enhancement measures proposed in the Settlement Agreement would be likely to adversely affect the Pine Hill ceanothus, Pine Hill flannelbush, the Layne's butterweed, and the valley elderberry longhorn beetle, but would not likely adversely affect the California red-legged frog. By letter dated September 25, 2007, we initiated formal consultation with FWS on the three plant species and valley elderberry longhorn beetles, and requested concurrence on the California red-legged frog. By letter dated October 23, 2007, FWS determined that the information in the draft EIS was insufficient for the FWS to consult on the UARP and requested additional information on the potential effect of the Proposed Actions on the Pine Hill plants, the valley elderberry longhorn beetle, and the California red-legged frog. By letter dated December 12, 2007, we provided the information requested by FWS. Subsequently, on December 13, 2007, FWS indicated that it had only recently learned of the El Dorado-SMUD Cooperative Agreement of 2005 and asked for a full assessment of the prospective development that could be stimulated by the water supply agreement. FWS reiterated this request by letter dated February 7, 2008, without mention of the documentation we provided in response to the original request. FWS maintains the position that it cannot initiate consultation on the relicensing of the UARP without a full assessment of the effects on ESA species of the water supply agreement.

We conclude that relicensing the Chili Bar Project with the fish and wildlife habitat protection and enhancement measures proposed in the Settlement Agreement would have no effect on the Pine Hill endemic plants and the valley elderberry longhorn beetle and would not likely adversely affect the California red-legged frog. By letter dated September 25, 2007, we requested concurrence from FWS on the California red-legged frog. By letter dated October 19, 2007, FWS determined that the information in the draft EIS was insufficient for the FWS to make a determination about the California red-legged frog and requested additional information. On November 2, 2007, we provided the information requested by FWS. On December 6, 2007, FWS concurred with our determination that the relicensing of the Chili Bar Project is not likely to adversely affect the California red-legged frog.

5.5.3 National Historic Preservation Act

The NHPA (16 U.S.C. 470 et seq.) (as amended) requires federal agencies to manage cultural resources under their jurisdiction and authorizes the Secretary of the Interior to maintain a National Register. The law also provides for the creation of SHPOs to facilitate the implementation of federal cultural resource policy at the state level, and for the responsible federal agency (i.e., agency official) to consult with Native American tribes who attach religious or cultural importance to cultural resources under their jurisdiction. Section 106 of the Act requires federal agencies to take into account the effect of any proposed undertaking on properties listed in, or eligible for listing in the National Register. If the agency official determines that the undertaking may have adverse effects on properties listed in or eligible for listing in the National Register, the agency official must afford an opportunity for the Advisory Council to comment on the undertaking. The relicensing of the UARP and Chili Bar Project is considered an undertaking, and the Commission acts as the agency official.

SMUD and PG&E, under the authority of the Commission, have conducted section 106 consultations with the California SHPO, and other interested parties since 2001. This consultation included scheduled collaborative cultural resource workgroup meetings, as well as individual meetings conducted by the applicants. Commission staff will be continuing Section 106 consultations. On February 11, 2008, Commission staff circulated a draft PA and the draft HPMP for the UARP for comment and directed SMUD to file a revised HPMP within 90 days of the close of the comment period. Under the Proposed Action, UARP would implement the final HPMP that would be attached to the executed PA. On January 15, 2008, the Commission circulated a draft PA for comments. Under the Proposed Action PG&E would finalize its HPMP within one year of license issuance. Each HPMP would provide specific guidance to applicant personnel about the treatment of historic, archaeological, and traditional cultural resources during the terms of the new licenses.

5.5.4 Americans with Disabilities Act

Public recreation facilities must comply with the Americans with Disabilities Act of 1990 (ADA, Public Law 101-336) to the extent possible. The Commission, however, has no statutory role in implementing or enforcing the ADA as it applies to its licenses. A licensee's obligation to comply with the ADA exists independent of its Project license. As recreation facilities are updated, expanded, or newly developed, SMUD and PG&E propose to ensure that access needs of the disabled are addressed and comply with ADA standards. The proposed recreational measures included are consistent with this Act.

5.5.5 Clean Air Act

The 1990 amendments to the Clean Air Act (CAA) and the Conformity Rules require federal agencies to conform to State Implementation Plans (SIPs). EPA and federal agencies have established requirements and procedures to ensure that federally sponsored or approved actions will comply with the National Ambient Air Quality Standards (NAAQS), and conform to the appropriate SIPs. The conformity rules apply to designated non-attainment or maintenance areas for criteria pollutants regulated under NAAQS. The SIPs are the approved state air quality regulations that provide policies, requirements, and goals for the implementation, maintenance, and enforcement of the NAAQS. SIPs include emission limitations and control measures to attain and maintain the NAAQS. The EPA has developed two conformity regulations for transportation and non-transportation projects. Non-transportation projects are governed by the "general conformity" regulations (40 CFR Parts 6, 51 and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Since the proposed Project is a non-transportation project, the general conformity rule applies. We prepared a general conformity determination and applicability analysis using the EPA NONROAD model and provided the results in the draft EIS. In response to the California Air Resources Board (CARB), we prepared another general conformity determination and analysis using the CARB EMFAC and OFFROAD2007 models and provided the report to the CARB for review. Under the EPA NONROAD model, SMUD proposed to adjust its construction schedule to eliminate exceedances of oxides of nitrogen. However, under the CARB OFFROAD model, emissions would be below the *de minimis* for all pollutants such that an adjustment to the construction schedule would not be needed.

COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Section 6
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FEIS

6.0 LITERATURE CITED

APLIC (Avian Power Line Interaction Committee). 1996. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996. Edison Electric Institute. Washington, DC.

APLIC. 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, DC.

BEA (U.S. Bureau of Economic Analysis). 2007. Regional economic accounts. Available at: http://www.bea.gov/bea/regional/reis/, accessed August 29, 2007. U.S. Bureau of Economic Analysis, Washington, DC.

Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers. Fish Passage Development and Evaluation Program, North Pacific Division, Portland, OR.

BLM (U.S. Bureau of Land Management). 2004. The South Fork American River—A management plan, and decision record. U.S. Bureau of Land Management, Folsom Field Office, Folsom, CA. (not seen, as cited in DTA and Goodavish, 2005a)

CARB (California Air Resources Board). 2006. Ambient air quality standards (AAQS). http://www.arb.ca.gov/research/aaqs/caaqs. California Air Resources Board, Sacramento, CA.

California Department of Finance, El Dorado County Economic Forecast 2004 web page. http://www.video.dot.ca.gov/hq/tpp/offices/ote/El%20Dorado04.pdf. September 6, 2005.

CDEC (California Data Exchange Center). 2007. California Data Exchange Center for the California Department of Water Resources. Sacramento, CA. Accessed from http://cdec.water.ca.gov/reservoir.html on February 13, 2007.

CDFG (California Department of Fish and Game). 2007. Rationale document for Settlement Agreement, base case. Filed on January 31.

CDFG. 2006a. PHABSIM analysis for Rubicon River below Rubicon reservoir dam.

CDFG. 2006b. Composite WUA analysis for Gerle Creek below Loon Lake dam and SF Silver Creek below Ice House dam.

CDFG. 2004. Bear hunting, final environmental document. State of California, the Resources Agency, CDFG Wildlife Programs Branch, Sacramento, CA.

CDFG. 2003. California stream bioassessment procedure (protocol brief for biological and physical/habitat assessment in wadeable streams) web page. http://www.dfg.ca.gov/cabw/csbp_2003.pdf, updated 2003, accessed on August 2, 2006. California Department of Fish and Game, Water Pollution Control Laboratory, Aquatic Bioassessment Laboratory.

CDHS (California Department of Health Services). 2002. Incomplete blue book regulations only, March 11, 2002 web page. http://www.dhs.ca.gov/ps/ddwem/publications/Regulations/Bluebook3-11-02.pdf, updated 2004, accessed on August 2, 2006. California Division of Drinking Water and Environmental Management.

CEC (California Energy Commission). 2007. 2007 Integrated energy policy report. California Energy Commission, Sacramento, CA. November 2007.

CEC. 2004. Integrated energy policy report 2004 update. Sacramento, CA. November

Central Valley Water Board (California Regional Water Quality Control Board, Central Valley Region). 2004. The water quality control plan (Basin Plan) for the California Regional Water Quality Control Board, Central Valley Region, The Sacramento River Basin and the San Joaquin River Basin, Fourth Edition, Revised September 2004 (with approved amendments). Central Valley Regional Water Quality Control Board web page. http://www.waterboards.ca.gov/centralvalley/available_documents/basin_plans/SacSJR.pdf, updated May 4, 2006, accessed May 5, 2006. Central Valley Regional Water Quality Control Board.

Central Valley Water Board. 2003. 2002 CWA Section 303(d) list of water quality limited segment, Central Valley Regional Water Quality Control Board, Approved by EPA July 2003 web page. http://www.waterboards.ca.gov/tmdl/docs/2002reg5303dlist.pdf, updated August 7, 2003, accessed June 14, 2006.

CH2M HILL. 2008a. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101), Iowa Hill pumped-storage development visual resources technical report addendum no. 1. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by CH2M HILL, Inc., Sacramento, CA. January 2008.

CH2M HILL. 2008b. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101), Iowa Hill pumped-storage development transportation route technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by CH2M HILL, Inc., Sacramento, CA. January 2008.

CH2M HILL and DTA (Devine Tarbell & Associates, Inc.). 2005a. Socioeconomic assessment of Iowa Hill construction and operations technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. January 2005.

CH2M HILL and DTA. 2005b. Iowa Hill pumped storage development property value assessment technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. January 2005.

CH2M HILL and DTA. 2004. Socioeconomic impact technical report. Prepared by CH2M HILL, Inc., Sacramento, CA, and Devine Tarbell & Associates, Inc., Sacramento, CA. October.

Cole, T.M. and E.M. Buchak. 1995. CE-QUAL-W2: A two-dimensional, laterally averaged, hydrodynamic and water quality model, Version 2.0. Prepared for U.S. Army Corps of Engineers, Washington, D.C. Instruction Report EL-95-1.

DTA (Devine Tarbell & Associates, Inc.). 2005a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Water temperature technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. May 2005, Version 3. 73 pages plus appendices.

DTA. 2005b. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Water quality technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. May 2005, Version 5. 98 pages plus appendices.

DTA. 2004a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) riparian vegetation and wetlands technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, San Francisco, CA. October 2004.

DTA. 2004b. Mule deer technical report. Prepared for SMUD's UARP FERC no. 2155. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004c. Bird-powerline associations technical report. Prepared for SMUD's UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004d. Black bear technical report. Prepared for SMUD's UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004e. Valley elderberry longhorn beetle technical report. Prepared for SMUD's UARP FERC No 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. July 2004.

DTA. 2004f. Bald eagle and osprey technical report. Prepared for SMUD's UARP FERC No. 2101. Devine Tarbell & Associates, Inc., Sacramento, CA. October, 2004.

DTA. 2004g. Iowa Hill wetlands technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Devine Tarbell & Associates, Inc., Sacramento, CA. October 2004.

DTA and EES (EES Consulting). 2005. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) Iowa Hill pumped storage development water temperature technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and EES Consulting, Seattle, WA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. February 2005. 32 pages plus appendices.

DTA and Goodavish (Devine Tarbell & Associates, Inc. and Martha Goodavish Planning and Design). 2005a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) UARP land use technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. February 2005.

DTA and Goodavish. 2005b. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101), Iowa Hill pumped storage development visual resources technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. January 2005.

DTA and Goodavish. 2004. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) visual assessment of Upper American River Project features technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Martha Goodavish Planning and Design, Walnut Creek, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, Sacramento, CA. September 2004.

DTA (Devine Tarbell & Associates, Inc.) and Stillwater Sciences. 2005a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) flow fluctuation in the reach downstream of Chili Bar technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA, and Pacific Gas and Electric Company, San Francisco, CA. May 2005 88 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005b. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Amphibians and aquatic reptiles technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. April 2005, Version 3. 54 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005c. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Reservoir fisheries technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. April 2005, Version 2. 19 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005d. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) stream fisheries technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. January 2005, Version 2. 43 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005e. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) Iowa Hill pumped storage development fish entrainment potential technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. February 2005. 32 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005f. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Stream habitat mapping technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. April 2005, Version 3. 16 pages plus figures and appendices.

DTA and Stillwater Sciences. 2005g. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) shallow water entrainment technical report. Prepared for Sacramento Municipal Utility District, Sacramento, CA.

DTA and Louis Berger. 2004a. Recreation demand technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and The Louis Berger Group, Oakhurst, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. September 2004.

DTA and Louis Berger. 2004b. Whitewater boating feasibility technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and The Louis Berger Group, Oakhurst, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. September 2004.

DTA and Louis Berger. 2004c. Recreational flow in the reach downstream of Chili Bar feasibility technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA, and The Louis Berger Group, Oakhurst, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA. September 2004.

DTA (Devine Tarbell & Associates, Inc.) and Stillwater Sciences. 2004a. Sacramento Municipal Utility District Upper American River Project (FERC Project No. 2101) and Pacific Gas and Electric Company Chili Bar Project (FERC No. 2155) Fish passage barriers technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA. Prepared for Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. August 2004, Version 1. 32 pages plus figures and appendices.

DTA (Devine Tarbell & Associates, Inc.) and Stillwater Sciences. 2004b. Physical habitat simulation technical report. Volume 1. Prepared for Sacramento Municipal Utility District Sacramento, CA. August 2004.

Devine Tarbell & Associates, Inc. (DTA) and Stillwater Sciences. 2004c. Amphibian habitat test flow technical report. Prepared by Devine Tarbell & Associates, Inc., Sacramento, CA and Stillwater Sciences, Davis, CA.

EPA (U.S. Environmental Protection Agency). 2006. Special Session on *Didymosphenia geminata* Western Division American Fisheries Society Meeting May 15-16, 2006 Bozeman, Montana, United States, Revised post meeting update web page. http://www.epa.gov/region8/water/monitoring/may06meeting.html, last updated September 13, 2006, accessed on February 5, 2007.

EPA. 2000. Guidance for assessing chemical contaminant data for use in fish advisories, Volume 1: Fish sampling and analysis, Third edition. EPA 823-B-00-007. U.S. Environmental Protection Agency, Office of Water, Washington, DC. November 2000.

FERC (Federal Energy Regulatory Commission). 2006. El Dorado Irrigation District, Project No. 184-065, order issuing new license (October 18, 2006). Federal Energy Regulatory Commission, Washington, DC.150 pp.

FERC. 2003. Final environmental impact statement for the El Dorado Irrigation District FERC Project No. 184. Federal Energy Regulatory Commission, Washington, DC.

FICON (Federal Interagency Committee on Noise). 1992. Federal Agency review of selected airpoint noise analysis issues. Federal Interagency Committee on Noise, Washington, DC. August 1992.

FWS (U.S. Fish and Wildlife Service). 2007. National bald eagle management guidelines. Available at: www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. Accessed February 19, 2008. U.S. Fish and Wildlife Service. May 2007.

FWS. 2006. Endangered and threatened wildlife and plants; 12-month finding for a petition to list the California spotted owl as threatened or endangered. Federal Register, Vol. 71, No. 100, p. 29886–29908. May 24, 2006.

FWS. 1999. Conservation guidelines for the valley elderberry longhorn beetle. U.S. Fish and Wildlife Service, Sacramento, CA. July 9, 1999. 13p.

FWS. 1986. The Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, OR. 160pp.

GANDA (Garcia and Associates). 2006. Identifying climatic and water flow triggers associated with breeding activities of a foothill yellow-legged frog (*Rana boylii*) population on the North Fork Feather River, California. Prepared for California Energy Commission Public Interest Research Program. Garcia and Associates, San Anselmo, CA. August 2006. Final.

GANDA. 2004. Results of the 2004 study evaluating impacts of elevated flows on foothill yellow-legged frog (*Rana boylii*) habitat in the Poe Reach, North Fork Feather River. Prepared for PG&E. Garcia and Associates, San Anselmo, CA. December 2004. Final.

Gerstung, E.G. 1973. Fish population and yield estimates from California Trout Streams. Cal-Neva Wildlife.

Howe, P.D. and S. Dobson. 2002. Silver and silver compounds: environmental aspects, Concise International Chemical Assessment Document (CICAD) 44. Available at: http://www.inchem.org/documents/cicads/cicads/cicad44.htm, accessed April 5, 2004. International Programme on Chemical Safety.

Institute for Bird Populations. 2007. BBS habitat classification: Classifying and photographing habitat at breeding bird survey (BBS) point count locations throughout the Sierra Nevada web page. http://www.birdpop.org/Sierra/bbshab.htm. The Institute for Bird Populations, Point Reyes Station, CA.

IUCN (International Union for the Conservation of Nature and Natural Resources). 2007. Global invasive species database web page. http://www.issg.org/database/species/ecology.asp?si=775&fr=1&sts=, last updated November 28, 2006, accessed on February 5, 2007. IUCN, The World Conservation Union.

Kilroy, C. 2004. A new alien diatom, *Didymosphenia geminata (Lyngbye) Schmidt*: its biology, distribution, effects and potential risks for New Zealand fresh waters. National Institute of Water & Atmospheric Research Ltd., Christchurch, New Zealand. NIWA Client Report: CHC2004-128, November 2004. 34 pp.

Kupferberg, S. J. 2006. Final letter report regarding *Rana boylii* in the UARP. Letter to J. O. Williams, Fisheries Biologist, Eldorado National Forest, Placerville, CA. October 5, 2006.

Lipton, D. 2007a. Biological evaluation of terrestrial species for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 2007.

Lipton, D. 2007b. Terrestrial management indicator species report for SMUD's proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 2007.

Mount, J., S. Yarnell, S. Kupferberg, and A. Lind. 2006. Pulsed flow effects on foothill yellow-legged frog (*Rana boylii*): Integration of empirical, experimental and hydrodynamic modeling approaches. Prepared for the California Energy Commission by U.C. Davis Center for Watershed Sciences. Contract No. 500-01-044.

Moyle, P.B. 2002. Inland fishes of California. Revised edition. University of California Press, Berkeley, CA. 502 pp.

MWH (Montgomery Watson Harza). 2004. Socioeconomic study data needs. June 29. (not seen, as cited in CH2M Hill and DTA, 2005a)

NAS (National Academy of Sciences). 1991. Seafood Safety. Committee on Evaluation of the Safety of Fishing Products, National Academy Press, Washington, DC. (not seen, as cited in EPA, 2000)

PG&E (Pacific Gas and Electric Company). 2005. Application of Pacific Gas and Electric Company for the Chili Bar Project, FERC Project No. 2155. Sacramento, CA. June 21.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, CO.

SDGFP (South Dakota Department of Game, Fish, and Parks). 2006. Troublesome diatom spreads in Black Hills streams. http://www.sdgfp.info/GFPnews/News06/07-14-06.htm, accessed on February 5, 2007. South Dakota Department of Game, Fish, and Parks. July 14, 2006.

Siegel, R.B. and D.F. DeSante. 1999. The draft avian conservation plan for the Sierra Nevada Bioregion: conservation priorities and strategies for safeguarding Sierra bird populations. Version 1.0. Available at: http://www.prbo.org/calpif/htmldocs/sierra.html. Institute for Bird Populations report to California Partners in Flight.

SMAQD (Sacramento Metropolitan Air Quality District). 2003. Sacramento area regional 2002 milestone report. Sacramento Metropolitan Air Quality District, Sacramento, CA. May 2003.

SMUD (Sacramento Municipal Utility District). 2006. Response to the Federal Energy Regulatory Commission's December 20, 2005 Request for Clarification and Additional Information, Upper American River Project (FERC Project No. 2101). Sacramento Municipal Utility District, Sacramento, CA. March 17, 2006. 159 pp.

SMUD. 2005. Application of Sacramento Municipal Utility District for the Upper American River Project, FERC Project No. 2101. Sacramento Municipal Utility District, Sacramento, CA. July 7, 2005.

SMUD. 2004. Fish community assessment metrics. A handout to the Aquatic Working Group. Sacramento Municipal Utility District, Sacramento, CA. (not seen, cited in Settlement Agreement Rationale Report).

SMUD (Sacramento Municipal Utility District) and PG&E (Pacific Gas and Electric Company). 2007. Relicensing Settlement Agreement for the Upper American River Project and Chili Bar Project. Sacramento Municipal Utility District, Sacramento, CA and Pacific Gas and Electric Company, San Francisco, CA. January 2007.

Stillwater Sciences. 2008. Sacramento Municipal Utility District, Upper American River Project (FERC Project No. 2101) technical report on Iowa Hill pumped-storage development turbidity analysis. Prepared for Sacramento Municipal Utility District, Sacramento, CA. Prepared by Stillwater Sciences, Sacramento, CA. January 2008.

Taylor, M. 2007. Biological evaluation for sensitive plants for the proposed Upper American River Project (UARP), FERC special use permit for the Iowa Hill pumping station. U.S. Forest Service, Eldorado National Forest.

Theurer, F.D., K.A. Voos, and W.J. Miller. 1984. Instream water temperature model. Instream Flow Information Paper 16. U.S. Fish and Wildlife Service FWS/OBS-84-15.

Thurow, R.F. and D.J. Schill. 1996. Comparison of day snorkeling, night snorkeling, and electrofishing to estimate bull trout abundance and size structure in a second-order Idaho stream. North American Journal of Fisheries Management 16(2):314-323.

Tollefson, L. 1989. Methylmercury in fish: Assessment of risk for U.S. consumers. In: The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies. D.J. Paustenback (ed). John Wiley & Sons, New York, NY. (not seen, as cited in EPA, 2000)

U.S. Census Bureau. 2005. American Community Survey 2005 web page. http://www.census.gov/acs/www/index.html. Last modified March 5, 2007.

USGS (United States Geological Survey). 2007. USGS Surface-Water Data for California. Reston, VA. Accessed from http://nwis.waterdata.usgs.gov/ca/nwis/sw, on January 15, 2007.

USGS. 2005. Water Resources Data, California, water year 2004. Volume 4, Northern Central Valley Basins and The Great Basin from Honey Lake Basin to Oregon State Line. Water Data Report CA-04-4. April 2005.

Water Board (State Water Resources Control Board). 2005. Notice of application to appropriate water by permit, Applications 31595 and 31596, El Dorado County, Rubicon and South Fork American Rivers, California. State Water Resources Control Board, Sacramento, CA. May 24, 2005.

WECC (Western Electricity Coordinating Council). 2005. 10-year coordinated plan summary: Planning and operation for electric system reliability. June.

Wells, S.A. 2000. CE-QUAL-W2 Version 3: Hydrodynamic and water quality river basin modeling Proceedings, HydroInformatics 2000, IAHR, CDROM_EM5.

Williams, J. 2007a. Aquatic management indicator species report for SMUD’s proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 28, 2007.

Williams, J. 2007b. Biological evaluation for aquatic species for SMUD’s proposed Iowa Hill development—FERC Project No. 2101-084. U.S. Forest Service, Eldorado National Forest, Placerville Ranger District. June 28, 2007.

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HYDROELECTRIC PROJECTS
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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Appendix A
Comments on the Draft Environmental Impact Statement
for the
Upper American River Hydroelectric Project
Project No. 2101-084
and the
Chili Bar Hydroelectric Project
Project No. 2155-024

FEIS

APPENDIX A

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE
UPPER AMERICAN RIVER HYDROELECTRIC PROJECT
PROJECT NO. 2101-084
AND THE
CHILI BAR HYDROELECTRIC PROJECT
PROJECT NO. 2155-024

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ACRONYMS AND ABBREVIATIONS

Advisory Committee	Iowa Hill Joint Advisory Committee
CARB	California Air Resources Board
Commission	Federal Energy Regulatory Commission
DO	dissolved oxygen
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
HPMP	historic properties management plan
Interior	U.S. Department of the Interior
PG&E	Pacific Gas and Electric Company
Reclamation	U.S. Bureau of Reclamation
SFAR	South Fork of the American River
SMUD	Sacramento Municipal Utility District
TCP	traditional cultural property
UARP	Upper American River Project
VQO	visual quality objective

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The U.S. Environmental Protection Agency's (EPA) notice of availability of the draft environmental impact statement (EIS) was issued on September 21, 2007, and comments on the draft EIS were due on November 13, 2007. In addition, the Federal Energy Regulatory Commission (Commission) staff conducted a public meeting in Placerville, California, on November 5, 2007.

About 20 people spoke at the public meeting. Two individuals who are signatories to the Settlement Agreement and several recreational boaters expressed concern about the modifications that staff made in the draft EIS to the proposed recreational streamflows downstream of Slab Creek dam. They stated that staff misunderstands the connection between the construction of the Iowa Hill development and the enhanced whitewater boating flows and request that the staff adopt the language of the Settlement Agreement in the final EIS. The majority of speakers, however, were local residents, participants on the Iowa Hill Joint Advisory (Advisory Committee), or representatives of the Apple Hill Growers Association, and they raised numerous concerns about the effects associated with the construction of the Iowa Hill development. These speakers cited blasting, heavy equipment damage to county roads, dust, threat of fire, the potential effects of fire, loss of habitat, and ultimately fewer visitors to the area as major concerns. With regard to use of roads during construction, many speakers asked if traffic studies were done; noted that Cable Road is only one lane; and cited safety concerns for the children, walkers, bicyclists, and pets that use the roads that would be upgraded to handle the construction traffic. Many speakers indicated that they attended meetings of the Advisory Committee with Sacramento Municipal Utility District (SMUD) representatives and requested that the final EIS consider the many mitigation measures that were identified by the Advisory Committee. Many of the points raised by the speakers at the public meeting are also raised in letters filed in response to the draft EIS and are addressed in our responses to those comments.

At the public meeting as well as by teleconference on November 15, 2007, Commission staff requested that SMUD file any new studies and modifications to its proposed action resulting from consultation with the Advisory Committee. In its response filed on December 7, 2007, SMUD indicated that it is conducting preliminary analyses of mitigation measures proposed by the Advisory Committee and has not adopted any new measures beyond what is proposed in the license application and Settlement Agreement. Several local residents including Jim and Nancy Summers, Mike DeBord, and Steve Speth also filed correspondence with SMUD from 2005 through 2007 that contains feedback and recommendations from Advisory Committee members on SMUD draft plans. Because the information contained in these filings relate to discussions between SMUD and the Advisory Committee that are not part of the public record and because SMUD has not modified its proposed action in response to the feedback, we do not provide point by point responses to these comments. However, we have taken the feedback into consideration in our recommendations in the final EIS.

In this appendix, we[49] summarize the written and oral comments received; provide responses to those comments; and indicate, where appropriate, how we modified the text in the final EIS. We grouped the comment summaries and responses by topic for convenience. We did not summarize statements that are simply in support of or against the Settlement Agreement or Staff Alternative measures without providing any new information. We did not summarize comments that point out minor edits to the draft EIS; however, we have made these edits in the final EIS. The following entities filed comments on the draft EIS.

Commenting Entity	Filing Date
UARP and Chili Bar Project	
Christa Campbell	November 5, 2007
Hilde Schweitzer	November 6, 2007
American Whitewater[50]	November 9, 2007
Teresa Simsiman	November 9, 2007
U.S. Department of the Interior	November 9, 2007
U.S.D.A. Forest Service	November 9, 2007
Lois Bailey-Hacker	November 8, 2007
California Department of Fish and Game	November 12, 2007
Friends of Slab Creek	November 13, 2007
David Maurier	November 13, 2007
Pacific Gas and Electric Company	November 13, 2007
Chuck Seidler	November 13, 2007
Sacramento Municipal Utility District	November 13, 2007
U.S. Environmental Protection Agency	November 13, 2007
Bryant Burkhardt	November 14, 2007

[49]In this section "we" means the Commission staff. This is a standard section for the Commission's NEPA documents that presents the Commission staff's preferred alternative and rationale in support of the preferred alternative; it does not necessarily reflect the Forest Service's conclusions.

[50]Filed on behalf of American Whitewater, California Outdoors, Friends of the River, California Sportsfishing Protection Alliance, American River Recreation Association and Camp Lotus, and Hilde Schweitzer

Commenting Entity	Filing Date
Jane Arteaga	November 19, 2007
U.S. Army Corps of Engineers	November 19, 2007
UARP Only	
Christa Campbell	November 5, 2007
Annamarie Clark	November 5, 2007
Mike DeBord	November 5, 2007
Richard Morris	November 5, 2007
Bob Penn	November 5, 2007
Hilde Schweitzer	November 5, 2007
Chris Shackleton	November 7, 2007
Jeffery Hansen	November 13, 2007
Jim and Nancy Summers	November 13, 2007
Michael and Eleanor Kuehn	November 21, 2007

PROCEDURAL AND GENERAL

Comment-1: Mr. Hansen and several individuals who commented at the public meeting questioned the Commission's decision to include SMUD's Iowa Hill development in the EIS for the relicensing of the Upper American River Project (UARP) and Chili Bar Project. These individuals request that environmental effects of the Iowa Hill development be considered in a separate EIS.

Response: SMUD proposes the Iowa Hill development as part of its application for a new license for the UARP to improve its ability to provide energy during peak demand periods. Because the operations of the proposed Iowa Hill development would affect the operation and environmental effects of the existing UARP, it is reasonable and appropriate to consider the Iowa Hill development at the same time that we are assessing the environmental effects associated with the relicensing of the UARP. Commission staff analyzed the potential effects of relicensing the UARP with and without the construction and operation of the proposed Iowa Hill on environmental resources in the draft EIS. In response to comments, we updated information about the use and improvements of local roads for construction and added more analysis of fire threats. However, we do not agree that a separate EIS is required for the Iowa Hill development.

Comment-2: Mr. Hansen and several individuals who commented at the public meeting noted that the draft EIS is completely silent about an extensive set of proposed Iowa Hill development construction and operation mitigation measures generated during the past several months by the Advisory Committee. The Advisory Committee includes representatives from SMUD, El Dorado County, El Dorado Irrigation District, Apple Hill Growers Association, Camino Community Action Committee, and the Iowa Hill Action Committee. Mr. Hansen states that these proposed measures will not be reviewed and adopted by SMUD until it decides to proceed with the development. Nevertheless, Mr. Hansen points out that these measures represent a significant effort in identifying meaningful mitigation and therefore should be included and analyzed in the final EIS.

Response: We requested that SMUD provide us with information about the role of the Advisory Committee as well as any changes to the license application or proposed measures based on discussion with the Advisory Committee. SMUD filed the requested information on December 7, 2007. We incorporated the information into the final EIS. According to that letter, SMUD has not adopted any of the recommendations contained in the Advisory Committee's matrices but is conducting preliminary analyses of the proposed mitigation measures. Some of these measures may be included in our recommended final Transportation Management Plan to be developed in consultation with the Advisory Committee.

Comment-3: Mr. Penn states that the EIS should include a detailed review of alternative power plant sites for the Iowa Hill development. He asks that such a review at a minimum include consideration of two sites (Deer Knob and Big Hill) bordering the Union Valley reservoir that have favorable features, easy access roads, in-place power lines, adequate elevation, no residential or commercial development, and much less exposure to fire.

Response: We added a discussion of the alternative sites analysis performed by SMUD in section 2.4.5, *Alternative Sites Analysis,* of the final EIS.

Comment-4: Interior notes that the proposed UARP operational changes, as described in the draft EIS, would change the seasonality of inflow from the South Fork of the American River (SAFR) into Folsom reservoir that is operated by the U.S. Bureau of Reclamation (Reclamation). Reclamation reserves the right to review the effects of the proposed UARP operational changes on Folsom dam and reservoir operations relative to its current contracts with SMUD and the city of Sacramento.

Response: The Commission's standard reopener article would be included in any license as the vehicle for making changes to the license if unforeseen and unanticipated adverse environmental effects occur in the future. The Commission can address any unintended changes in inflow to Folsom reservoir through the standard license reopener.

Comment-5: Pacific Gas & Electric (PG&E) points out that the word *Project* is used inconsistently in the draft EIS and requests that the final EIS clearly distinguish when a reference is in regard to both Projects or only the UARP or Chili Bar Project. PG&E further points out that virtually all of the Project-related reaches are outside of the Project boundaries and terminology in the final EIS should clarify this fact.

Response: In the draft EIS, staff used the capitalized term *Projects* to refer to both the UARP and Chili Bar Project and used the lower case term *project* or *projects* to refer to projects other than the UARP and Chili Bar Project. We searched on these terms to ensure that they are used consistently in the final EIS. We also clarified in the final EIS that the Project reaches are generally outside of the Project boundaries.

NEED FOR POWER

Comment-6: Mr. and Mrs. Summer raise numerous questions about the *Need for Power* discussion in section 1.0 of the draft EIS. First, they observe that the net rate of efficiency would be closer to 60 percent rather than the 80 percent projected by SMUD and that a lower net rate of efficiency would result in greater annual losses of energy than estimated. Second, they question the statement that SMUD and possibly other utilities would use the electricity from the Project to displace the use of gas-fired energy during on peak hours. Third, they comment that the statement in the draft EIS that California utilities and generators have some options for shifting power supplies from off-peak to on-peak periods through the use of pumped storage implies that was a conclusion cited in the 2004 Integrated Energy Policy. They point out that pumped storage is only one option and all other options should be fully explored prior to making any decision on the Iowa Hill development. Finally, Mr. and Mrs. Summer comment that the fourth paragraph in section 1.2.2 of the draft EIS implies that there will be power benefits to the local community. He notes that there is not one user of SMUD power in El Dorado County.

Response: The Summers did not provide any citations to support the contention that pumped storage projects have a net efficiency of 60 percent. The hydro-mechanical equipment in this Project would likely be new equipment designed to state-of-the-art standards. Therefore, efficiency in the range of 75 to 80 percent would not be unrealistic. Note the total head on this Project is on the order of 1,200 feet and variations in net head would not significantly affect the efficiency.

We see no reason to question the displacement of gas fired generation during on-peak hours. The power from by the Iowa Hill development would generally be produced during on-peak hours and hence would displace gas fired combustion turbines. We reviewed the recently issued *2007 Integrated Energy Policy Report* (CEC, 2007a) as issued by the California Energy Commission. The California Energy Commission continues to include pumped storage as a primary load management technique and an important tool for storing renewable energy on windy nights. There are other methods of shifting off-peak power to on-peak power, such as storage batteries; however, large-scale implementation of battery technology currently is not economically feasible.

We acknowledge that SMUD's service includes Sacramento County and a small portion of Placer County. We did not specifically reference El Dorado County a beneficiary in the draft EIS; however, SMUD is an interconnected utility, and energy as well as ancillary services may be incidentally provided to the region including El Dorado County.

Comment-7: Mr. DeBord states that the cost analysis does not include the new capital costs of supplying power to pump the water from Slab Creek reservoir to the new Iowa Hill reservoir. He also comments that SMUD repeatedly states that it would use wind power to supply this power, and he wonders why SMUD does not include the cost of the windmills needed to generate this power in its cost analysis. He states that factoring the capital cost of the planned windmills or other new power generating facilities could easily make the Project cost prohibitive.

Response: In its license application, SMUD assumes the pumping generation would come from gas-fired combustion turbines, not wind turbines. We agree with this assumption and have used it in our analysis. We show the cost of the pumping energy based on combustion turbines in table 4-13 of the draft EIS and continue to use that cost in the final EIS

PROJECT DESCRIPTION

Comment-8: PG&E makes a general comment that the draft EIS refers to the 19.1 mile-long reach between the Chili Bar dam and the Folsom reservoir in at least 20 differ ways. PG&E consistently referred to this reach as "the reach downstream of Chili Bar" in its license application and technical reports and suggests that it be referred to as such in the final EIS.

Response: We revised the text in the final EIS to use consistently "the reach downstream of Chili Bar and 19.1-mile-long length."

Comment-9: SMUD questions the discussion on page 2-9 of the draft EIS about expanding the Project boundary. First, SMUD notes that staff recommends expansion of the boundary to include the entire Jones Fork penstock. SMUD clarifies that the entire Jones Fork penstock is included in the Project boundary as depicted on exhibit G, as are the Robbs Peak, Camino, and White Rock penstocks. Second, SMUD states that the Deer Crossing camp (referred as Deer Camp in the Settlement Agreement and shown on figure 3-32 as Deer Creek Crossing Camp in the draft EIS) is a small private camp operated under a special use permit by the Forest Service but is not a Project-related campground. SMUD notes that the Forest Service originally included this camp it the preliminary section 4(e) conditions but subsequently deleted it from the revised 4(e) conditions and the camp is not included in the Settlement Agreement and should not be included in the Project boundary. Third, The Northern Union Valley road cited on page 2-9 of the draft EIS is a 7.5-mile-long system of connecting Forest Services roads that are not solely used for Project purposes but provide the primary access route to the Sierra Pacific Industry owned lands and should not be included in the Project boundary.

Response: We reviewed exhibit G and agree that the Jones Fork penstock is shown as completely within the Project boundary. We also deleted the reference to the private Deer Camp. Our analysis indicates that the proposed new campground on the south side of Loon Lake would provide publically accessible camping at that location. Because the Northern Union Valley Road is not used primarily for Project purposes, it should not be included within the Project boundary, consistent with Commission policy. We revised the text in section 2 of the final EIS accordingly.

Comment-10: U.S Department of the Interior (Interior), PG&E, and American Whitewater note that the informal boat launch described on page 2-10 of the draft EIS is managed by PG&E is for administrative use only and that the site is inaccessible to the public. PG&E provided suggested text for the final EIS.

Response: We revised the text in section 2 of the final EIS to clarify that PG&E uses the informal boat launch for inspections and maintenance and that this informal boat launch is inaccessible to the public.

Comment-11: PG&E points out that the draft EIS omits the description of the second section of Proposed Article 1-4 dealing with coordination in implementing certain license conditions. PG&E states that this provision is critical to the implementation of Proposed Articles 4 though 12 and 21 through 23, and Proposed Article 1-4 must described and adopted in the Staff Alternative in the final EIS.

Response: We added the second component of Proposed Article 1-4 to table 2-3 and to the Staff Alternative in section 5 in the final EIS to explicitly include SMUD's coordination with PG&E in the implementation of Proposed Articles 2-1, 2-2, 2-4, 2-5, 2-6, 2-14 and 2-15 for the Chili Bar Project. We note that we do discuss the importance of this coordination in the relevant resources sections of the EIS.

Comment-12: SMUD provides several clarifications to the description in section 2.0 about the construction of the Iowa Hill development. First, on page 2-14, SMUD clarifies that underground spoils would be transported to the upper reservoir site using a vertical material handling system consisting of either a conveyor belt or bucket-and-cable system located in the cable shaft as stated in exhibit C of the license application. Second, SMUD requests that the description of the proposed tie-line and switchyard locations on page 2-14 be revised to be consistent with exhibit C and exhibit G-036 of the license application.

Response: We modified the Project description to include SMUD's comments about the proposed vertical material handling system and revised the description of the proposed tie-in line and switchyard locations.

Comment-13: American Whitewater comments that the staff descriptions in section 2.0 of the water chemistry monitoring programs in Proposed Articles 1-5 and 2-4 on pages 2-20 and 2-21 of the draft EIS omit any reference to the general chemistry monitoring elements of that program. Interior comments that tables 2-3 and 2-4 in the draft EIS omit any reference or summary of the general chemistry monitoring element of the water chemistry monitoring program in Proposed Article 1-5 (item 10) of the Settlement Agreement. Interior requests that staff summarize both elements, in situ and general chemistry monitoring, in the final EIS.

Response: We added the general chemistry monitoring elements to the descriptions of the Proposed Articles in tables 2-3 and 2-4 in section 2 of the final EIS.

Comment-14: SMUD notes the descriptions of Proposed Articles 1-25 and 2-14 on pages 2-27 and 2-36 of the draft EIS are incorrect and should be revised to make clear that SMUD would provide two simple staff gages only on the two stream reaches proposed for whitewater boating consistent with the intent and language of the Settlement Agreement. SMUD states the staff repeats these incorrect descriptions on pages 5-10 and 5-15 of the draft EIS.

Response: We revised the text in the final EIS to correctly refer to Proposed Articles 1-25 and 2-14.

Comment-15: PG&E notes several discrepancies in the draft EIS with regard to storage capacity and usable storage in Chili Bar reservoir. First, PG&E notes that the storage capacity of 3,700 acre-feet given for Chili Bar reservoir in figure 2-2 is incorrect. PG&E points out that exhibit A-7 shows the storage capacity of Chili Bar reservoir as constructed as 3,319 acre-feet when full to the spillway crest elevation of 997.5 feet (NGVD), and the reservoir has a normal usable storage capacity of 1,339 acre-feet. Second, PG&E requests that the legend to figure 3-1 be clarified to show the full pool storage (3,319 acre-feet) at elevation 997.5. PG&E also requests that staff revise the usable storage volume of 1,088 acre-feet to 1,339 acre-feet on page 3-32 and add a footnote to page 3-58 to note that the 3,139 acre-feet at elevation 997.5 is based on as-constructed data.

Response: We revised figures 2-2 and 3-1, as requested. A usable storage volume of 1,088 acre-feet is based on the results of a 2004 bathymetric survey of Chili Bar reservoir as described in the *Chili Bar Reservoir Incremental Storage Modification Technical Report*, which was part of the license application. We added a footnote to table 3-2 stating that the usable storage based on as-constructed data was 1,339 acre-feet.

Comment-16: PG&E states that in addition to the discussion of PG&E's proposed Project boundary revision on page 2-37 of the draft EIS, PG&E plans to propose a future modification to the Chili Bar Project boundary to avoid a conflict with the UARP licensee's future Slab Creek reach boating take-out. PG&E indicates that although the exact location of the future UARP facility is unknown, it is anticipated that it would be in the vicinity of the White Rock powerhouse. PG&E proposes to develop and submit a revised proposed Project boundary after consultation with BLM and SMUD and requests that the schedule for the submittal of revised exhibit G drawings be consistent with the schedule for the UARP licensee's development of the UARP's Slab Creek recreation management plan.

Response: We added the additional boundary revisions contemplated by PG&E to section 2.5.4 of the final EIS. Under Proposed Article 2-13, PG&E would provide the new or improved recreational facilities within 3 years of license issuance. Under Proposed Article 1-49, SMUD would develop a recreation access plan for Slab Creek reservoir prior to the commencement of construction of the Iowa Hill development in 2009. Given these timelines, it would be reasonable for PG&E to provide revised exhibit G drawings after SMUD has prepared the recreation access plan for Slab Creek reservoir because that plan also would include the proposed Slab Creek boating take out and access facilities.

CUMULATIVELY AFFECTED RESOURCES

Comment-17: EPA recommends including a discussion about the potential effects of climate change relative to the proposed action in the cumulative effects analysis of the final EIS. EPA requests that the discussion summarize the applicable climate change studies, including the findings and recommendations for addressing potential effects on environmental resources and water supplies.

Response: Future climate change effects on water resources and water temperatures in the UARP and Chili Bar reservoirs and reaches are unknown, although some models may attempt to predict change in certain river basins. The Commission's standard reopener article would be included in any license as the vehicle for making changes to the license if unforeseen and unanticipated adverse environmental effects occur in the future.

GEOLOGY AND SOILS

Comment-18: Mr. Summers questions the statements in the draft EIS that the upper reservoir would be not likely affected by the known fault or fault systems any more than the structures that already impound Project waters and, with the earthen berm construction and impermeable liner, might actually withstand an earthquake better than the closest dam. He requests an analysis of failures at other pumped storage projects and a discussion of what would be done to prevent such a failure at the Iowa Hill development.

Response: We have no record of any pumped storage projects that have failed do to earthquake forces. An analysis of probable earthquake effects on Iowa Hill was done in the SMUD's Preliminary Safety Analysis Report, where the consultant concludes that the proposed reservoir would not be significantly affected by movements along fault lines resulting from earthquakes

Comment-19: Ms. Bailey-Hacker questions the findings of the geotechnical studies done in 1972 and 2004 that led to SMUD's conclusion that the Iowa Hill site is suitable for development of the upper reservoir. Ms. Bailey-Hacker questions why the surface geology would be suitable for use in the construction of the upper reservoir berm since it is likely to break down to soil and gravel during construction. She suggests that using larger rock in the upper reservoir berm would be more stable. She cites the Taum Sauk pumped storage project failure as an example of why she is concerned about the structural stability of the berm. She also states her concern that the foliation of the rock could allow seepage from the upper reservoir to cause geologic instability. Finally, Ms. Bailey-Hacker questions why an exploratory tunnel was not drilled to verify the type and quality of rock surrounding the proposed powerhouse and tunnel structures. She states that sample drill holes were only taken from residential parcels of land near the site, along Chute Camp Road, and from Slab Creek Reservoir.

Response: First, we note that the failure of the Taum Sauk reservoir was reported to have been caused by instrument malfunction, not instability of the embankment retaining the upper reservoir. Second, with regard to the stability of the berm, using a variety of crushed rock from the excavation of the upper reservoir site and tunnel is consistent with engineering practices that mix gradations of rock, from small to large sizes for this type of construction. By using a mixture of various sizes, or “well-graded” rock, the spaces between pieces of rock and gravel are filled with smaller particles to produce an embankment with no unstable voids. We analyzed SMUD’s proposed measures to control seepage in the EIS and conclude that installing a toe drain and drain pipes in the rock fill embankment, filling voids in the rock under the reservoir with construction grout, and installing an impermeable liner at the bottom of the upper reservoir would control seepage from the upper reservoir. Finally, in addition to the geotechnical studies performed on the site, SMUD maintains records from the construction and recent examination of nearby project facilities, including the Slab Creek dam, and the Camino and Whiterock tunnel, which confirm the presence of stable geology in the area. Therefore, at this phase of investigation, we do not think an exploratory tunnel at that specific location is needed. If unstable rock is encountered during SMUD’s final geologic studies, SMUD would excavate the unstable rock and replace it with concrete or similar material.

WATER RESOURCES

Comment-20: PG&E points out that USGS gage no. 11444500 (SFAR near Placerville)is not part of the UARP as listed in table 3-11 on page 3-49 of the draft EIS. PG&E states that this gage is actually on the SFAR below Chili Bar dam and is used for compliance purposes for the Chili Bar Project and requests that table 3-11 be revised.

Response: We revised the layout of the last rows of table 3-11 to clarify that that this gage is not part of the UARP. Page 3-40 of the draft EIS includes a description of the gage use for compliance downstream of the Chili Bar Project.

Comment-21: The Forest Service, SMUD, Interior, and American Whitewater question the staff’s modification to Proposed Article 1-8. The modification would require SMUD to maintain Gerle Creek reservoir at a set reservoir elevation of 5,288 feet from August through October to provide for the passage of brown trout spawning runs from the reservoir upstream into Gerle Creek. SMUD comments that this measure as modified by staff would not have the intended results and would place undue constraints on SMUD operations and maintenance activities at the Loon Lake and Robbs Peak developments. First, SMUD states that new bathymetric data from studies conducted during maintenance activities in the fall of 2006 confirm the presence of an alluvial deposit at the confluence of Gerle Creek and the reservoir that has the potential to pose a migration barrier. SMUD comments that this new information suggests that the water surface elevation of Gerle Creek reservoir may not facilitate fish passage into Gerle Creek. Second, SMUD states that the staff's modification to Proposed Article 1-8 would constrain SMUD's need to use the Gerle Creek reservoir as an afterbay to Loon Lake powerhouse. Third, the modification would limit SMUD's ability to conduct maintenance activities at the Loon Lake and Robbs Peak developments. The Forest Service and Interior point out that although maintaining the reservoir elevation at 5,288 feet may currently allow for fish passage, this could change over time. Therefore, these entities all request that the Commission adhere to the intent of Proposed Article 1-8 and require that SMUD maintain Gerle Creek reservoir at an elevation that would allow for passage of brown trout spawning runs from August through October and adjust that level as needed in consultation with the agencies.

Response: We reviewed the information provided by SMUD and agree that there are uncertainties as to whether passage of brown trout into Gerle Creek can be maintained by managing the level of Gerle Creek reservoir. Although the rationale report for the Settlement Agreement identified a reservoir elevation of 5,228 feet as being needed to provide effective fish passage into Gerle Creek, the new information provided by SMUD indicates that because of backwater effects from Gerle Creek reservoir, there is a deposit of cobbles and boulders extending upstream along Gerle Creek. Portions of this deposit now extend to an elevation that is higher than the normal maximum level of the reservoir, and that the geometry of this deposit may have a greater effect than reservoir levels on fish passage conditions. We note that future changes in the size and geometry of this deposit, which may affect fish passage conditions, are difficult to predict. As a result, we agree that additional studies, site visits, and consultation with the agencies, as proposed by SMUD, would be needed to determine how to ensure that upstream fish passage from the reservoir into Gerle Creek is maintained. Therefore, we revised the final EIS to include the new information provided by SMUD in section 3 and now recommend a Gerle Creek fish passage plan in section 5 that would include measures, such as periodic channel modifications, if needed, to ensure upstream passage of brown trout, consistent with the intent of the Settlement Agreement.

Comment-22: SMUD notes the staff recommendation on page 3-83 of the draft EIS to install a new gage downstream of the Rubicon reservoir. SMUD comments that there are alternative means to satisfy compliance needs and requests that the Commission not limit SMUD's options for minimum/pulse flow compliance to constructing a new gage. Specifically, for minimum flows, SMUD would continue to measure flow using acoustic flow meters attached to the outlet pipe following installation of the larger capacity valves. For pulse flows, SMUD would likely propose the use of the existing Rubicon reservoir water surface elevation recorder along with a rating of the Rubicon dam spillway, consistent with current practice. SMUD states that measuring flow using the spillway weir would likely be more accurate than modifying and using the abandoned auxiliary gage as recommended by staff and would avoid stream channel modification in the wilderness area. SMUD would prefer to consult with the Forest Service and USGS as to the most efficient means of establishing a compliance gage plan with the least effect to the wilderness area.

Response: We modified the text of the final EIS to allow for use of a gaging method that is best suited for this location based on consultation with the USGS and the Forest Service. We also noted that the use of the existing Rubicon reservoir water level recorder might be technically challenging.

Comment-23: PG&E points out that the statement on page 3-100 of the draft EIS that Chili Bar reservoir water is released from the low-level outlet, which is at a depth of about 73 feet below Chili Bar reservoir's normal maximum level is incorrect. PG&E primarily releases water from Chili Bar reservoir through the turbine or the turbine bypass valve and that they only operate the low-level outlet once a year in accordance with maintenance and emergency test requirements.

Response: We revised the text in the final EIS to describe the invert of the penstock intake as about 46 feet below the reservoir's normal maximum level.

Comment-24: Interior, SMUD, and American Whitewater agree the description of the temperature monitoring location in item k in the water quality section of Proposed Article 1-5 of the Settlement Agreement should read Silver Creek immediately upstream of the Camino reservoir's high water line.

Response: We note your agreement with our understanding of the temperature monitoring locations in the final EIS.

Comment-25: Mr. and Mrs. Kuehn comment that since 1983 more than half a million cubic yards of sediment originating from landslides and debris torrents have entered the river and most of it should be in Slab Creek reservoir. They ask why SMUD did not perform a sediment study for the Slab Creek reservoir in light of the deep-water pump storage intake.

Response: We reviewed and generally agreed with the "Iowa Hill Pumped Storage Development Turbidity Analysis" filed by SMUD in October 2004. This document analyzed effects of the proposed operation of the Iowa Hill development on sediment within Slab Creek reservoir. Based on this analysis, we determined that only initial and small-scale changes in the turbidity of the reservoir would be likely. The document also analyzed the existing and future growth of sediment delta in the upstream portion of the reservoir, and we agree with the determination that the proposed operational regime of the Iowa Hill development would not affect the delta for at least 100 years.

Comment-26: Interior and American Whitewater note that in the draft EIS, staff states that monitoring of certain water quality parameters may not be necessary during the full term of any new license. Interior and American Whitewater point out that Proposed Article 1-5 of the Settlement Agreement offers science-based options for future modifications or reduction in the frequency or number of stations what would require long-term monitoring. These entities recommend that the Staff Alternative be consistent with the Settlement Agreement.

Response: Our rationale on page 5-27 of the draft EIS for supporting Proposed Article 1-5 (see draft EIS page 5-27, paragraph 2) is consistent with the intent of the Settlement Agreement, which we interpret to allow SMUD to reduce monitoring of some water quality parameters once data have consistently documented that the parameter supports the desired aquatic resources. ,

Comment-27: In reference to the statement on page 3-106 of the draft EIS, PG&E requests that in the final EIS, staff clarify that water temperature modeling was not conducted for the Chili Bar Project or the reach downstream of Chili Bar.

Response: We revised the text in section 3.3.2.2 of the final EIS in the *Water Temperature Modeling* analysis to clarify that water temperature modeling was not conducted for the Chili Bar Project or the reach downstream of the Chili Bar Project.

AQUATIC RESOURCES

Comment-28: Interior, PG&E, American Whitewater, Friends of Slab Creek, Ms. Schweitzer, and several recreational boaters comment that on page 3-136 of the draft EIS, staff incorrectly defines a Super Dry water year type.

Response: We corrected the definition of a Super Dry water year type in the final EIS.

Comment-29: Interior and American Whitewater comment that the term *naturalized* as used on pages 3-147 and 3-156 to describe populations of rainbow trout is a politically sensitive term and suggests that in the final EIS the term *wild* be substituted for *naturalized*.

Response: We substituted the term *wild* as requested.

TERRESTRIAL RESOURCES

Comment-30: PG&E notes that the draft EIS states on pages 3-178 and 3-194 that overlapping studies were conducted to identify riparian vegetation and for foothill yellow-legged frogs within both Project boundaries and requests that the final EIS indicate that the stream reaches, which lie primarily outside of the Project boundaries, were also included in these overlapping studies. PG&E further requests that the final EIS clarify that the 18 survey sites for the foothill yellow-legged frogs were in the reach downstream of Chili Bar.

Response: We revised the final EIS to clarify the locations of the riparian and foothill yellow-legged frog surveys.

Comment-31: Mr. and Mrs. Kuehn indicate that Scotch broom invaded Iowa Hill about 5 years ago and is present on their property that adjoins the east boundary of SMUD's Iowa Hill property.

Response: Invasive species are prevalent throughout the Project area, and California as a whole. The presence of the invasive Scotch broom located on the Kuehn's property is not Project-related. SMUD proposes an invasive weed and vegetation management plan that would minimize the effects of the Iowa Hill development construction on the spread of invasive species.

Comment-32: Interior and American Whitewater note that Interior no longer maintains a list of federal Species of Concern as stated on page 3-188 of the draft EIS and that the fisher is currently on the FWS Candidate Species List.

Response: We revised the final EIS to correct the status of special-status species.

Comment-33: Interior requests that staff include *FD* in the list of notes for table 3-57 to indicate that the species has been federally delisted. Interior also points out that delisting from the list of endangered and threatened species does not remove all federal protections and requests that staff address the current status of federal protection for the bald eagle in the subsection on bald eagles in the final EIS.

Response: We revised table 3-57 of the final EIS to include the federally delisted designation. As pointed out by Interior, although the bald eagle has been federally delisted, it continues to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The proposed UARP is consistent with the National Bald Eagle Management Guidelines, which have been developed to ensure activities do not violate the protections provided by the acts. We added this information to the final EIS.

Comment-34: EPA questions the finding in the draft EIS that no riparian vegetation or wetlands would be affected by the construction of the Iowa Hill development because of the wetlands and intermittent drainages identified in the draft EIS as being located on both the proposed transmission line route and Iowa Hill site. To clarify the potential effects on waters of the United States that would occur with the construction of the Iowa Hill development, EPA recommends that staff indicate in the final EIS how the Project would comply with the 404(b)(1) guidelines, such as identifying how the preferred alternative avoids waters of the United States and what design measures could be used for further avoidance. EPA suggests including a map or more information about jurisdictional waters, if available, in the final EIS.

Response: According to the *Iowa Hill Wetlands Technical Report* (2004g), SMUD had the Iowa Hill development area, including the proposed reservoir, intake structure, and transmission line studied using aerial photography to locate potential wetland areas, followed by field surveys to delineate any wetlands. As described in section 3.3.4.1 of the draft EIS, the surveys did not locate any palustrine wetlands within these areas. Seven small drainages were located during field surveys, although only one, located along the proposed transmission line route, is classified as a riverine wetland. Our finding that the proposed Iowa Hill development would not affect any wetlands or riparian vegetation is based on the fact that the wetland study did not locate any wetlands within the proposed reservoir or intake sites and only one small intermittent riverine wetland was located along the proposed transmission line route. Narrow, riverine wetlands located within the proposed transmission line can be avoided by siting towers such that the transmission line spans the wetland with no fill required. As such, we do not anticipate construction of the proposed Iowa Hill development would result in fill of any jurisdictional wetlands. We revised the final EIS to clarify this statement.

Comment-35: Ms. Bailey-Hacker states that the biological "reports" do not discuss the effects of the proposed Iowa Hill development construction on wildlife and that the draft EIS does not discuss the fact that the Iowa Hill upper reservoir would be located on a spotted owl Protected Activity Center.

Response: Section 3.3.4.1 of the EIS describes wildlife, including California spotted owls, occurring in the vicinity of the proposed Iowa Hill development. Although one Protected Activity Center is located within 0.25-mile of the Iowa Hill development footprint, the upper reservoir is not located within a Protected Activity Center. Section 3.3.4.2 analyzes the effects of the construction and operation of the Iowa Hill development on wildlife, including California spotted owls, mule deer, black bears, and other species.

Comment-36: PG&E notes that the first two paragraphs under *Our Analysis* under *Vegetation and Noxious Weed Management* seem to apply to the UARP and the third paragraph seems to apply to the Chili Bar Project, but this is not clear. PG&E requests that staff clarify the final EIS to be explicit about when a particular section is discussing one Project or the other Project, or both Projects.

Response: We revised the final EIS to clarify which Project is being discussed.

Comment-37: Interior comments that recommendation no. 15 on page 5-14 of the draft EIS should reference the BLM Sensitive Species List instead of the Eldorado National Forest Watch List.

Response: Although Article 2-9 of the Settlement Agreement incorrectly defines special status plant and wildlife species as "species that are Federal Endangered or Threatened, Forest Service Sensitive," we revised the final EIS to indicate that the definition should be BLM Sensitive instead of Forest Service Sensitive.

THREATENED AND ENDANGERED SPECES

Comment-38: Interior comments the water storage and supply functions of the UARP would allow El Dorado County to fully implement its General Plan, and the prospective development that would result from the full implementation of the plan has the potential to directly affect all five of the Pine Hill endemic listed plants. Interior states that the final EIS should include an analysis in the resource section of this indirect effect and a discussion of cumulative effect of relicensing the UARP on the listed plants in the cumulative effects summary in section 5.0 of the final EIS.

Response: SMUD filed an informational copy of the El Dorado County – SMUD Cooperative Agreement with the Commission in December 2005. However, none of the terms of that agreement are included in the Settlement Agreement as they are outside the scope of the relicensing proceeding. The acquisition of water rights by the El Dorado parties and the provisions dealing with delivery of water from and storage of water in certain UARP facilities would be subject to the Water Board approval and would require a separate NEPA analysis after the El Dorado parties secure the requisite water rights.

Comment-39: Interior and American Whitewater disagree with the staff modification to Proposed Articles 1-12 and 2-9 that a draft biological assessment be prepared by the applicant for the relevant federal agencies and instead states that only the final biological assessment should be filed with the Commission. Interior and American Whitewater recommend the final EIS adopt the language in Proposed Articles 1-12 and 2-9.

Response: Under section 7 of the Endangered Species Act (ESA), it is the Commission's responsibility to consult with FWS or NMFS. Although the Commission can designate SMUD to conduct informal consultation with FWS and NMFS, only the Commission can enter into formal consultation with these federal agencies. Therefore, only the Commission can file a *final* biological assessment with FWS and NMFS and request formal consultation. As such, under this recommended measure, SMUD would prepare and file a *draft* biological assessment with the Commission, and the Commission would then prepare a *final* biological assessment and submit it to the appropriate federal agency requesting formal consultation, if necessary.

RECREATIONAL RESOURCES

Comment-40: Interior, PG&E, American Whitewater, Friends of Slab Creek, Ms. Schweitzer, and several recreational boaters note that table 3-67 does not include the proposed recreational flows downstream of the Chili Bar dam specified in the Settlement Agreement and requests that staff include the table from the Settlement Agreement in the final EIS. PG&E suggests that staff interpreted the flow values in the table in the Settlement Agreement to be in military time, when in fact, the values are in clock time.

Response: You are correct. We revised the information in table 3-67 to be consistent the proposed recreational flows downstream of the Chili Bar dam specified in the Settlement Agreement.

Comment-41: The Forest Service, American Whitewater, the Friends of Slab Creek Ms. Schweitzer, and several recreational boaters comment that the draft EIS does not convey an understanding of the connection between the construction of the Iowa Hill development and the release of recreational streamflows in the SFAR downstream of Slab Creek dam. These commentors state the construction of the Iowa Hill development would facilitate the provision of whitewater flows because (1) the upper reservoir would provide another source of water for these flows, and (2) the cost of making physical modifications to provide these flows would be less because SMUD would have the equipment and personnel already at the Iowa Hill construction site. SMUD comments that by using the constructed Iowa Hill development to better manage water in the Slab Creek reservoir, SMUD could provide boating flows without building expensive release structures. SMUD also requests that staff correct the description of Proposed Article 1-24 on pages 2-276 and 2-278 in the final EIS to reflect the language in the Settlement Agreement that SMUD would enhance recreational streamflows at year 15 after license issuance, if Iowa Hill is not constructed and if certain triggers are met. In addition, the Forest Service and American Whitewater comment that the draft EIS incorrectly summarizes Proposed Article 1-24 of the Settlement Agreement by substituting the words *constructed within 15 years* for the words *commenced construction within 15 years* as the trigger for consultation on a whitewater boating recreation plan.

Response: We revised the text on pages 3-276 and 3-278 to reflect the intent of Proposed Article 1-24. We acknowledge SMUD's comment that with the construction of the Iowa Hill development, it may be able to provide the enhanced recreational boating flows without expensive structural modifications to existing facilities. Therefore we have eliminated SMUD's original estimate of $10,000,000 for anticipated physical modification from the cost of the staff alternative. However, providing the enhanced recreational streamflows, with or without the construction of the Iowa Hill development, would reduce the energy the Project now generates. At the same time, we recognize the value of allowing SMUD and the Agencies as much time as possible to determine if the recreational triggers can be met. We continue to recommend that after

10 years of monitoring, in year 15 after license issuance, that recreational streamflow releases only be provided if the environmental and recreational triggers are met. However, we agree that the volume of these releases need not be revisited. We revised our conclusions about recreational streamflows in section 5 of the final EIS to be consistent with the clarifications made in section 3.

Comment-42: Mr. Shackleton comments that the whitewater run downstream of the Slab Creek dam is a high-quality Class IV/V section of whitewater with easy access to major population centers. He states that SMUD was able to provide the proposed level of flows during the whitewater flow study and urges the Commission to adopt the proposed recreational streamflows included in the Settlement Agreement.

Response: We understand that SMUD was able to provide the proposed level of flows during the whitewater flow study. We take issue with the assumption that whitewater flows would be provided regardless of the level of demand for these flows, and we would continue to require an assessment of the level of demand prior to requiring the proposed whitewater flows as a condition of any license issued for the Project.

Comment-43: Interior and American Whitewater comment that the Staff Alternative in the draft EIS does not include Proposed Article 2-20, which reserves BLM's authority under section 4(e) of the FPA, consistent with the Recreation Payment Agreement dated February 1, 2007, to provide for the protection and utilization of BLM lands through the inclusion of conditions in the license for the Chili Bar Project.

Response: We added Proposed Article 2-20 to table 2-3 in section 2 of the final EIS. However, because the Recreation Payment Agreement (found in appendix 6 of the Settlement Agreement for the UARP and Chili Bar Projects) was filed for information purposes only, we do not include this measure in the Staff Alternative.

Comment-44: Interior, PG&E, and American Whitewater comment that the limited recreational use of the Project facilities would not seem to warrant a separate recreation plan. PG&E further notes that such a plan was not included in the Settlement Agreement and that existing and proposed processes and consultation for monitoring and reporting are sufficient to address public recreation use.

Response: A recreation plan would formalize the existing consultation and reporting requirements and provide the rationale and description for the proposed new and improved recreational facilities for boating access and can be done at relatively minor cost to the Project.

LAND USE

Comment-45: The Forest Service, SMUD, and American Whitewater disagree with the Commission staff's limitation on the scope of the transportation system management plan to Project roads used solely for Project purposes because of the extensive, but not exclusive, use that SMUD makes of these roads. For instance, the Forest Service comments that SMUD's road plowing in the winter to provide access to Project facilities also increases recreational use that otherwise might not occur. SMUD comments that this provision is one that the Commission would not normally included as a condition of license, but as a matter of settlement, SMUD agreed to a broader plan. The Forest Service continues to request that the Commission's policy on Project access roads allow for cost-sharing of facilities on or adjacent to National Forest System lands and that the staff alternative be consistent with the provisions in the Settlement Agreement. For many of the same reasons, the Forest Service and American Whitewater also disagree with the staff's limitation on the scope of the trail system management plan to trails that are needed [solely] for Project purposes. SMUD indicates that while it would include these trails, such as the 7-mile-long segment of the Rubicon hiking trail that is used by SMUD staff to operate the Project and hikers traveling north to Project and non-project destinations, in the trail system management plan, these trails should not be included in the Project boundary.

Response: Commission policy would limit SMUD's and PG&E's responsibilities for road and trail maintenance to those roads and trails that are required solely for Project purposes and would include these facilities in the Project boundary. SMUD and PG&E may enter into a variety of arrangements with other entities to provide for road and trail maintenance as they so chose.

Comment-46: Mr. Summers comments that the draft EIS is incorrect in stating that Carson Road to Cable Road would be the primary access to the proposed upper reservoir site and that Carson Road to Larsen Drive to Slab Creek reservoir would provide primary access to the lower reservoir site. He points out that Larsen Road and Slab Creek Reservoir Road do not intersect and construction traffic would have to travel 1.8 miles between them. However, he states that SMUD now indicates that all Project traffic would access the site via the North Canyon and Slab Creek Reservoir Road but no decision has been made about how traffic would access North Canyon Road. Without this information, he questions how any informed decisions can be made relative to the effects of construction traffic on the local residents, roads, and air quality.

Response: In its comments on the draft EIS, SMUD points out that, as described in exhibit C of the license application, underground spoils would be transported to the upper reservoir site using a vertical material handling system. We provided this information in the final EIS (see response to Comment 12). SMUD also indicates, in a filing dated December 7, 2007, in response to questions raised at the public meeting on the draft EIS, that consultation with the Advisory Committee has produced an alternative route for construction traffic, the Iowa Hill SW connector route, which SMUD currently is considering. We provide SMUD's description of this alternative route for construction traffic access to the site in section 2 and 3 of the final EIS and recommend that SMUD include a detailed traffic analysis for this alternative in the final transportation management plan for the Iowa Hill development. We encourage selection of a route that would minimize user conflicts.

Comment-47: Mr. Summers observes that the draft EIS does not provide the number of vehicles currently using Larsen Road, North Canyon Road, or Carson Road, and the draft EIS does not provide the number of trips a day the Project would generate. He notes that there is no discussion about how workers would get to the construction site or the traffic effect for contingencies, such as imported materials on which to bed the poly membrane liner, which he states could add as many as 13,000 heavy truck trips. With this many potential truck trips, he requests an analysis of the truck traffic effects on property values, safety for local residents walking and bicycling along the roads, pets, and air quality.

Response: You are correct that the draft EIS does not provide the number of vehicles currently using Larsen, North Canyon, or Carson Roads because SMUD did not conduct traffic counts on Larsen or North Canyon Roads during the pre-application studies. SMUD conducted traffic counts on U.S. Route 50 and on Carson Road. SMUD's analysis that found that the traffic generated by Project construction would not affect the level of service categories as defined by El Dorado County, except at the East Camino eastbound ramp in the morning. This means that the roads are capable of handling the additional traffic and the additional traffic would not cause unacceptable delays under the county guidelines. We state the number of daily trips that the Project would generate in the discussion of construction impacts on local traffic in section 3.3.10.2 in the draft EIS. The proposed access routes to the upper reservoir and powerhouse construction sites are described in both section 2 and section 3.3.7.1 of the draft EIS. We, however, added the description of the alternative access routes considered by SMUD in the Transportation Route Technical Report filed on January 31, 2008. SMUD does not propose to haul in clay or other materials to place under the poly membrane at the upper reservoir site. Instead, SMUD would balance excavation and fill quantities on site. This means that excavated material would be crushed on site and used as fill material for the earthen berm. Consequently, fill material would not be trucked in from outside the construction sites nor would excavated material be trucked off the site. We revised the final EIS to make clear that SMUD proposes to use a vertical material handling system consisting of either a conveyor or bucket and cable system located in the cable shaft to transport material excavated from the proposed tunnel and powerhouse cavern to the upper reservoir site. Therefore, these materials would not be trucked. To transport the construction materials and equipment that are needed for construction, about 25 truck-trips are expected per day during initial mobilization and during other periods when deliveries are necessary, such as the liner itself.

Comment-48: Ms. Arteaga comments that the draft EIS does not take into account that the lower access road (Slab Creek Road referred to as Slab Creek dam access road in the draft EIS) goes through private property and does not have a recreational easement. She notes SMUD obtained an easement for the construction and operation of the Slab Creek development but not for public right-of-way and that the intent of the original easement is not sufficient for the needs of the Iowa Hill development. Therefore, she concludes that the proposed improved recreational access to both the river and the reservoir would be unauthorized use of private lands and that new easements would be needed for the construction of the Iowa Hill development. She also comments that adequate access for management and public use of National Forest System lands has not been acquired.

Response: We agree that SMUD would need to obtain the appropriate easements to use the lands prior to construction.

Comment-49: Ms. Arteaga cites the discussion on page 3-292 of the draft EIS about the potential for development that might result from improvements to the roads used for construction and states that Slab Creek Road is a private road and no other entity (SMUD, the Forest Service, or the county) takes responsibility for maintenance and public safety of the road. She asks, “Who will be responsible for the maintenance and public safety of the road?”

Response: As described in the Forest Service Road Maintenance Plan included in the license application, SMUD would maintain the Slab Creek Road (Dam Access Road and Reservoir Access Road)—grading, maintaining ditches, and removing rocks. Slab Creek Road would be maintained at a level needed to access Slab Creek dam facilities.

Comment-50: Mr. Summer, Mr. DeBord, and several commentors at the public meeting raise concerns about the increased potential for wildfires in the Slab Creek Canyon with the construction of a major project and the potential increase in public access to the canyon. They and others comment that the combination of an extreme fuel build-up in the canyon and the near constant breezes up and down the valley would turn a fire into a major wildfire very quickly. They recommend removal of the fire-fuel build-up, including the high pile of debris that SMUD stacked on National Forest System lands near the Slab Creek reservoir 10 years ago, prior to the commencement of any construction. In their opinion, the draft EIS must include an analysis of how the proposed Iowa Hill development and the associated increase in public use would affect the current potential for wildfires.

Response: We discuss the high fire hazard in the Iowa Hill area in sections 3.3.7.1 and 3.3.10.2 of the draft EIS. SMUD would file a fire risk and protection plan prior to any land disturbing/construction activity at Iowa Hill. This plan would be developed to reduce fire risk associated with construction and address issues such as blasting and equipment use, emergency and evacuation procedures, procedures for removing brush and other fire hazardous materials, and rules about construction workers smoking and other related fire risks.

Comment-51: Mr. and Mrs. Kuehn make several comments related to the proposed use of local roads for construction traffic. They comment that (1) that there is no detailed map showing the access route to the proposed powerhouse in the canyon or to the upper reservoir location; (2) the draft EIS implies that all construction traffic would pass through the town of Camino which is already congested and has limited parking; (3) Larsen Road is only 20 feet wide and provides an inadequate base for heavy trucks given the yearly damage done by local logging trucks; (4) Chute Camp Road is a very narrow, old road that would require full bench construction and retaining walls; and (5) excavated material from the powerhouse would be moved to the upper reservoir by a conveyor belt and not be trucked as stated in the draft EIS.

Response: We agree that there is not a detailed map in the draft EIS showing the proposed and alternative access routes to the construction. In response to a Commission request for additional information, SMUD filed a traffic analysis of an alternative access routes that were developed in consultation with the Advisory Committee that would channel construction traffic to the west of the construction site away from the Camino town center. We added descriptions of these alternative routes to section 3.3.7 of the final EIS. With regard to the proposed access routes, we acknowledge that Larsen Road and Chute Camp Road are unimproved rural roads that would require widening and strengthening to accommodate heavy truck traffic. SMUD would widen Chute Camp Road to meet guidelines for a narrow two-lane road and would retain the adjacent slope by tie-back anchors where necessary. SMUD also proposes to perform an engineering analysis of roadways to the upper reservoir site prior to finalizing the Transportation Management Plan to address issues of roadway width and capacity. Finally, we revised the Project description in section 2 of the final EIS to clarify that SMUD proposes to use a vertical material handling system to move excavated materials from the powerhouse site to the upper reservoir and not truck this material through the streets of Camino. We also corrected the names of road segments in the final EIS and corrected information about road names and width.

Comment-52: Mr. and Mrs. Kuehn comment that contrary to the statement on page 3-327 of the draft EIS, the El Dorado Transit serves Camino and Carson Road on a scheduled daily basis and will service unscheduled areas by appointment. They further comment that bicycling and walking are common in the area.

Response: We modified the text in section 3.3.10.2 of the draft EIS to clarify that SMUD indicated that because the area does not have public transportation facilities and is generally not suitable for walking or bicycling, its study focused on automobile and truck traffic likely to be generated by the Project. We also note that SMUD is considering alternative routes for construction traffic and heavy equipment that would avoid many of the user conflicts on the local roads.

Comment-53: Ms. Bailey-Hatcher comments that the information provided on page 3-292 of the draft EIS is incorrect and states that the El Dorado County General Plan (General Plan) land use designations in place for SMUD's parcels on Iowa Hill is Rural Residential and the zoning designation is RE-10, Residential Estate, 10 acres. She notes that the land that SMUD wants to clear-cut, blast, clear, and build over is heavily used for hunting, residential use, birdwatching, and hiking and states that the industrial use envisioned by SMUD is completely out of character with the area.

Response: The draft EIS refers to the 2004 General Plan Land Use Diagram that shows the land within the proposed boundary of the Iowa Hill development to be designated as Natural Resources. SMUD's land use technical report for the Iowa Hill development clearly states that its lands in the proposed boundary of Iowa Hill development are designated Rural Residential with a platted overlay under the General Plan. The General Plan designations are intended to maintain a low residential density. The proposed Iowa Hill development would not increase the residential density on SMUD lands. SMUD also states that the provisions of the El Dorado General Plan would not be applicable to a FERC-licensed project. If licensed, the proposed Iowa Hill development would be constructed entirely within the proposed project boundary as shown on figures 2-4 and 3-36 of the draft EIS on lands currently owned by SMUD, the Eldorado National Forest, and Sierra Pacific Industries. We also note that the Iowa Hill area currently includes hydroelectric uses at the Slab Creek dam and that the Sierra Nevada Forest Plan Amendment (2004) includes hydroelectric generation as a permitted use within the Eldorado National Forest.

AESTHETIC RESOURCES

Comment-54: Mr. Summer and several commentors at the public meeting state that the view of the American River Canyon is vitally important to many more properties than suggested in the draft EIS. He comments that SMUD has said that it intends to clear-cut the entire Project site, which he assumes to mean all the land within the Project boundary, including the transmission and road right-of-ways as shown on figure 2-4 (on page 2-13) of the draft EIS. Under this assumption, he states that the clear-cut area would extend well over the summit of Iowa Ridge and run down the west side of Iowa Hill and would affect the property values of many more parcels than mentioned in the draft EIS.

Response: Prior to construction, SMUD would clear the majority of the land within the proposed Project boundary, including the footprint of the upper reservoir, earthen berm, construction lay down areas, and the locations where organic top soils would be stored. In addition, SMUD would clear a 100-foot-wide corridor about 2 miles long for the new Project transmission line as well roadways and adjacent lands sufficient for grading the new or improved roads. The cleared areas would extend downslope and would be visible from the hillside across the Slab Creek reservoir prior to and during construction. SMUD’s Iowa Hill development revegetation plan shows areas to the north and south of the upper reservoir that would be cleared to accommodate the organic top soils removed during excavation for the upper reservoir and that would be revegetated following construction. As discussed in section 3.3.7.2 of the draft EIS and as documented in the Visual Resources Technical Report Addendum filed by SMUD on January 31, 2008, under the current design, the berm would be seen from several viewpoints and may not meet the Forest Service visual quality objectives (VQOs) for Eldorado National Forest. However, under Proposed Article 1-44, SMUD would develop a design for the Iowa Hill development that meets the visual quality standards.

CULTURAL RESOURCES

Comment-55: PG&E questions the use of *TCP* (i.e., traditional cultural properties) on pages 3-304 to 3-11 and suggests that the staff refer to *potential TCPs* rather than *TCP*.

Response: We reviewed section 3.3.9.1 through 3.3.9.3 of the draft EIS and determined that the term *TCP* generally is used appropriately. However, we agree that for clarity, reference should be made to potential TPCs in two instances on page 3-309 and 3-311, and we revised the text in the final EIS.

Comment-56: PG&E provides a clarification about the Chili Bar Toll House Cemetery. PG&E comments that the text should be revised to note that this cemetery also consists of a flat area that may have been prepared as a cemetery pad and to state that the wife of the toll house keeper was reportedly Native American.

Response: We revised the text in section 3.3.9.1 to provide the suggested clarifications.

Comment-57: The Forest Service, PG&E, and American Whitewater comment that Commission staff recommends that SMUD finalize and implement the Historic Properties Management Plan (HPMP) within 1 year of license issuance and states that the recommendation is unclear relative to the Forest Service review and approval and therefore is inconsistent with Proposed Article 1-28 that calls for completion of the HPMP within 6 months for the Forest Service approval. Similarly, Interior and American Whitewater comment that the recommendation that PG&E file a final HPMP with the Commission within 1 year of licenses does not explicitly provide for BLM review and approval. Both agencies and American Whitewater recommend that these measures be consistent with the Settlement Agreement.

Response: On February 11, 2008, the Commission issued a draft Programmatic Agreement and draft HPMP with a 30-day comment period. The Commission directs SMUD to file a revised HPMP within 90 days after the end of the comment period. It is the intent of the Commission to issue a final PA with a final HPMP attached prior to issuing any license for the project. Therefore, we modified Proposed Article-28 and related text in the final EIS to specify that SMUD implement the final HPMP.

Comment-58: Mr. and Mrs. Kuehn comment that there are remnants of historic logging operations throughout the area. They state that Cable Road was an access road to the South tower and today much of it follows the old narrow gage railroad grade. Ms. Bailey-Hacker comments that the unevaluated sites mentioned in SMUD's cultural reports should be evaluated before construction begins at the Iowa Hill development and requests a more thorough study of historical sites and peoples before the final EIS is completed.

Response: We are aware of the area's logging history and artifacts from that industrial use. SMUD conducted prehistoric, historic, and ethnographic studies of lands within Project's Area of Potential Effects including the Iowa Hill development site prior to submitting its license application and the results of these studies were summarized in the draft EIS. These reports have been reviewed by Commission staff and the Forest

Service and provided to the State Historic Preservation Office. We determined that the these reports covered the lands that could be affected by relicensing the project with the proposed Iowa Hill development and were sufficient for assessing the potential effects on cultural properties. Prior to any license issuance, the Commission will execute a Programmatic Agreement for the protection of historic properties. SMUD has prepared a draft HPMP that sets forth its procedures for monitoring potential effects to and completing evaluations of properties that could be affected by project operations. A revised HPMP, reflecting the comments of the Forest Service and others involved in the consultation process under section 106 of the National Historic Preservation Act, will be attached to the Programmatic Agreement.

SOCIOECONOMICS

Comment-59: SMUD comments that the updated construction costs it filed with the Commission in April 2007 are not reflected in table 3-71.

Response: The socioeconomic analyses in the draft EIS are based on the data provided in the 2004 and 2005 study reports. We included a new footnote in the final EIS to explain this. We also deleted table 3-71 both because the values in the table are not directly used in the IMPLAN analysis and to avoid confusion with the current cost estimates provided in table 4-5 in our developmental analysis.

Comment-60: Mr. Morris states that he is opposed to the Iowa Hill Project as initially proposed because it would overwhelm his small community. He states that the construction traffic on a one-lane, rural neighborhood street would devastate his quality of life and threaten his family's safety and property value. Mr. Morris notes that SMUD would not compensate him or his neighbors if they felt it necessary to sell their homes or businesses. He asks FERC to please identify how it would address that issue if the Commission decides to grant approval of the Project. He notes that he has participated in many sub-committee meetings where potential mitigation measures have been identified, and that at a minimum, all of these mitigation measures (Advisory Committee recommendations) should be adopted as a comprehensive package with no exceptions. He states that the safety of the children and local residents should be of paramount concern during the construction phase of the Project if it is built.

Response: Draft EIS section 3.3.7.2, *Environmental Effects, Land Ownership, Management, and Use,* stated that construction of Iowa Hill would begin with updating existing access roads, including Cable Road, Slab Creek dam access road, and Slab Creek reservoir access road, to accommodate construction vehicles. Given the improvement to Cable Road prior to the start of construction, and the analysis showing that the increased traffic would not reduce the level of service on these roads, we concluded in the draft EIS that residents in the area, while they would likely be inconvenienced, would not experience serious disturbances during construction. We revised final EIS section 3.3.10.2, *Environmental Effects, Construction Traffic Impact* *and Impact on Tourism at Apple Hill*, to reflect the results of SMUD's January 2008 *Transportation Route Technical Report*, which investigated several routes as alternatives to the proposed route described in the draft EIS (that is, the route using Cable Road, among others). It also evaluated the use of park and ride and/or equipment staging facilities as a means of alleviating traffic pressures. The study found that construction of the SW Connector would resolve the issues of large truck traffic on Cable Road, and that other measures such as a park-and-ride facility and use of multiple routes for different types of traffic could also help reduce adverse effects on neighborhoods. The final Transportation Management Plan may include these and other measures recommended by the Advisory Committee. However, we must emphasize that the Commission lacks any statutory authority to award or require compensation for harm or damages.

AIR RESOURCES

Comment-61: EPA comments that the Clean Air Conformity Analysis in appendix A of the draft EIS states that the construction schedule for the Iowa Hill development would be adjusted to eliminate the exceedances of oxides of nitrogen, but it notes that this measure is not included in the preferred alternative. EPA requests that in the final EIS staff include a revised General Conformity analysis that reflects the adjusted construction schedule to show that emissions are below the *de minimis* for all pollutants and that the adjustment to the construction schedule be included as a condition of any license issued for the Iowa Hill development, consistent with appendix A.

Response: In response to the California Air Resources Board (CARB), we revised our air conformity analysis using their OFFROAD model. The results of our analysis using the CARB model show that emissions would be below the *de minimis* for all pollutants. Based on these results, SMUD would not need to adjust the construction schedule. We provide the results of the revised air conformity analysis in section 3.3.11 and appendix B of the final EIS.

Comment-62: Mrs. Summers states that her property is in proximity to the Project and she is an asthmatic. Therefore, she wants assurances that SMUD will be in compliance with all California standards and guidelines in effect at the time of construction regarding particle pollution, ozone air pollution, ROG, and NOx on a daily basis.

Response: Based on our independent air conformity analysis included in the EIS, we conclude that the air emissions during construction of the proposed Iowa Hill development fall below the *de minimis* thresholds under California standards. We provided our analysis to the CARB for review.

STAFF'S CONCLUSIONS

Comment-63: Interior and American Whitewater note that recommendation no. 62 on page 5-11 of the draft EIS fails to include FWS in the reservation of authority to prescribe fishways at the UARP consistent with Proposed Article 1-35. Interior further points out that section 5.0 does not refer to Proposed Article 2-19 that reserves Section 18 authority for FWS and NMFS at the Chili Bar Project. Interior and American Whitewater state that staff should correctly paraphrase and include both Proposed Articles in the final EIS.

Response: We revised the text of the final EIS to include these corrections.

Comment-64: CDFG, SMUD, PG&E, Interior, and American Whitewater point out that the Staff Alternative in section 5 of the draft EIS modifies Proposed Articles 2-1 and 2-1 of the Settlement Agreement such that the minimum streamflow and ramping rate provisions would only apply when inflow to the Chili Bar Project is greater than the proposed minimum streamflow instead of when inflow to the Chili Bar reservoir is sufficient to maintain the proposed minimum streamflow and ramping rates. CDFG states that its HEC-ResSim model, which takes into account available storage in the reservoir, demonstrates that PG&E could comply with the minimum streamflow and ramping rates specified in the Settlement Agreement. CDFG, SMUD, PG&E, Interior, and American Whitewater request that the Commission adhere to the language in the Settlement Agreement and allow the storage in the Chili Bar reservoir to help PG&E meet the proposed minimum streamflow and ramping rates.

Response: We agree with the HEC-ResSim modeling results that show that under modeled conditions, storage in the Chili Bar reservoir could be used to maintain the minimum stream flow and ramping rates. We have modified proposed measures 1 and 2 for Chili Bar to reflect the language in the Settlement Agreement that allows for the usage of storage within Chili Bar reservoir when feasible.

Comment-65: PG&E notes that the draft EIS qualifies the development of the water temperature monitoring plan to install and maintain continuous recording devices to occur as soon as weather and flow conditions allow. PG&E states that it was not the intent of the Settlement Agreement to so restrict this measure and requests that the final EIS delete the phrase "as soon as weather and flow conditions allow."

Response: We revised the text in section 5 of the final EIS to be consistent with the intent of the Settlement Agreement.

Comment-66: Interior, SMUD, and American Whitewater comment the Staff Alternative does not include gages for real-time reporting on non-project diversion structures in the Rubicon watershed. Interior and American Whitewater recommend the Staff Alternative include these gages to be consistent with the Settlement Agreement for gaging on the Rubicon River. SMUD agrees with the staff conclusion that there is no nexus between the real-time telemetry of this gaging data and the UARP relicensing. However, SMUD points out that in summarizing the conclusions on this recommendation on page 5-22, staff appears to classify the tunnels and powerhouses as non-project diversion structures. SMUD requests that staff clarify the reference to gages located at the tunnels and powerhouses in the final EIS.

Response: We clarified that neither the Project gages at the tunnels and powerhouses, nor those on non-project diversion structures located within the upper Rubicon River watershed have real-time reporting in section 5 of the final EIS. As discussed in the draft EIS, real-time reporting gages requested by Placer County are not necessary for SMUD to ensure compliance with the recommended streamflow schedules or reservoir levels and their omission is not inconsistent with the Settlement Agreement.

Comment-67: The Forest Service, SMUD, Interior, and American Whitewater question the staff recommendation to not include the provisions of Proposed Article 1-23 to make every reasonable effort or good faith effort to meet specified reservoir elevations for several smaller reservoirs in the UARP, and these entities suggest that monitoring and adjusting the specified reservoir elevations every 5 years would address the staff's concern that these smaller reservoirs would not be able to comply with the specified elevations. SMUD comments that it agreed to keep reservoir elevations in non-storage reservoirs at historical levels for recreational and aesthetic reasons and its commitment to do so was important to the settlement negotiations. Therefore, these entities all recommend that the Staff Alternative adopt the language of Propose Article 1-23 to be consistent with the Settlement Agreement.

Response: We appreciate the effort that will be made to meet the specified reservoir elevations on the smaller reservoirs. However, as noted in the draft EIS, "good faith," "every reasonable" and related efforts to meet a measure would be impracticable to enforce as a license condition in the license articles. Therefore, we will not recommend the inclusion of these measures in any license that may be issued for the UARP.

Comment-68: SMUD notes the staff recommendation at page 5-8 of the draft EIS to expand the geographic scope of invasive weed management plan to include all lands within the Project boundary. SMUD states that staff's modification to this measure extends beyond the intent of Proposed Article 1-13 and would cost substantially more than estimated by the staff, especially in the lower 30 miles of the UARP transmission line boundary. Therefore, SMUD requests that the Commission adopt the plan described in the Settlement Agreement in the final EIS.

Response: As discussed in sections 3.3.4.2 and 3.3.5.2 of the draft EIS, managing Project-related invasive weeds infestations on all Project lands would benefit native plants and wildlife, particularly rare plants. We recognize that the increased coverage of this plan would result in some increased cost, and we recommend that monitoring be conducted during your annual inspections to cut down on expenses. Additionally, although SMUD states the effort to determine which new infestations are Project-related would be "impossible," determining which infestations are Project-related would involve the same methodology SMUD would be employing to implement Proposed Article 1-13. Although SMUD states that the cost of this plan would be substantial, it does not provide an estimated cost. Therefore, we revised the final EIS to include our estimated cost based on the information you provided about the level of effort envisioned.

Comment-69: SMUD requests that the staff-recommended wildlife lands mitigation plan, as described on page 5-39 of the draft EIS, not limit SMUD's options with respect to the issue of land ownership and inclusion of such wildlife mitigation plans in the Project boundary. Instead, SMUD requests that the staff-recommended plan allow for alternative approaches, such as an ownership transfer of SMUD-purchased land to a conservancy for wildlife preservation and management in perpetuity.

Response: Proposed Article 1-41 states that SMUD would purchase lands or obtain a conservation easement for lands to be managed as wildlife habitat for the term of the license. As stated in section 3.3.4.2 of the draft EIS, we were unable to analyze whether or not this proposed measure would adequately mitigate for the lost habitat without knowing what land would be purchased, what habitat types it contains, or which wildlife management goals SMUD would apply to the property. To ensure that the loss of wildlife habitat at the Iowa Hill development is properly mitigated, these mitigation lands need to be within FERC's jurisdictional authority. Therefore, these lands need to be within the Project boundary.

Comment-70: SMUD takes issue with the conclusion on page 5-31 of the draft EIS that it is reasonable to include the Cleveland Corral Information Center within the Project boundary. SMUD believes that the facility is not project-related because it is a Forest Service facility that is open to all visitors to Crystal Basin, including visitors to non-project lakes, stream, lands, and trails throughout the 68,000-acre basin. Further, SMUD states that this facility is not needed for Project purposes, is not currently included in the Project boundary or adjacent to a Project reservoir, and is not included in the Settlement Agreement. Therefore SMUD requests that the Commission not include this facility in the Project boundary in the final EIS.

Response: Although SMUD assisted in the construction of this facility and continues to provide support, we agree that there is no Proposed Article that would require continued support for the facility. Therefore, we revised sections 3 and 5 of the final EIS, and we longer would recommend inclusion of the Cleveland Corral Information Center within the UARP boundary.

Comment-71: SMUD comments that the discussion on page 5-31 of the draft EIS is unclear about what facilities at the Big Hill Overlook staff recommends for inclusion in the Project boundary. SMUD requests that, consistent with the discussion on page 3-267, the final EIS include only those recreational-specific facilities of Big Hill Overlook within the Project boundary and not the non-public facilities, such as the Forest Service heliport facilities.

Response: We revised section 5 of the final EIS to clarify that only the public accessible recreational facilities of the Big Hill Overlook would be included within the Project boundary.

Comment-72: The Forest Service and American Whitewater do not agree with the staff's position that Proposed Article 1-21 is contrary to the Commission's policy on the imposition of funds and cost caps and comment that the collection agreement between SMUD and the Forest Service described in Proposed Article 1-21 is the appropriate vehicle to direct and define the maintenance activities and estimated costs that are directly related to Project operations. The Forest Service and American Whitewater point to the data Rationale Report (CDFG, 2007, as cited in the main text of the draft EIS) that demonstrates a Project nexus and states that the annual dollar amount specified in Proposed Article 1-21 is considerably less than the actual costs to the Forest Service. SMUD comments that this provision is one that the Commission would not normally include as a condition of license and that it agreed to an annual payment to the Forest Service as a matter of settlement. However, SMUD points out that the annual amount was carefully negotiated, and it agrees with the Forest Service that the proposed annual payment is less than the cost estimates by the Forest Service for the operation, maintenance, and administration of the developed sites, facilities, or uses that are adjacent to or in the vicinity of UARP reservoirs and facilities. Furthermore, SMUD states that it would be a mandatory condition under section 4(e) and requests that the Commission include Proposed Article 1-21 as presented in the Settlement Agreement in any license issued for the Project. SMUD also comments that the discussion of its responsibilities for maintaining Project features combined with elimination of the cost cap suggests that SMUD would have responsibility for non project-related recreation.

Response: As a matter of Commission policy, we do not recommend inclusion of conditions that impose cost caps. We do, however, recognize the complex collaborative effort between SMUD and the Forest Service to provide recreational facilities at and near the UARP. We revised our analysis of Proposed Article 1-21 for Recreation Operation, Maintenance, and Administration in section 3.3.6.2 to conclude that the continued provision of funding by SMUD to the Forest Service for the day-to-day management and operation of Project recreation facilities benefits the public and that the proposed collection agreement would clearly define activities and costs related directly to Project recreational facilities. We also conclude that though the costs the Forest Service incurs outside the Project boundary are only a small part of the total funding, based on the recent Commission settlement policy, we would not recommend these costs be part of the an article the Commission would enforce.

Comment-73: SMUD notes the statement on page 5-33 concerning SMUD's obligations under any new license implies a staff concern that SMUD may be trying to limit its responsibility for Project-related recreational facilities. SMUD points out that under Proposed Article 1-20, it would maintain full responsibility for keeping UARP recreational facilities in safe and usable condition.

Response: We did not intend to suggest that SMUD would be limiting its responsibilities for maintaining Project recreational facilities in safe and useable conditions. We clarified this in the final EIS.

Comment-74: The Forest Service, American Whitewater, the Friends of Slab Creek, and several recreational boaters do not agree with the staff's recommended provision to determine within 10 years of licensing, what the recreational streamflows downstream of Slab Creek dam would be for the remainder of the license period. These entities state that Proposed Article 1-24 provided 15 years, if Iowa Hill development were not to be constructed, to provide whitewater flows based on monitoring because that period would allow SMUD a reasonable amount of time to construct Iowa Hill development, to allow a reasonable maximum period to install new facilities before increasing whitewater flows, and to meet the interests of whitewater boaters in having a specified period in which to increase whitewater flow days if monitoring studies indicate the increases are warranted. The Forest Service and American Whitewater further note that the draft EIS presents the most costly scenario for providing future whitewater flows rather than conveying the range of options discussed during settlement negotiations. According to the Forest Service and American Whitewater, the provision of whitewater boating flows was one of the most contentious issues addressed in the Settlement Agreement and modifications to the provision should not be made without agreement of the parties to the Settlement Agreement.

Response: As noted in response to Comment 40, we take issue with the assumption that whitewater flows would be provided regardless of the level of demand for these flows, and we would continue to require an assessment of the level of demand prior to requiring the proposed whitewater flows as a condition of any license issued for the Project.

Comment-75: Interior and American Whitewater do not agree with the staff's position that an annual fund of $15,000 for BLM to provide Project-related recreation brochure/map and an interpretive, education, public information plan is contrary to the Commission's policy on the imposition of funds and cost caps.

Response: As a matter of policy, the Commission holds licensees accountable for fully implementing the environmental measures included in a license and does not limit implementation of measures to specific cost caps. We, however, included the provision of Project-related recreational brochure/map and an interpretive, education, and public information plan in the Staff Alternative as reasonable measures that would benefit recreational users at the Chili Bar Project.

Comment-76: Interior notes on page 5-32 of the draft EIS staff indicates that PG&E's proposal to exclude 152 acres from the current Project boundary would likely have minimal environmental effects, but it does not make a recommendation because PG&E had not demonstrated the lands are no longer needed for Project purposes. Interior does not support PG&E's proposal to exclude these lands, but agrees that the new trail from Rock Creek road should be included in the Project boundary. PG&E comments that it proposes to develop and submit a revised proposed Project boundary after consultation with BLM and SMUD and request that the schedule for the submittal of revised exhibit

G drawings be consistent with the schedule for the UARP licensee's development of the UARP's Slab Creek recreation management plan.

Response: PG&E would be required to provide revised exhibit G maps after completion environmental measures that would require boundary changes, such as the proposed trail. Given that PG&E has 3 years to complete the proposed recreational improvements and that SMUD would need to file its Slab Creek recreation management plan prior to the commencement of construction of the Iowa Hill development, it would not be unreasonable for PG&E to file its revised exhibit E drawings after SMUD files its recreational management plan, assuming the schedules hold up over time.

CUMULATIVE EFFECTS

Comment-77: Mr. Hanson comments that although pages 3-290 and 3-292 of the draft EIS suggest that road improvements and maintenance associated with the construction of the Iowa Hill development may enhance the potential for development, nowhere in the draft EIS are the cumulative effects of this potential for development analyzed. He recommends that staff either augment the final EIS to include this analysis or preferably prepare a separate EIS for the Iowa Hill development.

Response: We augmented the cumulative effects summary in section 5 of the final EIS to include the cumulative effects of road improvements in the Iowa Hill area.

CONSISTENCY WITH COMPREHENSIVE PLANS

Comment-78: The Forest Service and American Whitewater comment that, contrary to the statement on page 5-44 of the draft EIS, the Iowa Hill development as described in the draft EIS, particularly the proposed berm, does not meet the visual quality standards in the Eldorado National Forest Land and Resource Management Plan and requests that the final EIS reflect this information.

Response: We revised the section 5 of the final EIS to reflect the conclusion in our analysis in section 3.3.8.2 that the Iowa Hill development as proposed would not meet the Eldorado National Forest VQOs. Under Proposed Article 1-44, SMUD would develop a visual resource protection plan that would include final designs for the development that would meet the Forest Service VQOs.

Comment-79: The Forest Service and American Whitewater point out that page 5-37 of the draft EIS incorrectly states that an HPMP is currently under review by the Forest Service and provides a copy of the Forest Service comment letter on the HPMP.

Response: We revised the text in section 5 of the final EIS to note that the Forest Service has provided comments to SMUD on the draft HPMP.

Comment-80: SMUD estimated the high-end cost to build the Iowa Hill development to be $855,362,000 in 2007 dollars.

Response: Staff corrected the high-end cost to be $855,362,000.

COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Appendix B
Clean Air Act Conformity Analysis

FEIS

APPENDIX B

UPPER AMERICAN RIVER HYDROELECTRIC PROJECT (FERC No. 2101)
AND
CHILI BAR HYDROELECTRIC PROJECT (FERC No. 2155)
CALIFORNIA

CLEAN AIR ACT CONFORMITY ANALYSIS

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LIST OF TABLES

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LIST OF ABBREVIATIONS

CAA	Clean Air Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	Carbon monoxide
Commission	Federal Energy Regulatory Commission
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ºF	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GCR	General Conformity Rule
HC	hydrocarbons
kg	kilogram
kV	kilovolt
mmBtu	million British thermal units
mph	miles per hour
MW	megawatt
MWh	megawatt-hours
MWR	Morale, Welfare and Recreation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOx	oxides of nitrogen
NSR	non-Attainment New Source Review
O_3	ozone
Pb	airborne lead
PG&E	Pacific Gas and Electric Company
Projects	UARP and Chili Bar Project
PM	particulate matter
$PM_{2.5}$	particulate matter with an equivalent aerodynamic diameter less than 2.5 um
PM_{10}	particulate matter with an equivalent aerodynamic diameter less than 10 um
PSD	prevention of significant deterioration
SIP	State Implementation Plan
SO_2	sulfur dioxide
SMUD	Sacramento Municipal Utility District
TPY	tons per year
UARP	Upper American River Project
VOC	volatile organic compounds

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1.0 INTRODUCTION

The Federal Energy Regulatory Commission (FERC), Office of Energy Projects has retained the services of The Louis Berger Group, Inc. (Berger), to perform a conformity determination with respect to proposed relicensing to the Upper American River Project (UARP or Project No. 2101) and the Chili Bar Hydroelectric Project (Project No. 2155). In support of the environmental impact statement (EIS) being prepared, Berger is performing a conformity determination for the Projects, pursuant to the provisions of 40 CFR 93.150 for General Conformity, to assess emissions that would result from construction and operation of the Projects

1.1 DESCRIPTION OF PROJECT

The Upper American River Project (UARP or Project No. 2101) is a hydroelectric project located in El Dorado and Sacramento County, California within the Rubicon River, Silver Creek, and the South Fork of the American River (SFAR) drainages and operated by the Sacramento Municipal Utility District (SMUD). The Chili Bar Hydroelectric Project (Project No. 2155), operated by the Pacific Gas and Electric Company (PG&E), is located on the SFAR in El Dorado County, California. The Projects have common stakeholders and issues, as well as operational and hydraulic interrelationships. The UARP can generate up to 688 megawatt (MW) of power, while the Chili Bar Project provides an additional capacity of 7 MW.

PG&E and SMUD entered into two relicensing cooperation agreements that defined the common relicensing issues between the Projects’ overlapping issues. These overlapping issues are related to flows into and out of Chili Bar reservoir and operational coordination. Both SMUD’s and PG&E’s license applications outlined their proposals to continue operating the UARP and the Chili Bar Project in accordance with certain existing and interim operational and environmental measures.

As part of the relicensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill pumped storage development (Iowa Hill development). The Proposed Action includes the construction of a new upper reservoir atop Iowa Hill and operation of the completed pump-storage facility with capability to generate 400 MW of electricity. The existing Project produces an average of approximately 1,835,000 megawatt-hours (MWh) of power annually. The Iowa Hill development is not expected to significantly change the Project's average annual energy production, but by using off-peak energy to pump water to the storage basin and then releasing water through the powerhouse during peak periods, SMUD would significantly increase the generated energy's value and water use efficiency.

The final EIS concludes that issuing a new license for the Chili Bar Project as proposed by PG&E with staff modifications would best achieve proper use, conservation, and comprehensive development of the Chili Bar Project and the Upper American River. Furthermore, continuing operations of the Chili Bar Project would not substantially increase air emissions. As such, an air conformity analysis was performed only for alternatives related to the UARP.

1.2 CLEAN AIR CONFORMITY

The 1990 amendments to the Clean Air Act (CAA) and the Conformity Rules require federal agencies to conform to State Implementation Plans (SIPs). Requirements and procedures have been established by the US Environmental Protection Agency (EPA) and federal agencies to ensure that federal sponsored or approved actions will comply with the National Ambient Air Quality Standards (NAAQS), and conform to the appropriate SIPs. The conformity rules apply to designated non-attainment or maintenance areas for criteria pollutants regulated under NAAQS. The SIPs are the approved state air quality regulations that provide policies, requirements, and goals for the implementation, maintenance, and enforcement of the NAAQS. SIPs include emission limitations and control measures to attain and maintain the NAAQS.

The EPA has developed two conformity regulations for transportation and non-transportation projects. Transportation projects are governed by the “transportation conformity” regulations (40 CFR Parts 51 and 93). Non-transportation projects are governed by the “general conformity” regulations (40 CFR Parts 6, 51 and 93) described in the final rule for Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Since the proposed project is a non-transportation project, the general conformity rule applies.

The general conformity determination and applicability analysis have been prepared as supplements to the EIS for the Project. Air emissions of the proposed actions during construction and operation of the Project Alternatives, including UARP-Only (without the Iowa Hill development), UARP with the Iowa Hill development, and No-Action Alternative, were evaluated for air conformity purposes.

2.0 GENERAL CONFORMITY

2.1 ATTAINMENT AND NON-ATTAINMENT AREAS

The General Conformity Rule applies to federal actions occurring in air quality regions designated as being in non-attainment for the NAAQS or attainment areas subject to maintenance plans (maintenance areas). Federal actions occurring in attainment areas are not subject to the conformity rules. A criteria pollutant is a pollutant for which an air quality standard has been established under the CAA. Under the requirements of the 1970 CAA, as amended in 1977 and 1990, the EPA established NAAQS, for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Non-attainment designation is based on the exceedances or violations of the air quality standard. A maintenance plan establishes measures to control emissions to ensure that the air quality standard is maintained in areas that have been re-designated as attainment from a previous non-attainment status.

The proposed Projects would take place in Sacramento County and El Dorado County, California. These impact areas are currently designated as serious non-attainment for 8-hour ozone, and as CO maintenance (previously nonattainment) areas. Sacramento County is also designated as moderate non-attainment for PM_{10}. The project areas are designated as attainment for other criteria pollutants. Thus, ozone (O_3), CO, and PM_{10} are the primary pollutants of concern. O_3 is principally formed through chemical reactions of oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the atmosphere; therefore, emissions of NO_x and VOC need to be included in the conformity analysis.

2.2 *DE MINIMIS* EMISSION LEVELS

Threshold (*de minimis*) rates of emissions for federal actions with the potential to have significant air quality impacts are established in 40 CFR 93.153. Under the general conformity rule, net emissions resulting from proposed federal action must be compared to the applicable *de minimis* levels on an annual basis. A formal conformity determination is required when the annual direct and indirect emissions from a federal action, occurring in a non-attainment or maintenance area, equals or exceeds the *de minimis* level. Table 2-1 lists the established *de minimis* levels for each criteria pollutant.

Table 2-1. *De minimis* emission levels for applicable air pollutants

Pollutant	**Non-attainment / Maintenance Designation**	**TPY**
Ozone (Precursors VOCs or NO_x)	Serious[a]	50
	Severe	25
	Extreme	10
	Other non-attainment areas outside ozone transport region	100
	Marginal and moderate non-attainment areas inside ozone transport region	50/100
Carbon monoxide	All[a]	100
Sulfur dioxide	All	100
Lead	All	25
Nitrogen dioxide	All	100

Pollutant	Non-attainment / Maintenance Designation	TPY
Particulate matter	Moderate[a]	100
	Serious	70

[a] *De minimis* levels for emissions included in the UARP Conformity Analysis.

2.3 ANALYSIS METHODOLOGY

Per the provisions of 40 CFR 93.150, federal agencies are required to perform a conformity determination when the emissions in non-attainment or maintenance areas would total or exceed thresholds emission levels. "Federal action," as defined in the Conformity Rules, means any activity engaged in by a federal agency, or any activity that a federal agency supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans, programs, and projects developed, funded, or approved under Title 23 USC or the Federal Transit Act (49 USC §5301 et seq.). Where the federal action is a permit, license, or other approval for some aspect of a nonfederal undertaking, the relevant activity is the part, portion, or phase of the nonfederal undertaking that required the federal permit, license, or approval. Therefore, the proposed action is defined as activities related to the re-licensing of the UARP.

Per the provisions of 40 CFR 93.150, a full conformity determination is required if calculated net emissions are above *de minimis* in non-attainment or maintenance areas. Net emissions are estimated as the difference in annual peak-year emissions between the action being analyzed and baseline condition, which is the no action alternative in this case.

The proposed action would be subject to conformity requirements if net project VOC or NOx emissions above baseline conditions exceed 50 tons per year, or if CO or PM net emissions exceed 100 tons per year. Other pollutants do not need to be included in the conformity analysis since the area is designated as attainment or unclassifiable for all other criteria pollutants. The conformity determination consists of an emission netting analysis and comparison with applicability thresholds. The detailed methodologies and procedures for air emission calculations and general conformity demonstration are described below.

3.0 ANALYSIS

The conformity analysis for a federal action examines the effects of the direct and indirect net air emissions from all sources compared to baseline conditions. Direct emissions are emissions of a criteria pollutant or its precursors that are caused or initiated by a federal action and occur at the same time and place as the action. Indirect emissions, occurring later in time and/or further removed in distance from the action itself, must be included in the determination if both of the followings apply; the federal agency can practicably control the emissions and has continuing program responsibility to maintain control and the emissions caused by the federal action are reasonably foreseeable.

3.1 ACTIVITIES INCLUDED IN ANALYSIS

The three alternatives proposed in the final Environmental Impact Statement for Hydropower License (FERC Project Nos. 2101 and 2155) include both construction and operations-related activities that may effect air emissions in the Project Area.

3.1.1 No-Action Alternative

Under the No-action Alternative, the UARP and Chili Bar Project would continue to operate under the terms and conditions of the existing licenses, and no new environmental protection, mitigation, or enhancement measures would be implemented. This alternative establishes baseline environmental conditions for comparison of net emissions produced under the other alternatives. Under the No-action Alternative, a Simple-Cycle Turbine (SCT) system will be added for additional on-peak use. These stationary combustion turbines use natural gas to generate shaft power that is converted into electricity.

3.1.2 SMUD's Proposal: Iowa Hill Development

As part of the re-licensing process, SMUD proposes to increase electrical capacity of the UARP by constructing the Iowa Hill development, which would operate as a pumped storage facility. The Iowa Hill development, as proposed, would be an off-stream pumped storage project that makes use of the existing UARP Slab Creek reservoir as a lower reservoir and creates a new upper reservoir atop Iowa Hill. A proposed underground powerhouse would house two or three, equally sized, reversible, variable-speed pump/turbine units with a rated capacity of 400 MW. Under this alternative, SMUD would also seek for additional future off-peak generation with either a preferred Combined-Cycle Turbines (CCT) combustion system or conventional coal-fired units for supplements of energy supply. A Simple-Cycle Turbine (SCT) system will also be added for additional on-peak use.

3.1.3 UARP-Only Alternative

Under this alternative, all components of SMUD's Proposal would be established with the exception of the Iowa Hill development. SMUD would operate the existing UARP facilities. Slab Creek reservoir water level fluctuations under this alternative would be the same as existing conditions, while the release schedule for the project dams would be the same as with the Iowa Hill development. Without the additional 400 MW of capacity from the Iowa Hill development, SMUD would have to meet future peak generation needs with replacement facilities, additional on-peak simple cycle peaking plants, such as a SCT system, or seek an alternative supplemental energy supply. SMUD would also add the additional future off-peak generation with either a preferred CCT combustion system or conventional coal-fired units during for supplements of energy supply.

3.2 EMISSIONS SOURCE DETERMINATION

The General Conformity Rule (GCR) requires that potential emissions generated by any project-related demolition or construction activity and/or increased operational activities be determined on an annual basis and compared to the annual *de minimis* levels for those pollutants (or their precursors) for which the area is classified as non-attainment or maintenance. CO, PM, NO_x, and VOC emissions attributable to operational activities and construction were analyzed.

In estimating construction-related air pollutants emissions, the California Air Resources Board (CARB) OFFROAD2007 model was used. The usage of equipment, the likely duration of each activity, and manpower estimates for each activity for the construction were determined by the engineer. In estimating operational-related emissions, the EPA-developed AP-42 emission factors were used if other emissions information was not provided.

3.3 CONSTRUCTION EMISSIONS

Construction-related air emissions include potential direct and indirect VOC, NO_x, CO, and PM emissions generated by construction equipment and vehicles. Emissions may result from the use of construction equipment, equipment mobilization, site preparation, foundations, exterior masonry work, interior and exterior utilities, structures demolition and construction, and exterior pavement around structures. Construction activities would involve operations of on-site construction equipment and motor vehicles, including construction material delivery trucks and workers' commuting vehicles, and dusts from earth surface handling activities. Since the maximum annual emissions would result from all lots being constructed at the same time, the number and type of equipment necessary for construction activities were determined in aggregate for the project.

In estimating air emissions from construction activities, the usage of equipment and the duration of activities for construction were first determined based on the sizes of structures and lots to be constructed. To be conservative, all equipment was assumed to be diesel-powered unless otherwise noted. Types of equipment to be used include, but are not limited to; bull dozers, rigs, crushers, rock saws, drill, scrapers, concrete batch plants, dumpers, excavators, compressors, water tanks, cranes, graders, pavers, backhoes, dump trucks, front-end loaders, jackhammers, and vibrators. The resulting air emissions were then calculated using the engine emissions model and procedures established by CARB, and other relevant data from EPA provided guidance and dust emission factors.

Because there are no construction activities in either the No-Action Alternative or the UARP-Only Alternative, construction-related emissions analysis has been performed only for the Iowa Hill development. Operational-related air emissions have been analyzed for all proposed alternatives.

Construction of the Iowa Hill development may affect short-term air quality due to construction equipment and vehicle emissions, and fugitive dust from earthmoving activities. Both potential effects would be temporary (limited to the construction period) and local (only occurring in the immediate vicinity of the construction activity).

Estimates of construction equipment emissions were based on the estimated hours of usage and emission factors for each motorized source for the project. Emission factors for NOx, VOC, CO, and PM related to heavy-duty diesel equipment were obtained from CARB OFFROAD2007 Model. The on road trucks and workers' vehicles emissions were estimated by latest CARB EMFAC model, and relevant Vehicle Emission Study Reports (EPA). Emission factors are available for hydrocarbons (HC), which include all VOC as well as other non-VOC constituents; therefore, HC emissions represent a conservative estimate of VOC emissions.

Emission factors in grams of pollutant per hour per horsepower were multiplied by the estimated running time and equipment associated average horsepower provided by the EPA to calculate total grams of pollutant from each piece of equipment. Total grams of pollutant were converted to tons of pollutant.

The OFFROAD2007 model recommends the following formula to calculate hourly emissions from nonroad engine sources:

$M_i = N \times HP \times LF \times EF_i$

Where:

M_i = mass of emissions of pollutants.

N = source population (units).

HP = average rated horsepower.

LF = typical load factor.

EF_i = average emissions of pollutant per unit of use (e.g., grams per horsepower-hour).

Estimated emissions from construction activities are presented in attachment 1. Construction of the Iowa Hill Development will occur in two phases. During the first phase, which will last approximately 24 months, material will be excavated from the upper storage reservoir and tunnel sites. The second phase, which will extend from month 25 to month 49, will include the construction of the upper storage reservoir berm, drain structure, and impermeable surface bottom, and the installation of generating equipment in the underground facilities. Emissions will be greatest during Phase I due to the large volume of material excavated; therefore this phase was evaluated for worst-case (peak-year 2009) air emissions. Other years will have lesser emissions from the construction sites.

Heavy construction equipment and truck emissions for the Iowa Hill development would be generated from the engine exhaust pipes of diesel construction equipment and trucks used for 1) the excavation and transport of materials; 2) the boring and lining of underground tunnels; 3) surface dust control in upper reservoir and stockpiling areas; and 4) delivery of equipment and materials to the construction site.

Fugitive dust emissions from the excavation of the upper reservoir site and the tunnels would be associated with excavation and transport of topsoil; ripping and transport of weathered rock; blasting, loading, and transport of basin rock; and transport of tunnel spoils. In addition, wind erosion of areas disturbed during construction activities may contribute emissions. Commuting and delivery motor vehicles operations would result in indirect emissions. The activities that are subject to the general conformity determination include vehicles' operations within project areas. Per engineering and construction team estimates, motor vehicles operations are assumed to be as follows:

- On-Road (off-site) delivery vehicles would travel at an average speed of 25 miles per hour, for a total estimated 15 deliveries per working day with 45 minutes delivery time per visit.
- Each commuter vehicles would make an average round trip of 60 miles within project areas at an average speed of 25 mph.
- Average number of commuting worker vehicles would be 130 per working days.
- There would be 264 working days per construction year.
- Obey California Idling Provisions to limit heavy duty diesel vehicles idling to 5 minutes (October 2005, CARB).

Emission factors for motor vehicles were calculated for 2009 for both delivery vehicles (heavy duty diesel vehicles) and commuter vehicles (light duty gasoline vehicles) using the most recent CARB EMFAC mobile source emission factor model associated with regional parameters.

Under the proposal, SMUD would develop and implement an Iowa Hill Development Construction Dust and Exhaust Emissions Abatement Plan in consultation with interested parties. Under the plan proposed measures would potentially minimize exhaust and fugitive dust emissions during construction of the Iowa Hill development, including:

- Operational measures, such as limiting engine idling time and shutting down equipment when not in use;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;

- Use of low sulfur and low aromatic fuel meeting California standards for motor vehicle diesel fuel;
- Regular preventive maintenance to prevent emission increases resulting from engine problems;
- Use of low-emitting diesel engines meeting federal emissions standards for construction equipment, if available;
- Use of either water application or chemical dust suppressant application to control dust emissions from unpaved surface travel and unpaved parking areas;
- Use of vacuum sweeping and/or water flushing of paved road surface to remove buildup of loose material to control dust emissions from travel on the paved access road (including adjacent public streets impacted by construction activities) and paved parking areas;
- Require all onsite haul trucks to maintain at least two feet of freeboard;
- Limit on-site traffic speeds on unpaved surfaces to 20 mph;
- Install sandbags or other erosion control measures to prevent silt runoff to roadways;
- Re-plant vegetation in disturbed areas as quickly as possible; and
- As needed, use gravel pads along with wheel washers or wash tires of all trucks exiting Mitigate fugitive dust emissions from wind erosion of areas disturbed from construction activities (including storage piles) by application of either water or chemical dust suppressant and/or use of windbreaks.

To determine the potential worst-case (peak-year) construction emissions, the engine exhausts and dust emission rates were evaluated for each source of emissions according to construction schedule. Tables 3-1 and 3-2 present the estimated worst-case maximum daily and annual heavy equipment exhaust and fugitive dust emissions with proposed measures discussed above for onsite construction activities during peak-year of construction. Detailed emissions analyses and procedures for various heavy construction equipment, trucks, and fugitive dust emissions are presented in attachment B1.

The emissions resulting from heavy equipment and trucks during construction under the Iowa Hill Alternative, as shown on table 3-2, also represent the net emission increases versus the No-action Alternative, which has no construction-related emissions. These net increases for NOx, CO, VOC, and PM are all below *de minimis* levels and meet the conformity thresholds. The SOx emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement.

Table 3-1. Maximum daily construction emissions during peak year (pounds per day)

Emission Source	NO_x	CO	VOC	SO_x	PM_{10}	$PM_{2.5}$
On-site heavy equipment and trucks	323.8	114.0	33.6	0.3	13.0	12.1
Fugitive dust					234.5	46.1
Vehicles for deliveries (on-road)	13.4	12.1	1.7	0.02	0.5	0.4
Worker travel vehicles (on-road)	7.8	75.5	7.7	0.08	0.7	0.4
Total construction emissions	345.0	201.6	43.0	0.4	248.7	59.0

Table 3-2. Annual construction emissions during peak year (tons per year)

Emission Source	NO_x	CO	VOC	SO_x	PM_{10}	$PM_{2.5}$
On-site heavy construction equipment and trucks	33.3	11.3	3.5	0.04	1.4	1.3
Fugitive dust					31.0	6.1
Vehicles for deliveries (on-road)	1.8	1.6	0.2	0.003	0.07	0.05
Worker travel vehicles (on-road)	1.0	9.9	1.0	0.01	0.09	0.05
Total construction emissions	36.1	22.8	4.70	0.18	32.56	16.9
De minimis emission levels	50	100	50	100[a]	100	100

[a] Sulfur dioxide *de minimis* level does not apply to the projects

3.4 OPERATIONAL EMISSIONS

The existing UARP produces renewable energy by using available stream flow within the two river basins in which the project is located. Conventional hydroelectric generation is a reliable, efficient, economical, and less polluting source of energy than burning fossil fuels. As water flows downstream, conventional hydro projects store and then release the water to convert the potential energy into electricity through hydraulic turbines that are connected to generators. The water exits the turbines and is returned to a stream. To evaluate air emissions resulting from UARP future operations, the energy generations for all Projects Alternatives were evaluated.

3.4.1 Operational Emissions from No-action (Baseline) Alternative

Hydropower, defined by EPA as clean energy, has nearly zero air quality impacts during operations (electricity generation). Under the No-action (baseline) Alternative, the UARP generates an average of 1,835,000 MWh of emissions-free energy annually. Hydropower's air emissions are negligible for criteria pollutants because no fuels are burned. In the UARP relicensing proceeding, SMUD proposes to add 400 MW of pumped storage capacity to the existing conventional hydropower generation at the project. Unlike conventional hydropower generation, pumped storage generation uses an upper and lower reservoir and pumps water to the upper reservoir for use in generating power to meet peak loads. So that all the alternatives we evaluate have the same total generation, we assumed that under the No-action Alternative, SMUD would meet its peak load needs by adding a simple cycle turbine (SCT) system built to generate the same additional on-peak energy of 931,000 MWh as the proposed Iowa Hill Pumped Storage development and this would contribute air emissions. Additionally, we add 43,000 MWh of off-peak energy to the baseline such that the alternative would be directly comparable to an alternative with Iowa Hill. The first column of table 3-3 shows the generation from the No-action Alternative and table 3-4a and table3-4b summarize emissions from the existing hydroelectric operations and added on-peak SCT generation. The detailed emission analysis is included in attachment B2.

3.4.2 Operational Emissions from UARP-Only Alternative

Under the UARP-only Alternative, the existing UARP facilities would operate in a manner identical to the Proposed Action, without construction of Iowa Hill development. As column 2 of table 3-3 shows, the UARP-only Alternative would result in the annual generation of 1,699,000 MWh of conventional hydroelectric energy, resulting in a reduction of about 136,000 MWh from the No-action Alternative. This reduction in generation compared to the No-Action Alternative is caused by the proposed environmental measures in the relicensing settlement agreement. We added generation in our analysis to replace this energy.

Table 3-3. Energy generation and requirement for all Project alternatives (post 2014)

UARP Operation	No Action Plus SCT for Peaking	Proposed Action Without Iowa Hill	Proposed Action With Iowa Hill	Staff Alternative
Capacity (MW)	688	688	1,088	1,088
Energy generation:				
Super-peak generation (MWh)	0	0	931,000	931,000
On-peak generation (MWh)	1,287,000	1,217,000	1,217,000	1,217,000
Off-peak generation	548,000	482,000	525,000	525,000

UARP Operation	No Action Plus SCT for Peaking	Proposed Action Without Iowa Hill	Proposed Action With Iowa Hill	Staff Alternative
(MWh)				
Total UARP Hydroelectric Generation (MWh)	1,835,000	1,699,000	2,673,000	2,673,000
Pump back energy requirements (MWh)	--	--	1,230,000	1,230,000
Net UARP Energy generation (MWh)	1,835,000	1,699,000	1,443,000	1,443,000
Replacement of delta energy between no action and alternatives				
On-peak replacement (MWh)	--	70,000	(861,000)	(861,000)
Off-peak replacement (MWh)		66,000	23,000	23,000
Replacement subtotal (MWh)	--	136,000	392,000	392,000
Other supply units:				
Additional on-peak from SCT	931,000	1,001,000	70,000	70,000
Additional off-peak from CCT or Coal	43,000	109,000	1,296,000	1,296,000
Other Supply Subtotal	974,000	1,110,000	1,366,000	1,366,000
Total net energy (MWh) under Project Alternative	2,809,000	2,809,000	2,809,000	2,809,000

Table 3-4a. Peak-year annual operational emissions for the No-action Alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
No-Action Sub-total		0.0	0.0	0.0	0.0	0.0

Table 3-4b. Peak-year annual operational emissions for the No-action Alternative (post 2014).

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,835,000	0.0	0.0	0.0	0.0	0.0
On-peak generation from SCT	931,000	77.7	38.2	22.3	9.3	11.2
Off-peak generation						
Option 1 Combined Cycle	43,000	2.2	0.9	0.8	0.4	0.5
Option 2 Coal-fired unit	43,000	2.4	2.3	0.4	0.8	2.2
Combined cycle sub-total		79.9	39.1	23.2	9.7	11.7
Coal-fired unit sub-total		80.1	40.5	22.8	10.1	13.4

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Similar to the No-action Alternative, operation of the existing UARP facilities would not result in any atmospheric emission of criteria pollutants, or other hazardous material that can affect air quality. However, without the Iowa Hill Development, SMUD would have to meet future peak generation needs by using other resources, or purchasing power from the energy market. To account for both the reduction in generation from environmental measures and the added peak generation Iowa Hill provides we've added on-peak SCT generation (1,001,000 MWh[51]), and by off-peak CCT or coal-fired units (109,000 MWh[52]) (See table 3-3) to the baseline. The replacement energy generation from all involved gas turbines or fossil fuel facilities would result in regional air emissions associated with operations. Table 3-5a and Table 3-5b estimate the

[51] Computed by adding the 931,000 MWh of on-peak added to the baseline plus 70,000 MWh in replacement on-peak energy due to environmental measures.

[52] Computed by adding the 43,000 MWh of off-peak added to the baseline plus 66,000 MWh in replacement off-peak energy due to environmental measures.

near-term (prior to 2015) and future (post 2015) emissions related to the UARP-Only Alternative's use of various systems. These emissions are compared to the No-Action emissions, to obtain the net emission increases or decreases for the conformity test of *de minimis* levels.

Table 3-5a Peak annual operational emissions for the UARP-only Alternative (prior to 2015)

	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	136,000					
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 Combined Cycle	66,000	3.3	1.4	1.3	0.7	0.8
Option 2 Coal-fired unit	66,000	3.7	3.6	0.7	1.3	3.4
Combined cycle sub-total		9.1	4.2	2.9	1.4	1.6
Coal-fired unit sub-total		9.5	6.5	2.3	2.0	4.2

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

Table 3-5b. Peak annual operational emissions for the UARP-only Alternative (post 2014).

UARP-Only (without Iowa Hill)	Annual Energy Generation (MWh)	Peak-Year Annual Emissions (tons per year)				
		NO_x	CO	VOC	PM_{10}	SO_2
Hydroelectric	1,699,000	0.0	0.0	0.0	0.0	0.0
Replacement facilities:	1,110,000					
On-peak SCT	1,001,000	83.6	41.0	24.0	10.0	12.0
Off-peak generation						
Option 1 Combined Cycle	109,000	5.5	2.2	2.1	1.1	1.3
Option 2 Coal–fired unit	109,000	6.0	5.9	1.1	2.1	5.6
Combined cycle sub-total		89.0	43.3	26.1	11.1	13.3
Coal-fired unit sub-total		89.6	47.0	25.1	12.1	17.6

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.3 Operational Emissions from Proposed Iowa Hill Development

Pumped storage projects store water during off-peak periods that can be rapidly released to provide energy generation during on-peak periods. Regional power benefits from the new development would include those often referred to as ancillary system benefits, including spinning reserves, non-spinning reserves, peaking capacity, and grid stability. The generation capacity of the Iowa Hill development would reduce the need to produce peak energy using fossil fuel-fired plants. Our analysis shows the Iowa Hill development would generate about 931,000 MWh during the super-peak period and 43,000 MWh off-peak. During Iowa Hill pumping operation, turbines would be reversed and 1,230,000 MWh of energy from a tie-in transmission line connected to the Camino-White Rock Line will pump water into the upper reservoir, thus reducing the net energy generation under this alternative to 1,443,000 MWh. Considering this revision to net energy production and future super-peak energy demand, replacement energy by other forms of electrical generation would be needed as discussed below.

3.4.4 Air Emissions Resulting From SCT for Additional On-Peak Generation

Additional on-peak generation of 70,000 MWh would be included in the Iowa Hill alternative. The additional on-peak generation would be produced from a natural gas SCT and would provide for the replacement on-peak generation due to environmental measures. A SCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. These emissions are listed in table 3-6, which summarizes the post 2014 annual peak-year emissions for all units associated with the Iowa Hill development. The annual emissions prior to 2015 would be the same as UARP-only alternative

Table 3-6. Annual peak-year operational emissions from the SMUD-proposed action with Iowa Hill Development (post 2014).

	Annual Energy Generation (MWh)	**Peak-Year Annual Emissions (tons per year)**				
		NO_x	**CO**	**VOC**	**PM_{10}**	**SO_2**
Hydroelectric	2,673,000	0.0	0.0	0.0	0.0	0.0
Electric Water Pumps	–1,230,000	--	--	--	--	--
Replacement facilities include:						
On-peak SCT	70,000	5.8	2.9	1.7	0.7	0.8
Off-peak generation						
Option 1 combined cycle	1,296,000	64.8	26.6	24.6	13.0	15.6
Option 2 coal–fired unit	1,296,000	71.9	70.6	13.0	25.3	66.1
Combined Cycle subtotal		70.6	29.4	26.3	13.7	16.4
Coal-fired subtotal		77.8	73.5	14.6	26.0	66.9

[a] EPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu.

[b] California Energy Commission, November 2001

[c] SMUD, July 2006.

[d] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs. Combined-Cycle Gas Turbine," 2002, for Power-Gen International

[e] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)

3.4.5 Air Emissions Resulting From CCT or Coal-Fired Unit for Additional Off-Peak Generation

Additional off-peak generation of 1,296,000 MWh would be included in the Iowa Hill alternative. The additional off-peak generation would be produced from a natural gas CCT or renewable sources and would provide both pumping energy and replacement of off-peak generation due to environmental measures.

Even, with the best available control technology installed, a CCT would contribute emissions of nitrogen dioxide (NO_2), SO_2, CO, ozone, VOC, and particulate matter. In addition to emission from SCT, table 3-6 summarizes the post 2014 annual peak-year emissions associated with the Iowa Hill development. The analysis includes replacement energy, additional off-peak energy generation, and use of coal-fired units the worst-case scenario for comparison.

Total future emissions resulting from the Iowa Hill development are compared to the No-Action Alternative emissions to obtain the net emission increases or decreases for conformity test of *de minimis* levels.

3.5 CONFORMITY APPLICABILITY TEST FOR *DE MINIMIS* LEVELS—TOTAL PROJECT-INDUCED ANNUAL EMISSIONS FROM CONSTRUCTION AND OPERATION

For conformity test purposes, peak-year net increases or decreases in annual operational and construction emissions are compared among Project Alternatives (tables 3-7 and 3-8).

These net emissions represent the difference in emissions between each analyzed alternative and the no-action and are used to compare with the *de minimis* levels for conformity requirement. Both off-peak replacement generation option 1, combined cycle turbine, and option 2, coal fired unit, are presented in the table for comparing to the options used in no-action conditions. As shown in these tables, the Projects-induced emissions would not exceed the *de minimis* criteria of 50 TPY of VOC or NOx, and would not exceed the criteria of 100 TPY of CO or PM, for any of the peak-case years. During the construction period, the California Idling Provisions of 5-minute limit for heavy-duty trucks and diesel equipment apply to the construction site, and therefore engine emissions would be less than those from the engines without idling limit by approximately 5 percent. Therefore, no mitigation is warranted and the Projects are determined to be compliance with the general conformity rules.

The SO_x emissions shown in the tables are for references only, since the Projects are within sulfur dioxide attainment area and are not subject to conformity requirement for sulfur dioxide.

Table 3-7. Peak-year project-induced annual emissions[a] during Iowa Hill construction period (prior to 2015).

		Additional Supply	Net Peak Annual Emissions (tons/year)					
			NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only								
Construction			0	0	0	0	0	0
Operational		CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
		Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill								
Construction			36.1	22.8	4.7	0.2	32.6	16.9
Operational		CCT	9.1	4.2	2.9	1.6	1.4	1.3
		Coal	9.5	6.5	2.3	4.2	2.0	1.8
	Total	CCT	45.2	27.0	7.6	1.8	34.0	18.2
		Coal	45.6	29.3	7.0	4.4	34.6	18.7
	De minimis		50	100	50	100	100	100

[a] Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

[b] CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

[c] Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

Table 3-8. Peak-year project-induced annual emissions[a] following Iowa Hill construction period (post 2014)

	Additional Supply	Net Peak Annual Emissions (tons/year)					
		NO_x	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$
UARP-Only							
Operational	CCT[b]	9.1	4.2	2.9	1.6	1.4	1.3
	Coal[c]	9.5	6.5	2.3	4.2	2.0	1.8
Iowa Hill							
Operational	CCT	–9.2	–9.6	3.1	4.7	3.9	3.5
	Coal	–2.4	33.0	–8.1	53.6	15.8	14.2
De minimis		50	100	50	100	100	100

[a] Project induced emission equals net change in emissions between the proposed actions and no-action. A positive value equals an increase and negative value equals a decrease in net emissions for this pollutant.

[b] CCT represents the use of combined cycle turbine for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

[c] Coal represents the use of coal-fired unit for off-peak generation for both alternatives and simple cycle turbine for on-peak generation in UARP-only Alternative.

4.0 CONCLUSION

The cumulative emissions and effects on air quality resulting from all operational and construction activities of UARP Alternatives were evaluated. Construction-related emissions result from development of the UARP Iowa Hill pump-storage facility, while operational emissions are associated with generation of additional power under UARP alternatives.

As shown in this analysis, the Projects-induced emissions for all Projects Alternatives during both worst-case construction and operational periods would not exceed the applicability test *de minimis* criteria. Therefore, the Projects will meet the General Conformity rules for all evaluated Alternatives.

While air quality emission modeling indicates construction of the Iowa Hill development would contribute to increases in temporary emissions, these increases are below *de minimis* criteria and would be limited to worst-case conditions during a short-term period. Overall, total peak-year annual construction emissions related to Iowa Hill facility development meet the General Conformity requirements because they would not exceed *de minimis* thresholds.

Without the Iowa Hill development, viable substitute resources to cover the energy supply shortage in the future would be required. Air emissions resulting from these substitute plants are also estimated to be below the conformity thresholds based on plants' control measures, including selective catalytic reduction (SCR) and thermal efficiency control, to achieve emission reduction to meet the regulations and requirements.

ATTACHMENT B1

GENERAL CONFORMITY ANALYSIS

UARP/CHILI BAR PROJECT AIR EMISSIONS SUMMARY PRIOR TO 2015

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Table B1-1. UARP/Chili Bar Project air emissions summary, prior to 2015.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh)[a]					Peak-Year Annual Emissions (tons/year)				
				NO_x	CO	VOC	PM	SO2	NO_x	CO	VOC	PM	SO2
No-action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		Generation sub-total	1,835,000						0.0	0.0	0.0	0.0	0.0
UARP-only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	70,000	0.167	0.082	0.048	0.020	0.024	5.8	2.9	1.7	0.7	0.8
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	66,000	0.100	0.041	0.038	0.020	0.024	3.3	1.4	1.3	0.7	0.8
		- Option 2 Coal-fired unit	66,000	0.111	0.109	0.020	0.039	0.102	3.7	3.6	0.7	1.3	3.4
		Generation sub-total	1,835,000					Sub-total – Option 1	9.1	4.2	2.9	1.4	1.6
								Sub-total – Option 2	9.5	6.5	2.3	2.0	4.2
									Peak-Year Iowa Hill Construction Emissions (tons/year)				
									NO_x	**CO**	**VOC**	**PM**	**SO2**
UARP with Iowa Hill	Construction Emissions (Prior to 2015)	a) Heavy equipment and trucks.							44.3	18.3	4.0	3.4	0.10
		b) Dust from earth & surface handling.										31.0	
		c) Deliveries and workers' commuting vehicles.							0.3	10.4	1.4	0.1	0.03
								Sub-total	44.6	28.7	5.4	34.5	0.1
									General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action				
									NO_x	**CO**	**VOC**	**PM**	**SO2**
				UARP only (without Iowa Hill)									
				- Option 1 (CCCT for off-peak)					9.1	4.2	2.9	1.4	1.6
				- Option 2 (Coal unit for off-peak)					9.5	6.5	2.3	2.0	4.2
				UARP with Iowa Hill									
				- During Construction					44.6	28.7	5.4	34.5	0.1
Staff alternative will have the same air emissions as those for Proposed UARP action with Iowa Hill													

References:
[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu
[b] California Energy Commission, November 2001
[c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs. Conventional Coal vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International
[d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)
[e] SMUD, July 2006

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ATTACHMENT B2

GENERAL CONFORMITY ANALYSIS

UARP/CHILI BAR PROJECT AIR EMISSIONS SUMMARY POST 2015

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Table B2-1. UARP/Chili Bar Project air emissions summary, post 2015.

Alternative	Action	Description	Annual Energy Generation (MWh)	Emission Factors (Lb/MWh)[a]					Peak-Year Annual Emissions (tons/year)				
				NO_x	CO	VOC	PM	SO2	NO_x	CO	VOC	PM	SO2
No-action (Baseline)	Operational emissions	a) Hydroelectric	1,835,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	861,000	0.167	0.082	0.048	0.020	0.024	71.9	35.3	20.7	8.6	10.3
		Generation sub-total	2,696,000						71.9	35.3	20.7	8.6	10.3
UARP-only (without Iowa Hill)	Operational emissions	a) Hydroelectric	1,699,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Additional on-peak simple cycle combustion turbine	931,000	0.167	0.082	0.048	0.020	0.024	77.7	38.2	22.3	9.3	11.2
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	66,000	0.100	0.041	0.038	0.020	0.024	3.3	1.4	1.3	0.7	0.8
		- Option 2 Coal-fired unit	66,000	0.111	0.109	0.020	0.039	0.102	3.7	3.6	0.7	1.3	3.4
		Generation sub-total	2,696,000					Sub-total – Option 1	81.0	39.5	23.6	10.0	12.0
								Sub-total – Option 2	81.4	41.8	23.0	10.6	14.5
									Peak-Year Iowa Hill Construction Emissions (tons/year)				
									NO_x	CO	VOC	PM	SO2
UARP with Iowa Hill	Operational Emissions (post 2015)	a) Hydroelectric	2,673,000	0.000	0.000	0.000	0.000	0.000	0.0	0.0	0.0	0.0	0.0
		b) Electric energy requirements for pump-back operation	-1,230,000						0.0	0.0	0.0	0.0	0.0
		c) Additional off-peak for energy generation using											
		- Option 1 Combined cycle combustion turbine	1,253,000	0.100	0.041	0.038	0.020	0.024	62.7	25.7	23.8	12.5	15.0
		- Option 2 Coal-fired unit	1,253,000	0.111	0.109	0.020	0.039	0.102	69.5	68.3	12.5	24.4	63.9
		Generation sub-total	2,696,000					Sub-total					
								Option 1	62.7	25.7	23.8	12.5	15.0
								Option 2	69.5	68.3	12.5	24.4	63.9

	General Conformity Test – Increased Emission Level (tons/year) Proposed Build Alternative versus No-Action				
	NO_x	CO	VOC	PM	SO2
UARP only (without Iowa Hill)					
- Option 1 (CCCT for off-peak)	9.1	4.2	2.9	1.4	1.6
- Option 2 (Coal unit for off-peak)	9.5	6.5	2.3	2.0	4.2
UARP with Iowa Hill					
- Option 1 (CCCT for off-peak)	-9.2	-9.6	3.1	3.9	4.7
- Option 2 (Coal unit for off-peak)	-2.4	33.0	-8.1	15.8	53.6

Staff alternative will have the same air emissions as those for Proposed UARP action with Iowa Hill

References:
[a] USEPA, AP-42, Volume 1, Fifth Edition, 2005, 1 MWh = 3.41 MMBtu
[b] California Energy Commission, November 2001
[c] Engineering, Construction, Environmental and Consulting Solutions (ECECS) Tech. Paper "Emission Comparison: IGCC vs Conventional Coal vs Combined-Cycle Gas Turbine," 2002 for Power-Gen International
[d] SOTA (State of the Art) Manual for Stationary Combustion Turbines (NJDEP, 2004)
[e] SMUD, July 2006

COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE UPPER AMERICAN RIVER AND CHILI BAR
HYDROELECTRIC PROJECTS
Docket Nos. P-2101-084 and P-2155-024

Appendix C
Capital and Annual Costs of Measures for the UARP and Chili Bar
Project

FEIS

APPENDIX C

CAPITAL AND ANNUAL COSTS OF MEASURES FOR THE UARP AND CHILI BAR PROJECT

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C.1 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE UARP ALTERNATIVES

In this section, we present the costs of environmental measures associated with the UARP alternatives. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted, in this case, to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-1. No reduction in dependable capacity was identified by SMUD for any environmental measures. Because table 1 of SMUD's April 11, 2007, submittal shows the total generation benefits drop by $8,848,800 and table 4 shows the total generation benefit drops by $8,914,400, we used the slightly lower value in our analysis to be consistent with SMUD's projected effect on energy generation. We also note that in some cases the footnotes, resulting costs, and Settlement Agreement did not always agree. In those instances, we made an appropriate entry in the column labeled comments. We show corrections to footnotes in italics. We also note when staff does not endorse a particular measure. Please note that minor round off errors of $100 may occur because all values are rounded to the nearest $100.

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Table C-1. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the UARP-only Alternative, Proposed Action (with Iowa Hill development), and Proposed Action with Staff Modifications. (Source: SMUD, 2007; Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
1	**Article 1-1. Minimum streamflows.**							
2	Implement daily minimum reservoir release schedule, and provide compliance documentation to FERC annually.	$0	$5,500	$5,500	$0	Water quantity	Yes	
3	Periodic manual adjustments to minimum release valves at all 10 Project dams.[c]	$0	$23,600	$23,600	$0	Water quantity	Yes	
4	Minimum release at Rubicon dam; installation of larger valve required.	$273,300	$0	$18,100	$710,000	Water quantity	Yes	
5	Minimum release at Buck Island.	$0	$0	$0	$134,000	Water quantity	Yes	
6	Minimum release at Loon Lake.	$0	$0	$0	$964,000	Water quantity	Yes	
7	Combined minimum release at Gerle Creek dam and Robbs Peak dam.	$0	$0	$0	$1,265,000	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
8	Minimum release at Ice House dam.		$0		$617,000	Water quantity	Yes	
9	Installation of larger valve at Ice House.	$273,300	$0	$18,100	$0	Water quantity	No	
10	Minimum release at Junction dam.	$0	$0	$0	$457,000	Water quantity	Yes	
11	Minimum release at Camino dam.	$0	$0	$0	$484,000	Water quantity	Yes	
12	Minimum release at Brush Creek dam.	$0	$0	$0	$2,000	Water quantity	Yes	
13	Minimum release at Slab Creek dam; installation of larger valve required.	$2,076,700	$0	$137,900	$2,648,000	Water quantity	Yes	
14	**Articles 1-2 and 1-3. Pulse flows**							
15	Implement pulse flows below Rubicon dam, with ramping; capital costs are for physical modifications at tunnel gate to facilitate pulse flows.[d]	$82,000	$1,500	$6,900	$152,000	Soils and geology	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
16	Implement geomorphic pulse flows below Loon Lake dam, with ramping; capital costs are for site sensitivity investigation and test releases prior to implementation.	$273,300	$500	$18,600	$126,000	Soils and geology	Yes	
17	Implement geomorphic pulse flows below Ice House dam, with ramping.	$0	$500	$500	$200,000	Soils and geology	Yes	
18	**Article 1-4. Develop and file a plan to coordinate with Chili Bar Licensee on operations and in implementing certain license conditions.**	$32,800	$10,900	$13,100	$0	Water quantity	Yes	
19	**Article 1-5. Monitoring program.**							
20	Prepare and implement long-term monitoring plan for trout populations.[e]	$10,900	$39,300	$40,000	$0	Aquatic	Yes	
21	Prepare and implement long-term monitoring plan for hardhead populations.[f]	$10,900	$6,600	$7,300	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
22	Prepare and implement long-term monitoring plan for aquatic macroinvertebrates.[g]	$10,900	$13,100	$13,800	$0	Aquatic	Yes	
23	Prepare and implement long-term monitoring plan for foothill yellow-legged frogs.[h]	$10,900	$37,700	$38,400	$0	Terrestrial	Yes	
24	Prepare and implement long-term monitoring plan for mountain yellow-legged frogs.[i]	$10,900	$6,600	$7,300	$0	Terrestrial	Yes	
25	Prepare and implement long-term monitoring plan for riparian vegetation.[j]	$10,900	$19,700	$20,400	$0	Terrestrial	Yes	Staff corrected footnote—every 10 years after year 15.
26	Investigate fluvial geomorphic properties at two sites in Loon Lake dam reach.	$273,300	$0	$18,100	$0	Soils and geology	Yes	
27	Prepare and implement long-term monitoring plan for geomorphology.[k]	$10,900	$10,500	$11,200	$0	Soils and geology	Yes	Staff corrected footnote—every 10 years after year 15.
28	Prepare and implement long-term monitoring plan for water temperature.[l]	$131,200	$27,300	$36,000	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
29	Prepare and implement long-term monitoring plan for physical water quality.[m]	$10,900	$109,300	$110,000	$0	Water quality	Yes	
30	Prepare and implement long-term monitoring plan chemistry water quality.[n]	$10,900	$54,700	$55,400	$0	Water quality	Yes	
31	Prepare and implement long-term monitoring plan for bacterial water quality.[o]	$10,900	$16,400	$17,100	$0	Water quality	Yes	Staff revision based on applicant's information on monitoring frequency in Settlement Agreement.
32	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish.[p]	$10,900	$5,500	$6,200	$0	Water quality	Yes	
33	Prepare and implement 2-year monitoring plan for fish entrainment at Robbs Peak powerhouse.	$327,900	$0	$21,800	$0	Aquatic	Yes	
34	Prepare and implement long-term monitoring plan for bears.[q]	$10,900	$10,900	$11,600	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
35	Prepare and implement long-term monitoring plan for bald eagles.	$10,900	$32,800	$33,500	$0	Terrestrial	Yes	
36	**Article 1-6. Adaptive Management Program.**[r]	$0	$0	$0	$0	Multidisciplinary	Yes	
37	**Article 1-7. Develop and implement Stream Channel Stabilization Plan in Loon Lake dam reach.**[s]	$109,300	$0	$7,300	$0	Soils and geology	Yes	
38	**Article 1-8. Maintain elevation of Gerle Creek reservoir to ensure fish passage into Gerle Creek.**[t]	$27,000	$5,000	$6,800	$0	Aquatic	Yes	
39	**Article 1-9. Implement plan to pass large woody debris downstream at Robbs Peak, Junction, Camino and Slab Creek dams.**	$21,900	$12,500	$14,000	$0	Aquatic	Yes	
40	**Article 1-10. Develop and implement a Streamflow and Reservoir Elevation Gaging Plan.**[u]	$655,800	$54,700	$98,200	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
41	**Article 1-11. Develop and implement a plan to evaluate canal and penstock emergency and maintenance release points.**	$32,800	$0	$2,200	$0	Water quality	Yes	
42	**Article 1-12. Wildlife and plant protection measures.**							
43	Annually monitor for deer or wildlife in Gerle Canal.	$0	$1,100	$1,100	$0	Terrestrial	Yes	
44	If any new construction or maintenance may affect Forest Service sensitive plants or wildlife, or ESA species, conduct a biological evaluation; the Forest Service may require measures to protect sensitive species, and a biological assessment and consultations with FWS may be required per the ESA.	$0	$16,400	$16,400	$0	Terrestrial	Yes	
45	Conduct annual review of special-status species lists and prepare study plan and perform study, if necessary.[v]	$0	$11,400	$11,400	$0	Terrestrial	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
46	Consult with agencies before conducting any O&M under transmission lines within the Pine Hill Pare Plant Preserve.	$0	$1,000	$1,000	$0	Terrestrial	Yes	
47	Develop Avian Protection Plan that addresses retrofitting transmission lines to meet design and sighting standards to minimize bird electrocutions and collisions.[w]	$306,000	$0	$20,300	$0	Terrestrial	Yes	
48	**Article 1-13. Develop and implement a Vegetation and Invasive Weed Management Plan for ENF lands, and monitor annually.**	$43,700	$54,700	$57,600	$0	Terrestrial	Yes	Staff revision of proposed measure to include all Project lands and employee awareness training.
49	**Expand Vegetation and Invasive Weed Management Plan to include all Project lands and monitor annually**	$0	$30,300	$30,300	$0	Terrestrial	Yes	Not an applicant measure.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
50	**Article 1-14. Meet annually with resource agencies to review results of implementing all ecological measures, and prepare and share a Project O&M plan for that year.**	$0	$32,800	$32,800	$0	Terrestrial	Yes	
51	**Article 1-15. Develop Recreation Implementation Plan, and update every 6 years (cost of updates incorporated into facility review measure).**	$16,400	$0	$1,100	$0	Recreation	Yes	
52	**Article 1-16. Conduct recreation survey and prepare Recreation Report every 6 years.[x]**	$0	$55,100	$55,100	$0	Recreation	Yes	
53	**Article 1-17. Designate a Forest Service liaison.**	$0	$32,800	$32,800	$0	Recreation	Yes	
54	**Article 1-18. Review recreation facilities every 6 years.**	$0	$21,900	$21,900	$0	Recreation	Yes	
55	**Article 1-19. Specific recreation measures.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
56	Prepare and implement a plan to install bear-proof food storage and trash receptacle facilities.[y]	$568,400	$0	$37,700	$0	Recreation	Yes	
57	Construct vault toilet at Buck Island reservoir.	$54,700	$0	$3,600	$0	Recreation	Yes	
58	Improve hiking trails at Buck Island reservoir.	$10,900	$0	$700	$0	Recreation	Yes	
59	Reconstruct or relocate portions of Rubicon Hiking Trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
60	Reconstruct hiking trail at Pleasant Campground.	$10,900	$0	$700	$0	Recreation	Yes	
61	Construct vault toilet at Ellis Creek staging area.	$32,800	$0	$2,200	$0	Recreation	Yes	
62	Prepare and implement a Development Plan for Loon Lake.	$371,600	$0	$24,700	$0	Recreation	Yes	
63	Reconstruct Pleasant Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
64	Expand and upgrade Northshore RV Campground.	$245,900	$0	$16,300	$0	Recreation	Yes	
65	Reconstruct Loon Lake Campground (including Equestrian Loop).	$1,038,400	$0	$68,900	$0	Recreation	Yes	
66	Upgrade Loon Lake Group Campgrounds.	$98,400	$0	$6,500	$0	Recreation	Yes	
67	Reconstruct Loon Lake Group Equestrian Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
68	Upgrade Loon Lake Boat Launch and Day Use Area.	$21,900	$0	$1,500	$0	Recreation	Yes	
69	Upgrade Red Fir Group Campground.	$76,500	$0	$5,100	$0	Recreation	Yes	
70	Upgrade Loon Lake Chalet.	$437,200	$0	$29,000	$0	Recreation	Yes	
71	Upgrade Loon Lake Sanitation Station.	$16,400	$0	$1,100	$0	Recreation	Yes	
72	Upgrade Loon Lake Trailhead facility.	$16,400	$0	$1,100	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
73	Construct a new campground on the south shore of Loon Lake reservoir.	$2,951,100	$0	$195,900	$0	Recreation	Yes	
74	Prepare and implement a Development Plan for the Gerle Creek and Airport Flat areas.	$98,400	$0	$6,500	$0	Recreation	Yes	
75	Reconstruct Gerle Creek Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
76	Upgrade Gerle Creek Day Use Area.	$27,300	$0	$1,800	$0	Recreation	Yes	
77	Upgrade Angel Creek Day Use Area.	$306,000	$0	$20,300	$0	Recreation	Yes	
78	Upgrade Airport Flat Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
79	Extend Angel Creek Trail (to tie into Summer Harvest Trail).	$273,300	$0	$18,100	$0	Recreation	Yes	
80	Upgrade Summer Harvest Trail.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
81	Prepare and implement a Development Plan for the Union Valley area.	$131,200	$0	$8,700	$0	Recreation	Yes	
82	Prepare and implement a Union Valley Reservoir Boating Management Plan.	$76,500	$0	$5,100	$0	Recreation	Yes	
83	Upgrade Azalea Cove Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
84	Upgrade Big Silver Group Campground.	$109,300	$0	$7,300	$0	Recreation	Yes	
85	Upgrade Camino Cove Campground.	$437,200	$0	$29,000	$0	Recreation	Yes	
86	Upgrade Fashoda Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
87	Upgrade Fashoda Day Use Area.	$16,400	$0	$1,100	$0	Recreation	Yes	
88	Upgrade Jones Fork Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
89	Upgrade Lone Rock Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
90	Reconstruct Sunset Campground.	$983,700	$0	$65,300	$0	Recreation	Yes	
91	Upgrade Sunset Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
92	Reconstruct Wench Creek Campground.	$874,400	$0	$58,000	$0	Recreation	Yes	
93	Reconstruct Wench Creek Group Campground.	$218,600	$0	$14,500	$0	Recreation	Yes	
94	Upgrade West Point Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
95	Upgrade West Point Boat Launch.	$87,400	$0	$5,800	$0	Recreation	Yes	
96	Upgrade Wolf Creek Campground.	$382,600	$0	$25,400	$0	Recreation	Yes	
97	Upgrade Wolf Creek Group Campground.	$87,400	$0	$5,800	$0	Recreation	Yes	
98	Reconstruct Yellowjacket Campground.	$453,600	$0	$30,100	$0	Recreation	Yes	
99	Upgrade Yellowjacket Boat Launch and extend boat ramp.	$109,300	$0	$7,300	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
100	Extend the Union Valley Reservoir bike trail (to loop the reservoir).	$3,289,900	$0	$218,400	$0	Recreation	Yes	
101	Construct access trails and restore areas on north side of Union Valley reservoir.	$453,600	$0	$30,100	$0	Recreation	Yes	
102	Prepare and implement a Development Plan for the Ice House area.	$371,600	$0	$24,700	$0	Recreation	Yes	
103	Site and construct a new small boat-in camping area.	$98,400	$0	$6,500	$0	Recreation	Yes	
104	Reconstruct Ice House Campground.	$546,500	$0	$36,300	$0	Recreation	Yes	
105	Reconstruct Ice House Day Use Area.	$191,300	$0	$12,700	$0	Recreation	Yes	
106	Upgrade Northwind Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
107	Upgrade Strawberry Point Campground.	$191,300	$0	$12,700	$0	Recreation	Yes	
108	Upgrade Ice House Boat Launch.	$21,900	$0	$1,500	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
109	Reconstruct Ice House Sanitation Station.	$54,700	$0	$3,600	$0	Recreation	Yes	
110	Construct access trails and restoration along Lakeshore Road.	$191,300	$0	$12,700	$0	Recreation	Yes	
111	Construct a new day use facility (Highland Point).	$453,600	$0	$30,100	$0	Recreation	Yes	
112	Construct a new day use facility (Upper Silver Creek/Ice reservoir).	$453,600	$0	$30,100	$0	Recreation	Yes	
113	Extend the Ice House Mountain Bike Trail (to loop the connector trail to Union Valley reservoir bike trail.	$1,639,500	$0	$108,800	$0	Recreation	Yes	
114	Upgrade Big Hill Overlook facility.	$10,900	$0	$700	$0	Recreation	Yes	
115	Improve the informal boat launch at Junction reservoir.	$109,300	$0	$7,300	$0	Recreation	Yes	
116	Improve the access area at Bryant Springs Road and SF Silver Creek.	$27,300	$0	$1,800	$0	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
117	Develop and implement plan to improve access at Brush Creek reservoir.	$131,200	$0	$8,700	$0	Recreation	Yes	
118	Develop and implement plan for boating access at Slab (upstream end).[z]	$2,448,300	$0	$162,500	$0	Recreation	Yes	
119	Develop and implement plan to improve boating access at Slab Creek reservoir (near dam).[aa]	$338,800	$0	$22,500	$0	Recreation	Yes	
120	**Article 1-20. Complete necessary heavy maintenance as determined via 6-year recreation facility review.[bb]**	$0	$109,300	$109,300	$0	Recreation	Yes	
121	**Article 1-21. Annually pay the Forest Service $1,000,000 for O&M and administration of recreation facilities and to manage use.**	$0	$1,000,000	$1,000,000	$0	Recreation	Yes	Staff recommends that SMUD provide for operations and maintain and does not endorse cost cap.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
122	**Article 1-22. Provide data to the Forest Service for carrying capacity.**	$71,000	$0	$4,700	$0	Recreation	Yes	
123	**Article 1-23. Reservoir levels.**							
124	Meet specific, summer monthly reservoir levels at Loon Lake, Union Valley, and Ice House reservoirs.[cc]	$0	$0	$0	$725,400	Recreation	Yes	
125	Maintain Gerle Creek reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 through September 10.[dd]	$0	$0	$0	$0	Recreation	Yes	
126	Maintain Slab Creek reservoir elevation above 1,830 feet during daylight hours, and restrict daily fluctuations to less than seven feet during daylight hours between July 1 and September 30.[dd]	$0	$0	$0	$0	Recreation	Yes	
127	Maintain the seasonal reservoir levels at Junction and Brush Creek reservoirs within historical levels.	$0	$0	$0	$0	Recreation	No	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
128	Maintain Rubicon and Buck Island reservoir water surface elevations as high as possible, and with minimum fluctuation, from May 1 to September 10.[dd]	$0	$0	$0	$0	Recreation	No	
129	Monitor reservoir levels and prepare report every 5 years.	$0	$10,900	$10,900	$0	Recreation	Yes	
130	**Article 1-24. Recreation streamflows.**							
131	Provide up to 19 days annually during March 1 through May 31 and in October of various flows from Slab Creek dam for whitewater boating, with ramping, and use monitoring.	$0	$35,200	$35,200	$322,000	Recreation	Yes	Cost associated with physical modifications and reduced energy benefits associated with October flow releases in year 15 are contingent on studies in year 10.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
132	Slab Creek whitwater boating capital costs for physical modifications to facilitate long-term boating flows.[ee]	$10,930,000	$0	$725,500	$0	Recreation	No	Staff has not included this cost for either the Proposed Action or Proposed Action with Staff Modifications because SMUD now indicates the cost could be considerably less than $10.9 million if the Iowa Hill development is constructed.
133	Develop and implement a whitewater boating management plan for Slab Creek dam reach, including access facilities and a plan for easement for access and parking.[ff]	$732,300	$0	$48,600	$0	Recreation	Yes	
134	Provide up to 16 days annually of various flows from Ice House dam for whitewater boating, with ramping, and use monitoring.	$0	$19,000	$19,000	$108,000	Recreation	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
135	**Article 1-25. Public information services.**							
136	Develop and implement plan to make Project information (streamflow and reservoir levels) available to the public.	$32,800	$10,900	$13,100	$0	Recreation	Yes	
137	Develop and implement an interpretive, education and public information plan, and provide a Project recreation brochure.	$109,300	$27,300	$34,600	$0	Recreation	Yes	
138	**Article 1-26. Annually match fish stocking by CDFG, up to 50,000 pounds of fish each year.**	$0	$106,100	$106,100	$0	Recreation	Yes	
139	**Article 1-27. Visual resource protection.**						Yes	
140	Meet with the Forest Service every 5 years and review opportunities to better blend Project features with landscape.[gg]	$0	$3,300	$3,300	$0	Land use and aesthetics	Yes	
141	Prior to any new construction or maintenance, prepare plan to protect visual resources.	$0	$5,500	$5,500	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
142	Improve visual quality of Robbs powerhouse and Jones Fork penstock.[hh]	$0	$0	$0	$0	Land use and aesthetics	Yes	
143	Improve visual quality of fencing at Union Valley dam switchyard.	$360,700	$0	$23,900	$0	Land use and aesthetics	Yes	
144	Improve visual quality of weather stations.	$480,900	$0	$31,900	$0	Land use and aesthetics	Yes	
145	Improve visual quality of several other Project features.	$273,300	$0	$18,100	$0	Land use and aesthetics	Yes	
146	**Articles 1-28 and 1-29. Develop and implement the Heritage Properties Management Plan, and suspend work or operations in the event heritage resources are discovered.**	$16,400	$5,500	$6,600	$0	Cultural resources	Yes	
147	**Article 1-30. Transportation system management.**							

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
148	Develop and implement Transportation System Management Plan, including a Snow Plowing Plan; update every 5 years.[ii]	$98,400	$273,300	$279,800	$0	Land use and aesthetics	Yes	Staff restricts this measure to only Project-related roads primarily used for Project purposes
149	Improve three Forest Service roads (5.3 miles of north shore road at Union Valley Reservoir, 1.3 miles of lake shore road at Ice House reservoir, and Wright's Lake tie-in intersection) and add gate at Junction dam road.[jj]	$4,382,900	$0	$290,900	$0	Land use and aesthetics	Yes	
150	**Article 1-31. Develop and implement a Trails System Management Plan; update every 5 years.**[kk]	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
151	**Article 1-32. Develop and implement a Facility Management Plan; update every 5 years.**	$54,700	$3,300	$6,900	$0	Land use and aesthetics	Yes	
152	**Article 1-33. Develop and implement a Vegetation Management Plan to rehabilitate inadequately vegetated areas.**[ll]	$32,800	$21,900	$24,100	$0	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
153	**Article 1-34. Develop and implement a Fire Prevention and Response Plan.[ll]**	$82,000	$21,900	$27,300	$0	Land use and aesthetics	Yes	
154	**Article 1-37. Develop a Project Implementation Plan that sets forth a schedule for implementing all articles in the license.**	$16,400	$0	$1,100	$0	Multidisciplinary	Yes	
155	**Article 1-40. Aquatic resources–Iowa Hill development.**							
156	Monitor hardhead populations in Slab Creek reservoir 2 years before and 2 years after construction of Iowa Hill development.	$382,600	$0	$25,400	$0	Aquatic	Yes	
157	Monitor temperatures in shallow water areas of Slab Creek reservoir to determine if Iowa Hill development is affecting hardhead distribution.[mm]	$0	$2,600	$2,600	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
158	Maintain 12°C or higher temperatures during June, July, and August in SFAR reach below Mosquito Bridge (Iowa Hill development measure).[nn]	$0	$16,400	$16,400	$0	Aquatic	Yes	
159	**Article 1-41. Purchase equivalent land or conservation easement for inkind replacement of wildlife habitat due to Iowa Hill development.[oo]**	$546,500	$0	$36,300	$0	Terrestrial	Yes	
160	Develop a wildlife lands mitigation plan for Iowa Hill construction.	$20,000		$1,300	$0	Terrestrial	Yes	Not an applicant measure.
161	**Article 1-42. Develop and implement a Storm Water Pollution Prevention Plan for construction of Iowa Hill development.[pp]**	$54,700	$0	$3,600	$0	Water quality	Yes	
162	**Article 1-43. Prepare and implement a Groundwater Management Plan for managing groundwater inflows during construction of the Iowa Hill development and post construction monitoring.[pp]**	$54,700	$0	$3,600	$0	Water quantity	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
163	**Article 1-44. Develop a design for the Iowa Hill development that meets the visual quality standards of the ENF Management Plan.[pp]**	$27,300	$0	$1,800	$0	Land use and aesthetics	Yes	
164	**Article 1-45. Heritage resources protection.[qq]**	$0	$0	$0	$0	cultural resources	Yes	
165	**Article 1-48. Develop and implement a noise attenuation plan for construction of the Iowa Hill development.**	$54,700	$0	$3,600	$0	Land use and aesthetics	Yes	
166	**Article 1-49. Develop a Recreation Access Plan for Slab Creek reservoir to address access during Iowa Hill development construction and post construction.[rr]**	$27,300	$0	$1,800	$0	Recreation	Yes	
167	File and implement a transporation plan for Iowa Hill	$30,000	$3,900	$5,900	$0	Land Use and Aesthetics	Yes	Included in license application, but not in Settlement Agreement

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits[b]	Discipline	Staff Adopting?	Notes
168	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[ss]	$0	$461,800	$461,800	$0	Multidisciplinary	Yes	
169	**Total of all Article 1 measures under the UARP-only Alternative.**	$48,753,100	$2,850,800	$6,086,300	$8,914,400			
170	**Total of all Article 1 measures under the Proposed Action.**	$39,000,900	$2,873,700	$5,461,800	$8,914,400			
171	**Total of all Article 1 measures under the Proposed Action with Staff Modifications.**	$38,747,600	$2,904,000	$5,475,300	$8,914,400			

[a] Annualized costs for one-time and capital costs determined as actual costs over a 50-year license term with 6.25 percent SMUD discount rate.

[b] Flow-related costs were derived from output of the CHEOPS water balance model, and represent incremental generation value costs from the model Base Case due to modifications to system operations at individual facilities.

[c] Annual cost based on substantial increase in frequency of dam visits to adjust valves to implement monthly release schedule.

[d] Estimated capital cost assumes minor modifications to Rockbound tunnel intake gate at Rubicon reservoir.

[e] Annual cost based on $163,950 per year of trout sampling at 13 sites, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly trout sampling cost based on relicensing study costs 2002-2004. Four of the sites will require helicopter transport.

[f] Annual cost based on $27,325 per year of hardhead sampling, performed every 2 years out of 5 during the first 16 years, then 2 years out of 10 thereafter throughout license term.

[g] Annual cost based on $54,650 per year of benthic macroinvertebrates at 10 sites, performed every 2 of 5 years during the first 16 years, then 2 years out of 10 thereafter throughout license term. Yearly BMI sampling based on relicensing study costs 2002–2004. One of the sites will require helicopter transport.

[h] Annual cost based on $81,975 per year of foothill yellow-legged frog sampling at 6 sites in three Project reaches, performed at variable frequencies depending on Project reach. Yearly sampling based on relicensing studies and PG&E survey protocols, which call for repeat visits to sampling sites. Monitoring results may lead to expansion of monitoring program and higher costs.

[i] Annual cost based on $54,650 per year of mountain yellow-legged frog sampling at Rubicon Reservoir, Rockbound Lake, and Buck Island reservoir (spring/summer surveys). Yearly sampling based on relicensing studies and PG&E survey protocols, which call for periodic visits to sampling sites. Studies performed by CDFG may result in reduced monitoring costs.

[j] Annual cost based on $163,950 per year for aerial photograph mapping and intensive greenline sampling at 15 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly riparian sampling cost based on relicensing study costs of 2003. Three of the sites will require helicopter transport.

[k] Annual cost based on $87,440 per year of sampling at 8 sites, performed every 5 years *through year 15 and every 10 years for the remainder of the* license term. Yearly geomorphology sampling cost determined from relicensing studies.

[l] One time cost associated with installing permanent temperature monitoring instruments at 12 Project facilities with linkage to SMUD data management systems. Annual costs associated with yearly installation of 5 non-permanent instruments.

[m] Annual cost based on $109,300 per year of sampling, performed every year of license term. Yearly physical monitoring at 7 Project reservoirs (two seasons/year) and multiple stream sites (four seasons/year) above and below Project reservoirs based on costs to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[n] Annual cost based on $273,250 per year of sampling, performed every 5 years of license term. Yearly water chemistry monitoring at all Project reservoirs (four seasons/year) and multiple stream sites above and below Project reservoirs based on costs (e.g., laboratory costs for total and dissolved metals at very low detection levels) to perform similar sampling during relicensing in 2002–2003. High elevation reservoirs and several stream sites will require helicopter transport.

[o] Annual cost based on $32,790 per year of sampling at 15 sites, performed every year the first 5 years then every other year through the term of the license. Yearly sampling based on relicensing study costs. Monitoring results may lead to sampling every year, which will increase annual costs.

[p] Annual cost based on $27,325 per year of sampling at 6 reservoirs, performed every 5 years throughout the license term. Yearly sampling based on relicensing study costs. Additional studies may be required based on results of sampling.

[q] One time and/or annual costs could increase under the adaptive management plan depending on results of monitoring plan.

[r] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[s] Includes one-time cost of developing study plan to investigate stream stabilization throughout 8.5-mile Loon Lake dam reach and performing the field investigation (stream stability was not studied throughout Loon Lake dam reach during relicensing). Implementing any remedial actions is an unknown future cost and not included in the table.

[t] One-time cost associated with study of current passage conditions. Annual cost associated with regular re-evaluations of passage conditions through license term. This measure is estimated to result in no reduction in annual energy benefits.

[u] One-time and capital cost is for adding new gaging sites below Gerle Creek dam and Robbs forebay dam ($546,500), and staff gages for the two boating reaches and possible telemetry equipment installation below Rubicon and Buck Island dams ($109,300); annual cost is for two streamflow monitoring sites and nine reservoir monitoring sites to be added to compliance program, and maintenance of new gages and telemetry equipment in remote sites.

[v] Annual costs associated with performing periodic reviews of new species added to special-status species lists ($5,000). A total cost of $320,000 (8 surveys at $40,000 per survey) is assumed for special-status species field surveys, distributed equally over the 50-year license term.

[w] One time cost estimate includes Avian Protection Plan development and $54,650 per year for 5 years of study. Results of study may require retrofitting.

[x] Annual cost based on $234,995 for recreation survey and $109,300 for recreation report, performed every 6 years through license term.

[y] Capital cost of $21,860 for plan development and $546,500 for implementation.

[z] Capital and one-time costs are for plan development and a new access route from the south side of the reservoir.

[aa] Actual costs may be significantly greater due to steep topography.

[bb] Actual costs may vary significantly from year to year.

[cc] Power generation losses associated with this measure reflect CHEOPS model simulated spill at UARP storage reservoirs. See section 2.0 for a discussion of the likelihood of spill occurring at the storage reservoirs under real time operation.

[dd] This reservoir level restriction measure is estimated to result in no reduction in annual energy benefits.

[ee] Capital cost is based on reconfiguring White Rock tunnel adit to serve as release point for boating flows; this reconfiguration work would be done in year 15 and only if the Iowa Hill development is not built and use triggers have been met.

[ff] Actual costs may vary.

[gg] Annual costs are for meetings with the Forest Service only. As a result of the meetings, additional annual costs are likely for measures to blend Project facilities into surrounding landscape.

[hh] The cost to paint the powerhouse and penstock are not included because SMUD will incur these costs as part of regular maintenance activities during the license term.

[ii] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan. Annual costs include road maintenance and snow plowing.

[jj] Breakdown of one-time costs: (1) North Union Valley Road cost share portion: $3,278,000, (2) Lakeshore Road: $821,500, (3) Wright's Lake tie-in cost share portion: $272,500, and (4) Junction Dam Road: $10,930.

[kk] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ll] Actual costs may vary significantly from year to year.

[mm] Annual costs based on assumption of need to place 6 to 8 temperature sensors throughout Slab Creek Reservoir annually for period of 10 years to demonstrate that temperatures in shallow water areas of Slab Creek Reservoir are not affecting hardhead distribution by pump discharge.

[nn] Annual costs associated with placing temporary temperature probe in SFAR at Mosquito Road Bridge each year from June through August.

[oo] Actual cost may vary significantly depending on future land prices in rural Sierra Nevada foothill area.

[pp] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[qq] Estimated costs for this measure are incorporated into the cost estimates for Articles 1-28 and 1-29.

[rr] One-time cost only includes development of plan. Plan implementation costs are not included because of uncertain nature of measures that will be included in the plan.

[ss] Annual cost is based on 2,730 hours of Project Management (2,730 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 887 hours of General Administration (887 hours x $60.43 direct rate + 64 percent surcharge for overhead).

C.2 CAPITAL COST AND ANNUALIZED COSTS FOR SHARED MEASURES FOR THE UARP AND CHILI BAR PROJECTS

Costs identified in this section will result from SMUD's 90 percent contribution to the implementation of overlapping-issue measures contained in the Chili Bar Project, as described in appendix 2 of the Settlement Agreement. The latest cost information for the UARP was submitted on April 11, 2007, by SMUD. The annual operations and maintenance costs were submitted as 50-year average costs. Normally, it is our practice to request actual cash flows for each measure over the first 30 years of any potential new license, compute the present worth, and then annualize the present worth to obtain annual operations and maintenance costs. To provide continuity with the SMUD submittal, we have opted in this case to use its average operations and maintenance costs. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-2.

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Table C-2. Summary of SMUD's capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for shared measures included in the Proposed Action and Proposed Action with Staff Modifications. (Source: SMUD, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$0	Water quantity	Yes	
2	**Article 2-2. Ramping rates.**	$0	$0	$0	$0	Water quantity	Yes	
3	**Article 2-3. Develop a plan to coordination with UARP Licensee.**	--	--	--	--	Water quantity	Yes	
4	**Article 2-4. Monitoring Program to prepare and implement long-term monitoring plan for fish at two sites downstream of Chili Bar dam.**	$9,800	$7,000	$7,700	$0	Aquatic	Yes	
5	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites downstream of Chili Bar dam.	$9,800	$5,900	$6,600	$0	Aquatic	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
6	Prepare and implement long-term monitoring plan for amphibians and reptiles (FYLF, CRLF, and western pond turtle) in one reach downstream of Chili Bar dam.	$9,800	$15,100	$15,800	$0	Terrestrial	Yes	
7	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam	$9,800	$9,500	$10,200	$0	Terrestrial	Yes	
8	Prepare and implement long-term monitoring plan for water temperature at four stations downstream of Chili Bar dam.	$9,800	$13,500	$14,200	$0	Water quality	Yes	
9	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and downstream of the Chili Bar dam.	$9,800	$22,500	$23,200	$0	Water quality	Yes	
10	Prepare and implement long-term monitoring plan chemistry water quality in Chili Bar reservoir and downstream of Chili Bar dam.	$9,800	$9,000	$9,700	$0	Water quality	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
11	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$9,800	$12,200	$12,900	$0	Water quality	Yes	
12	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$9,800	$1,800	$2,500	$0	Water quality	Yes	
13	**Article 2-5. Adaptive Management Program.**[a]	$0	$0	$0	$0	Multidisciplinary	Yes	
14	**Article 2-6. Sediment Management Program.**	$9,800	$5,800	$6,500	$0	Soils and geology	Yes	
15	**Article 2-7. Large woody debris.**	--	--	--	--	Aquatic	Yes	
16	**Article 2-8. Streamflow and reservoir elevation gaging.**	--	--	--	--	water quantity	Yes	
17	**Article 2-9. Wildlife and plant protection measures.**	--	--	--	--	Terrestrial		
18	**Article 2-10. Invasive Weed and Vegetation Management plans**	--	--	--	--	Terrestrial	Yes	Staff revision to include all Project lands.

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
19	**Article 2-11. Annual review of ecological conditions.**	--	--	--	--	Terrestrial	Yes	
20	**Article 2-12. BLM liaison.**	--	--	--	--	Recreation	Yes	
21	**Article 2-13. BLM recreation improvements.**	--	--	--	--	Recreation	Yes	
22	**Article 2-14. Public information services. Plan for providing streamflow and reservoir level information.**	$9,800	$13,500	$14,200	$0	Recreation	Yes	
23	Pay BLM $15,000 annually to provide Project related brochure and public education plan.		$15,000	$15,000			Yes	Staff would recommend that PG&E prepare a brochure and education plan and does not endorse cost cap.
24	**Article 2-15. Recreational streamflows.**	$0	$0	$0	$0	Recreation	Yes	
25	**Article 2-16. Visual resource protection.**	--	--	--	--	Land use and aesthetics	Yes	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost	Reduction in Annual Energy Benefits	Discipline	Staff Adopting?	Notes
26	**Article 2-17. Heritage resources.**	--	--	--	--	Cultural resources	Yes	
27	**Article 2-18. Heritage resource discovery.**	--	--	--	--	Cultural resources	No	This measure is part of the PA that is implemented before the new license.
28	**Article 2-21. Implementation schedule.**	--	--	--	--	Multidisciplinary	Yes	
29	SMUD labor to manage development and implementation of plans, monitoring programs, data management, etc.[b]	$0	$24,400	$24,400	$0	Multidisciplinary	Yes	
30	**Proposed Action**	$107,800	$155,200	$162,900	$0			

Notes: Measures with a dash in the cost columns are not overlapping measures.

[a] Adaptive management measure costs are not included because of the uncertainty associated with the need to implement the measures coupled with uncertainty of the nature and extent of the measure.

[b] Annual cost is based on 144 hours of Project Management (144 hours x $83.50 direct rate + 64 percent surcharge for overhead) and 47 hours of General Administration (47 hours x $60.43 direct rate + 64 percent surcharge for overhead).

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C.3 CAPITAL COST AND ANNUALIZED COSTS FOR MEASURES FOR THE CHILI BAR PROJECT

In this section, we present the costs of environmental measures associated with the Chili Bar Project. The latest cost information for the Chili Bar Project was submitted on May 16, 2007, by PG&E. We include capital, operations and maintenance, total annualized costs, and reductions in energy benefits in table C-3. No reduction in dependable capacity was identified by PG&E for any environmental measures. We note that PG&E made an estimate of the reduction of energy benefits in its May 16, 2007, submittal and estimated the total benefit reduction as approximately 1,000 MWh.

To enable staff to make a preliminary estimate in the final EIS, we assumed that the combined effect of minimum instream flow, ramping and recreational streamflow is a loss of 1,000 MWh as per the May 16, 2007, PG&E submittal. We applied the same ratio of peak to off-peak generation loss as PG&E previously estimated for its proposal in its additional information response dated May 18, 2006. This would result in a loss of 27.8 MWh of on peak energy and 972.2 MWh of off-peak energy.

Additionally, the effect of the Iowa Hill development on annual energy change, including both on-peak and off-peak energy, should be provided if new modeling shows a different result than the 2006 modeling. PG&E made an earlier estimate of this effect in its additional information response dated May 18, 2006, and we used this estimate in our analysis of the effect of the Iowa Hill development on energy generation and the resulting change in benefit. We applied the SMUD peak and off-peak energy rates to PG&E's 709-MWh loss due to environmental measures and the additional 291-MWh energy decrease due to the Iowa Hill development. That estimate showed that on-peak generation would increase by 638 MWh if the Iowa Hill development were to be built, and off-peak generation would decrease by 929 MWh, resulting in a decrease of 291 MWh. Therefore, if the Iowa Hill development were to be constructed, there would be an overall energy decrease of 1,000 MWh. If PG&E chooses to use peak, partial peak, off-peak, and super off-peak energy values on a monthly basis, it would need to provide complete backup information so that the Commission staff can independently check the computations.

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Table C-3. Summary of capital costs, operations and maintenance costs, annualized costs and reduction in annual energy benefits for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Chili Bar Project. (Source: PG&E, 2007 and Staff)

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
1	**Article 2-1. Minimum streamflows.**	$0	$0	$0	$56,300	Water quantity	Computed as 27.8 MWh times $73.89/MWh plus 972.2 MWh times $55.80/MWh
2	**Article 2-2. Ramping rates.**	$30,000	$15,000	$19,400		Water quantity	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
3	**Article 2-3. Coordination with UARP Licensee.**	$0	$10,000	$10,000	$0	Water quantity	
4	**Article 2-4. Monitoring Program.**[b]						
5	Prepare and implement long-term monitoring plan for fish at two sites in the reach downstream of Chili Bar dam.	$1,100	$800	$1,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
6	Prepare and implement long-term monitoring plan for macroinvertebrates at two sites in the reach downstream of Chili Bar dam.	$1,100	$700	$900	$0	Aquatic	
7	Prepare and implement long-term monitoring plan for amphibians and reptiles in the reach downstream of Chili Bar dam.	$1,100	$1,700	$1,900	$0	Terrestrial	
8	Prepare and implement long-term monitoring plan for riparian vegetation in the reach downstream of Chili Bar dam.	$1,100	$1,100	$1,300	$0	Terrestrial	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
9	Prepare and implement long-term monitoring plan for water temperature at four stations in the reach downstream of Chili Bar dam.	$1,100	$1,500	$1,700	$0	Water quality	
10	Prepare and implement long-term monitoring plan for physical water quality in Chili Bar reservoir and in the reach downstream of the Chili Bar dam.	$1,100	$2,500	$2,700	$0	Water quality	
11	Prepare and implement long-term monitoring plan for water chemistry in Chili Bar reservoir and in the reach downstream of Chili Bar dam.	$1,100	$1,000	$1,200	$0	Water quality	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
12	Prepare and implement long-term monitoring plan for bacterial water quality in the reach downstream of the Chili Bar dam.	$1,100	$1,400	$1,600	$0	Water quality	
13	Prepare and implement long-term monitoring plan for metals bioaccumulation in fish in Chili Bar reservoir.	$1,100	$200	$400	$0	Water quality	
14	**Article 2-5. Adaptive Management Program.**[c]	$0	$0	$0	$0	Multidisciplinary	
15	**Article 2-6. Sediment Management Program.**[b]	$1,100	$600	$800	$0	Soils and geology	
16	**Article 2-7. Large woody debris.**	$0	$10,000	$10,000	$0	Aquatic	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
17	**Article 2-8. Streamflow and reservoir elevation gaging.**	$10,000	$5,000	$6,500	$0	Water quantity	
18	**Article 2-9. Wildlife and plant protection measures.**	$0	$5,000	$5,000	$0	Terrestrial	
19	**Article 2-10. Invasive Weed and Vegetation Management Plans.**	$10,000	$5,000	$6,500	$0	Terrestrial	
20	**Article 2-11. Annual review of ecological conditions.**	$0	$10,000	$10,000	$0	Terrestrial	
21	**Article 2-12. BLM liaison.**	$0	$2,000	$2,000	$0	Recreation	
22	**Article 2-13. BLM recreation improvements.**	$70,000	$5,000	$15,200	$0	Recreation	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
23	**Article 2-14. Public information services.**	$1,100	$1,500	$1,700	$0	Recreation	
24	**Article 2-15. Recreational stream flows.**	$0	$0	$0	$0	Recreation	Preliminary reduction in energy benefit has been lumped with minimum streamflows measure.
25	**Article 2-16. Visual resource protection.**	$0	$0	$0	$0	Land use and aesthetics	
26	**Article 2-17. Heritage resources.**	$10,000	$2,000	$3,500	$0	Cultural resources	
27	**Article 2-18. Heritage resource discovery.**	$0	$0	$0	$0	Cultural resources	
28	**Article 2-21. Implementation schedule.**	$25,000	$5,000	$8,600	$0	Multidisciplinary	

Row No.	Environmental Measure	Capital Cost	Annual O&M cost	Annualized Cost[a]	Reduction in Annual Energy Benefits	Discipline	Comment
29	PG&E labor to manage development and implementation of plans, monitoring programs, data management, etc.	$0	$25,000	$25,000	$0	Multidisciplinary	
30	**Proposed Action**	$167,100	$112,000	$136,900			
31	Additional staff measure(s)						
32	Prepare a recreation plan for Chili Bar Project every 6 years.		$2,700	$2,700		Recreation	PG7E estimates that additional costs could result as the plan evolves.
33	**Proposed Action with Staff Modifications**	$167,100	$114,700	$139,300			
34	**Iowa Hill development effect on Chili Bar generation**				–$4,800		Computed as –638 MWh times $73.89/MWh plus 929 MWh times $55.80/Mwh

[a] As per PG&E, costs are current estimates based on initial analysis of the Settlement Agreement and are subject to revision.

[b] Overlapping measure with UARP.

[c] Adaptive management measure costs are not included due to the uncertainty associated with the nature, extent and implementation.

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Document Content(s)