Office of
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June 2010

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR HYDROPOWER LICENSE SURRENDER

KILARC-COW CREEK HYDROELECTRIC PROJECT – FERC PROJECT NO. 606

CALIFORNIA

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF ENERGY PROJECTS
888 FIRST STREET, NE
WASHINGTON, DC 20426

FERC/DEIS-D-0236

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California

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Administration & Compliance
888 First Street, NE
Washington, DC 20426

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COVER SHEET

a. Title: License Surrender for the Kilarc-Cow Creek Hydroelectric Project, FERC Project No. 606

b. Subject: Draft Environmental Impact Statement (DEIS)

c. Lead Agency: Federal Energy Regulatory Commission

d. Abstract: On March 12, 2009, Pacific Gas and Electric filed an application to surrender its license for the Kilarc-Cow Creek Hydroelectric Project (FERC Project No. 606), located on Old Cow Creek, South Cow Creek, and tributaries in Shasta County, California. The project consists of two developments, Kilarc and Cow Creek. The two developments operate independently and are located in two different subwatersheds. The Kilarc development has an installed capacity of 3.23 megawatts (MW) and the Cow Creek development has an installed capacity of 1.44 MW.

Of the total 184.32 acres of land within the project boundary, 1.87 acres of federal lands are administered by the U.S. Bureau of Indian Affairs. The project generates an average of about 31,100 megawatt hours (MWh) annually.

The staff's recommendation is for the license surrender as proposed, with additional staff recommendations.

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f. Transmittal: This DEIS prepared by Commission staff on the application filed by PG&E to surrender the license for the existing Kilarc-Cow Creek Hydroelectric Project is being made available to the public on or about

June 22, 2010, as required by the National Environmental Policy Act of 1969.[1]

[1] National Environmental Policy Act of 1969, amended (Public Law [Pub. L.] 91-190, 42 United States Code [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).

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 developments 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(3)...[4]

Moreover, section 6 of the FPA allows licensees to voluntarily surrender existing licenses to the Commission and cease operation of their facilities. 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 license surrender 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, Pub. L. 99-495 (1986) and the Energy Policy Act of 1992, Pub. L. 102-486 (1992), and the Energy Policy Act of 2005, Pub. L. 109-58 (2005).

[3] Pub. L. 95-91, 91 Stat. 556 (1977).

[4] 16 U.S.C. §803(a) (2008).

[5] 16 U.S.C. §803(g) (2008).

[6] 18 Code of Federal Regulations §385.206 (2008).

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ACRONYMS AND ABBREVIATIONS

AA1	Action Alternative 1
AA2	Action Alternative 2
AC	alternating current
ac-ft	acre-feet
ADA	Americans with Disabilities Act
Adjudication	1969 Cow Creek Adjudication
ADU	Abbott Ditch Users
APE	area of potential effects
Basin Plan	*Water Quality Control Plan*
BA	biological assessment
BE	biological evaluation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BO	Biological Opinion
Cal FIRE	California Department of Forestry and Fire Protection
Cal Fish and Game	California Department of Fish and Game
California DOF	California Department of Finance
California RPS	Renewable Portfolio Standard
California SBOE	California State Board of Education
California SWRCB	California State Water Resources Control Board
CEQA	California Environmental Quality Act
CFP	California fully protected
CFR	Code of Federal Regulations
cfs	cubic feet per second
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CPUC	California Public Utilities Commission
CRWQCB	California Regional Water Quality Control Board
CSC	California state species of concern
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DC	direct current
DEIS	draft environmental impact statement
DO	dissolved oxygen
DOI	Department of Interior
DPS	distinct population segment
EFH	essential fish habitat

EIS	environmental impact statement
ESA	Endangered Species Act
ESU	evolutionarily significant unit
°F	degrees Fahrenheit
FC	federal candidate
FD	federal delisted
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
FPA	Federal Power Act
FR	*Federal Register*
ft	foot or feet
ft^2	square foot or square feet
ft msl	feet above mean sea level
FT	federally threatened
FWS	U.S. Fish and Wildlife Service
GANDA	Garcia and Associates
in.	inch(es)
JRP	JRP Historical Consulting Services and the California Department of Transportation
KOP	key observation point
kWh	kilowatt hour(s)
LCC	Land Conservation Commitment
LCCP	land conservation and conveyance plan
LCP	land conservation plan
licensee	Pacific Gas and Electric
LSA	license surrender application
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
mg/kg	milligrams(s) per kilogram
mg/l	milligram(s) per liter
mm	millimeter(s)
MOA	memorandum of agreement
MMP	mitigation and monitoring plan
MPR	market price referent
MW	megawatt
MWh	megawatt hour
National Register	National Register of Historic Places
NCPC	Northern California Power Company
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI	notice of intent

NTU	nephelometric turbidity units
PAOT	people-at-one-time
PEL	probable effect level
PG&E	Pacific Gas and Electric
PM&E	protection, mitigation, and enhancement
project	Kilarc-Cow Creek Project
Proposed Action	PG&E's proposal
Pub. L.	Public Law
RTE	rare, threatened, or endangered
SA	special animal
SCO	Shasta County Ordinance
SE	state endangered
SHN	SHN Consulting Engineers & Geologists and Vestra Resources, Inc.
SHPO	State Historic Preservation Officer
SPI	Sierra Pacific Industries
sq mi	square mile(s)
Stewardship Council	Pacific Forest and Watershed Land Stewardship Council
TCP	traditional cultural property
TEL	threshold effect level
TPI	total personal income
TRPA	Thomas R. Payne & Associates
TU	Trout Unlimited
U.S.C.	United States Code
USGS	U.S. Geological Survey
VAOT	vehicles-at-one-time
VELB	valley elderberry longhorn beetle
WL	watch list
WVCFC	Whitmore Volunteer Community Fire Company

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EXECUTIVE SUMMARY

On March 12, 2009, Pacific Gas and Electric (PG&E) filed an application to surrender its license for the Kilarc-Cow Creek Hydroelectric Project (FERC No. 606). The Kilarc-Cow Creek Project is located on Old Cow Creek, South Cow Creek, and tributaries in Shasta County, California. Of the total 184.32 acres of land within the project boundary, 1.87 acres are held in trust by the United States under the jurisdiction of the Bureau of Indian Affairs.

Proposed Action

The project consists of two forebays and five diversion dams; 20 canal sections, flumes, tunnels, and associated spillways; one siphon; two penstocks; and two powerhouses with associated tailraces, switchyards, and transmission facilities. The project operates in a run-of-river mode, has an installed capacity of 4.6 MW, and generates an average of 31,100 MWh annually. Additional detail about the project is provided in section 2.1, *Existing Project Facilities and Operations*.

In its application, PG&E proposes to surrender the license for operation of the project and to decommission and remove or modify several project features, including: (1) remove diversion dams and allow for free passage of fish and sediment; (2) leave in place some diversion dam abutments and foundations to protect stream banks and provide grade control; (3) leave in place and secure powerhouse structures during decommissioning with an option for preservation of powerhouse structures for future reuse; (4) remove electric generators, turbines, and other equipment; (5) grade and fill forebays; and (6) in consultation with affected landowners, leave in place, breach, or fill canal segments and remove metal and wood flume structures. Additionally, PG&E proposes to retire access roads to the project where possible. Under PG&E's proposal (Proposed Action), the removal of the project facilities would take three years, followed by two years of maintenance and monitoring of the site restoration work.

Alternatives Considered

This draft environmental impact statement (DEIS) analyzes the effects of project decommissioning and recommends conditions for surrender of the project license. In addition to PG&E's proposal, we consider three other alternatives: (1) Action Alternative 1 (AA1)─ surrender the Cow Creek Development as proposed by PG&E, and retain sufficient infrastructure at the Kilarc Development to maintain the Kilarc forebay for recreation; (2) Action Alternative 2 (AA2)─ surrender the Kilarc Development as proposed by PG&E, and retain sufficient infrastructure at the Cow Creek Development to maintain flow in Hooten Gulch so that the Abbot Ditch Users (ADU) can continue to access their water right at the current point of diversion; and (3) No Action─ continued project operation with no changes.

Proposed Action, as Modified by Staff

Under the Proposed Action, as modified by staff, the project would be decommissioned as proposed by PG&E with all of their proposed measures but would include the following additional recommendations and mandatory conditions:

A. Staff Additional Recommendations—

- PG&E should file with the Commission documentation of providing the well-owners located downgradient of the Kilarc forebay ample notice before commencement of draining the Kilarc forebay.
- PG&E should include Sierra Pacific Industries' requirement to maintain its access roads to minimum specifications when used during the Proposed Action within the project boundary.
- PG&E should file documentation of its cooperation with Tetrick Ranch and ADU regarding the date at which water delivery to the Hooten Gulch will cease.

B. Mandatory conditions—The DOI reserves its authority for fishway prescriptions, but decommissioning as proposed by PG&E would remove any project-related obstacles to fish passage. Additionally, once the Commission accepts surrender of the license its authority to impose conditions on the project ceases. The California State Water Resources Control Board is expected to issue a water quality certification for the proposed decommissioning by August 18, 2010; conditions in the certification are not known at this time.

Action Alternative 1—Retaining Kilarc Forebay

The purpose of AA1 is to ensure continued recreational access at the Kilarc forebay. Those facilities of the Kilarc Development required to maintain the forebay would be improved to provide fish passage and to increase flows to the bypassed reach. The remainder of the Kilarc Development and the entire Cow Creek Development would be decommissioned as described in PG&E's Proposed Action. In AA1 we analyze: the impacts of the surrender and removal of the Cow Creek diversion dam, the maintenance of the Kilarc forebay and related infrastructure, and the installation of a new fish passage facility at the Kilarc main canal diversion dam and a fish screen at the entrance to the Kilarc main canal. This alternative does not include generation. This alternative assumes that an interested entity with adequate financial resources can be identified to take over operation and maintenance of the remaining facilities and monitoring required by resource agencies. Final Commission approval of the surrender of license would be dependent upon the licensee's compliance with all the conditions the Commission may require in any order accepting surrender of the Kilarc-Cow Creek license.

Action Alternative 2—Retaining Flow to ADU

The purpose of AA2 is to maintain flow in Hooten Gulch to ensure continued flow to ADU (ADU can continue to access water at the current point of diversion). Those

facilities of the Cow Creek Development required to maintain flow to Hooten Gulch would be improved to provide fish passage and to increase flow to the bypassed reach. The remainder of the Cow Creek Development and the entire Kilarc Development would be decommissioned as described in PG&E's Proposed Action. In AA2, we analyze the impacts of the surrender and removal of the Kilarc diversion dam, the maintenance of the South Cow Creek main canal, and the installation of an upgraded fish passage facility at the South Cow Creek diversion dam. This alternative does not include generation. This alternative assumes that an interested entity with adequate financial resources can be identified to take over operation and maintenance of the remaining facilities and monitoring required by resource agencies. Final Commission approval of the surrender of license would be dependent upon the licensee's compliance with all the conditions the Commission may require in any order accepting surrender of the Kilarc-Cow Creek license.

Public Involvement and Areas of Concern

Pre-Filing of PG&E's Application

The Commission's regulations (18 Code of Federal Regulations sections 4.38 and 6.1) require that applicants consult with appropriate resource agencies, Indian tribes, and other entities before filing an application for surrender of license. Before filing its license surrender application (LSA), PG&E held public meetings in Whitmore, Redding, and Palo Cedro, California, on March 27, May 15, and May 16, 2007, respectively. On June 13 and 14, 2007, PG&E hosted a public site visit at the project facilities. PG&E discussed the preliminary proposed decommissioning plan at meetings in Redding and Palo Cedro, California, on September 12 and 13, 2007, and held additional meetings on November 7 and 8, 2007, to discuss comments received during the 30-day comment period and the resource issues to be addressed in the LSA. PG&E consulted with federal and state resource agencies in spring and summer 2008, holding several meetings and conducting a site visit. PG&E issued the draft LSA at meetings held on September 9 and 10, 2008, in Redding and Palo Cedro, California. PG&E collected comments from interested parties and addressed them in the final LSA.

Post-Filing of PG&E's Application

On May 12, 2009, the Commission issued a notice that PG&E's application for surrender of license was accepted for filing, and soliciting comments, protests, and motions to intervene on this application. After the application was filed, Commission staff conducted scoping to determine what issues and alternatives should be addressed. Commission staff issued a scoping document to interested parties on September 15, 2009. Scoping meetings were held in Palo Cedro, California, on October 19, 2009, and in Redding, California, on October 22, 2009. In addition, two days of environmental site reviews of the project facilities were open to the public. On February 19, 2010, the Commission issued a notice of intent to complete an environmental impact statement as the National Environmental Policy Act document due to the scope of the issues.

The primary issues associated with surrendering the project license are: the potential socioeconomic effects on ADU, the potential loss of the Kilarc forebay as a recreation site and source of water for fire protection, and potential effects of dam removal on fish passage and habitat.

Effects of Proposed Action

Geologic and Soil Resources—Under PG&E's proposal, the removal of the Mill Creek, North Canyon Creek, and South Canyon Creek diversion dams would restore the annual peak runoff magnitude, and the associated sediment transport capacity of these channels. Stored sediment behind the Kilarc and South Cow Creek diversion dams would be released.

Water Resources— Two forebays would be permanently lost. Enhancement of stream flows in the bypassed reaches would result from an increase in the average monthly flows and by restoration of natural seasonal flows. Annual peak stream flows would increase slightly.

Fisheries and Aquatic Resources—The removal of project features and the cessation of diversions would return the bypassed reaches to more natural flow conditions, and sediment transport and deposition, which is expected to result in long-term benefits for aquatic species. Short-term adverse effects on resident fish and habitat due to possible stranding during impoundment drawdowns would be mitigated by PG&E's proposed environmental measures.

Botanical Resources—A riparian and wetland system more natural to the seasonal and cyclic hydrologic conditions that prevailed prior to the project would be established. Vegetation associated with wetlands, swales, and seeps that have become established adjacent to project facilities could be adversely affected, as could vegetation in the path of new or improved access roads needed for the proposed action. The riparian area within Hooten Gulch may be reduced as augmentation of flows downstream of the Cow Creek powerhouse would end. Mountain lady's slipper and big-scale balsam-root, special status species, are expected to be unavoidably affected, and soil disturbance and water level alterations may provide mechanisms for the adverse establishment and spread of invasive plant species.

Terrestrial Resources—Wildlife species sensitive to noise, lighting, and human activity may be temporarily affected, and there may be some mortality of non- or minimally mobile wildlife species. The discontinuation of Cow Creek powerhouse operations during spring would minimize potential effects on amphibians and turtles, and the expected increase in summer flows to South Cow Creek would provide long-term habitat benefits to the foothill yellow-legged frog. The proposed environmental measures would help mitigate any minor effects on roosting bat species, habitat for special status bird species, and nesting non-status birds.

Rare, Threatened, and Endangered Species—Protection through avoidance of any elderberry shrubs would protect potential habitat for the valley elderberry longhorn

beetle. Water temperatures in the South Cow Creek bypassed reach likely would be reduced, but likely would continue to exceed criteria for coldwater fisheries. Federally listed fish species would benefit from greater, unrestricted access to valuable spawning, feeding, nursery, and overwintering habitats.

Recreation—Individuals, including underserved youth and the disabled, who have traditionally used the Kilarc forebay and the day use area for recreational activities, such as bank fishing, sightseeing, picnicking, and general recreation, would be adversely effected over the long-term, because access to the Kilarc forebay and the recreation facilities would no longer exist. However, other comparable recreation areas exist within driving distance of the project that provides similar recreational opportunities.

Land Use—Under PG&E's proposal, the adverse effects of removal of project facilities on land use, and on properties adjacent to the project, would be short-term in nature, limited to the physical removal process at each development that would include disturbance by equipment operation and constructing new access roads. Adverse effects on fire suppression from the removal of the Kilarc forebay would be long-term but minor, as other local sources of water exist for helicopter access. Removal of the Kilarc forebay and Kilarc day use area would conflict with PG&E's commitment to the land conservation plan (LCP), and have a moderate long-term adverse impact on the public recreation focus for project lands associated with its Kilarc Reservoir Planning Unit, developed as part of the Stewardship Council Recommended Concept in the LCP.

Activities associated with the Proposed Action at the Cow Creek Development could conflict with the preservation of agricultural lands goal of the Shasta County General Plan by having an adverse effect on agricultural lands currently irrigated by flows from the Abbott Diversion. Additionally, activities associated with the Proposed Action at the Cow Creek Development could conflict with PG&E's commitment to the LCP, and have a long-term adverse impact on the agricultural land preservation focus for project lands associated with its Cow Creek Planning Unit, developed as part of the Stewardship Council Recommended Concept in the LCP. Under the Proposed Action, the removal of augmented water flows to Hooten Gulch, and the resulting loss of flows to the Abbott Diversion, could have major long-term adverse effects on local uses of flows for agricultural irrigation purposes if an alternate source of water was not provided.

Aesthetics—The removal of the Kilarc forebay area as a visual resource, and termination of the public's right to access this area, represents a long-term adverse effect. However, this effect would be minor because sightseeing and scenic views are possible from other recreational areas within close proximity to the project. Any impacts to aesthetic and visual resources at the Cow Creek Development would be minor due to project facilities being located on private lands that inaccessible to the general public.

Socioeconomics— If an alternate diversion were not constructed, adverse effects to socioeconomics would occur, including : (1) reducing property taxes paid to Shasta County by about $41,547 annually; (2) the flow in Abbott Ditch would cease to irrigate the 312 acres of crop and pasture lands that support, in part, Tetrick Ranch and ADU

farming and ranching operations; and (3) the Tetrick Hydroelectric Project would not generate as much power and would represent a loss of a source of revenue for its current owner. These adverse effects would be relatively minor effects to the region but major adverse effects to those entities directly affected.

Cultural Resources—The proposed memorandum of agreement between the State Historic Preservation Officer and the Commission would provide mitigation for the unavoidable adverse effects on archaeological and historical resources at the Kilarc and Cow Creek Developments.

Economics—In section 4.1, *Comparison of Alternatives*, we estimate the total construction cost for the alternatives identified above. Our analysis shows that the cost would be approximately $9,000,000 for the Proposed Action and for the Proposed Action, with additional staff recommendations.

Staff Conclusions

We recommend surrender of the project license as proposed by PG&E with staff additional recommendations and mandatory conditions, as described above under *Alternatives Considered*.

Based on the analysis contained within this DEIS, we recommend the Proposed Action, with staff additional recommendations, as the preferred action because: (1) the Proposed Action and Action Alternatives would be comparable in cost considering the large uncertainty in estimating costs at this point in the planning process (see section 4.1.12, *Economic Analysis*); (2) the cost of the Proposed Action and Action Alternatives would likely be less than the cost of the No-Action Alternative (existing annual license), which would eventually require greater construction costs for upgrading existing facilities in order to meet operational and/or environmental requirements; (3) there would be a long-term benefit to rate payers from the decommissioning of a facility that is no longer economically viable; (4) the recommended environmental mitigation measures proposed by PG&E, with staff additional recommendations, would adequately protect environmental resources effected by the Proposed Action; (5) section 6 of the Commission's regulations allow licensees to surrender existing project licenses and cease project operation; (6) there are no proponents in place for long-term maintenance of facilities upgraded and left in place under AA1 or AA2; and (7) neither AA1 nor AA2 would provide suitable flows for aquatic habitat in Old Cow Creek and South Cow Creek. The overall benefits of the Proposed Action, with staff additional recommendations, would be worth the cost of the proposed and recommended environmental measures and on balance would outweigh the consequences of the other alternatives. Under the Proposed Action, with staff additional recommendations, the Commission would authorize the decommissioning of the Kilarc and Cow Creek Developments. However, the surrender of license would become effective only after decommissioning activities at both developments and all mitigation measures are completed.

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1.0 INTRODUCTION

1.1 APPLICATION

On March 13, 2009, Pacific Gas and Electric (PG&E or licensee) filed an application to surrender its project license for the Kilarc-Cow Creek Hydroelectric Project (FERC Project No. 606). The Federal Energy Regulatory Commission (FERC or the Commission), under the authority of the Federal Power Act (FPA),[7] licenses and oversees the operation of non-federal hydroelectric projects in the United States. Moreover, section 6 of the FPA allows licensees to voluntarily surrender existing licenses to the Commission and cease operation of their facilities.

The Kilarc-Cow Creek Project (project) was licensed on February 8, 1980, with a termination date of March 27, 2007. The project has a total installed capacity of 4.67 megawatts (MW), and generates an average of 31,100 megawatts hours (MWh) annually (PG&E, 2009a). The project is located on Old Cow Creek, South Cow Creek, and tributaries in Shasta County, California, and consists of two developments (Kilarc and Cow Creek) (Figure 1). The project consists of two forebays and five diversion dams; 20 canal sections, flumes, tunnels, and associated spillways; one siphon; two penstocks; and two powerhouses with associated tailraces, switchyards, and transmission facilities.

A total of 184.32 acres of land are within the project boundary. Of this total, 1.87 acres are held in trust by the United States under the jurisdiction of the Bureau of Indian Affairs (BIA) for which PG&E has acquired rights for project purposes.

Prior to filing a surrender application, PG&E began the process for relicensing the project in 2002 by filing the notice of intent (NOI) with the Commission. In 2002, PG&E met with interested parties and resource agencies, including the U.S. Department of Commerce, National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), California Department of Fish and Game (Cal Fish and Game), and California State Water Resources Control Board (California SWRCB) to discuss relicensing the project. PG&E used the results of these early meetings to prepare and file its application for new license first stage consultation document in June 2002 where PG&E proposed 28 different studies to address the issues developed through the early consultation process. PG&E received comments from NMFS, FWS, Cal Fish and Game, and California SWRCB. PG&E incorporated the comments where appropriate and modified the study plans.

After performing the relicensing studies, the resource agencies identified several measures that could be recommended for implementation to protect, mitigate, or enhance the area's resources, including: (1) increased minimum flows in bypassed reaches; (2) an

[7] 16 U.S.C. § 791(a)-825(r).

upgraded fish ladder at South Cow Creek diversion dam; and (3) installation of new fish passage facilities on Old Cow Creek at the Kilarc main diversion dam.

PG&E concluded in early 2004 that the cost of providing the protection, mitigation, and enhancement (PM&E) measures for the resources affected by the project would outweigh the economic benefit of generation at the project over the life of a new license. In February 2004, PG&E notified interested parties about its decision to pursue decommissioning as an alternative to relicensing the project. PG&E started discussions on relicensing options and decommissioning alternatives at an interagency meeting held in March 2004. Interested parties expressed their interest in collaboratively working on the development of a decommissioning agreement with PG&E, and offered comments regarding project effects. Representatives included NMFS, FWS, the Bureau of Land Management (BLM), Cal Fish and Game, California SWRCB, Shasta County, Trout Unlimited (TU), and Friends of the River, among others. Consequently, several meetings were held in April 2004, with the purpose of identifying subject areas to be included in a formal project agreement and the desired conditions for each subject area post-decommissioning.

At the conclusion of the meetings, interested parties formulated an agreement, which they signed on March 30, 2005. Under the agreement, PG&E would not seek a new license for the project, but instead would surrender the project under the terms and conditions of the agreement. PG&E would operate the project until the current license expired (on March 27, 2007) and then on an annual license basis thereafter until the project was either acquired by another applicant or decommissioned.

In April 2005, Commission staff issued a notice soliciting applications for the project. Potential applicants were to file a NOI by July 7, 2005. In June 2005, the Redding City Council elected not to file a NOI for the project based on the high cost to relicense the project relative to the income expected from power production documentation. That same month, Synergics Energy Services gave notice that it intended to file an application within 18 months under the Traditional Licensing Process. However, neither Synergics Energy Services nor any other entity filed a license application within the required time.

On March 10, 2008, PG&E issued a solicitation of interest for operation of the Kilarc forebay as a recreation facility. The original letter contained a guidance document to assist interested parties in evaluating whether they would be capable of operating the facility as required. Completed solicitation of interest forms were due back by April 24, 2008. No completed forms were received by PG&E.

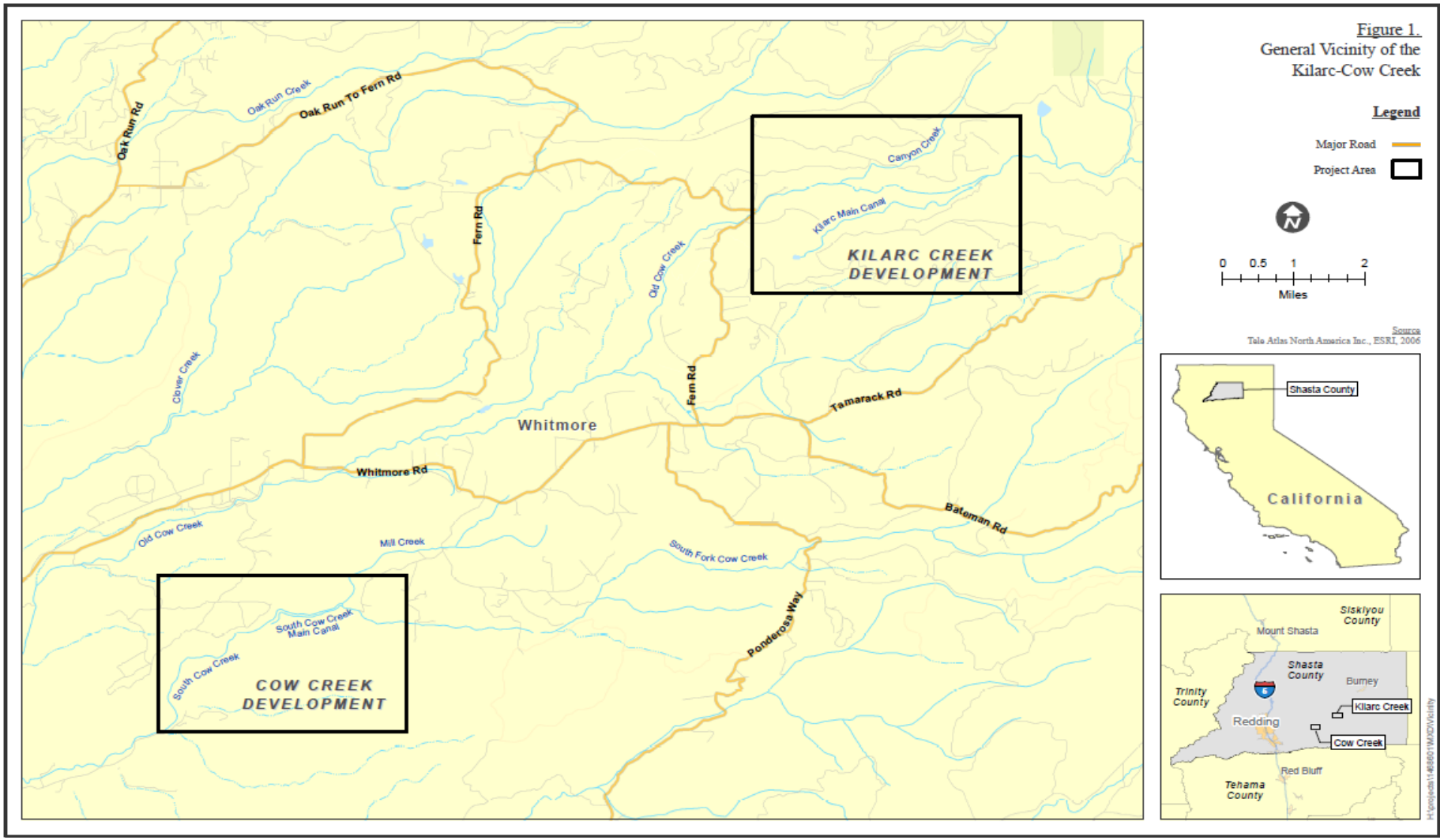

Figure 1. General vicinity of the Kilarc-Cow Creek Project, FERC Project No. 606 (Source: PG&E, 2009a).

Under the Commission's regulations at 18 Code of Federal Regulations (CFR) 6.1, an application for surrender of a project license, other than a minor license or transmission line, must be filed by the licensee in the same manner as the application for license. Pursuant to 18 CFR 16.25, where a licensee does not file an application for new license after indicating it intended to, the Commission issues notice seeking other applicants. In this case, no new license applications were received in response to the Commission's notice. Pursuant to 18 CFR 6.2, a project license may be surrendered only when the licensee has fulfilled the obligations under the license as prescribed by the Commission and project lands are restored to a satisfactory condition.

On March 13, 2009, PG&E filed an application to surrender its license to operate the Kilarc-Cow Creek Project and to decommission and remove project facilities (PG&E, 2009a). On May 12, 2009, Commission staff issued a public notice accepting the license surrender application (LSA) and soliciting motions to intervene, protests and comments, recommendations, and terms and conditions. NMFS, DOI, and Cal Fish and Game timely filed, on July 7, 10, and 10, 2009, respectively, recommendations based on the March 30, 2005 agreement between the parties. The agencies' recommended conditions are the protection, mitigation, and enhancement measures proposed by PG&E, which we summarize in section 2.3.3, *Proposed Environmental Measures.*

The National Environmental Policy Act of 1969 (NEPA)[8], the Commission's regulations, and other applicable laws require that we independently evaluate the environmental effects of surrendering the project license as proposed, as well as consider reasonable alternatives to the Proposed Action. On September 16, 2009, the Commission issued a public notice of scoping meetings and environmental site reviews to assist it in identifying the scope of the environmental issues that should be analyzed in the NEPA document. Scoping meetings and environmental site reviews were held on October 19 to 22, 2009. On the basis of comments filed in response to the scoping notice and comments made at the scoping meeting, Commission staff issued a NOI to prepare an environmental impact statement (EIS) on February 19, 2010. The Commission has prepared this draft EIS (DEIS) to describe and evaluate the probable effects, including site-specific and cumulative effects, if any, of PG&E's proposal (Proposed Action) and reasonable alternatives to the Proposed Action.

1.2 PURPOSE AND NEED FOR ACTION

The Commission must decide whether or not to approve PG&E's application for surrender of license and decommissioning the Kilarc-Cow Creek Project and decide what conditions should be included in any surrender order issued. In addition to power and development, under the FPA the Commission must give equal consideration to the

[8] National Environmental Policy Act of 1969, as amended (Public Law [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, Section 4 [b], September 13, 1982).

purposes of energy conservation; the protection, 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.

In accordance with NEPA and the Commission's regulations (18 CFR Part 380), this DEIS assesses the effects associated with the proposed surrender and decommissioning of the project, evaluates alternatives to PG&E's Proposed Action, and makes recommendations to the Commission on whether or not to approve PG&E's application, and if approved, recommends conditions to become part of any surrender order issued.

In this DEIS, we assess the environmental and economic effects of the Proposed Action, the No-Action Alternative (today's status quo), and two Action Alternatives (Action Alternative 1(AA1) and Action Alternative 2 (AA2)) developed by Commission staff to address comments received in scoping. Important issues that are addressed include: fish passage; effects to rare, threatened, or endangered (RTE) species; change in water quantity, protection of water quality; changes to wildlife habitat and wetlands; access to recreation; land use; impacts to socioeconomics and cultural resources.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the FPA states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce or the U.S. Department of the Interior (DOI).

DOI reserved its authority for fishway prescriptions in a letter dated July 10, 2009. Decommissioning of project facilities as proposed by PG&E would eliminate the existing project facilities that currently may obstruct fish passage.

1.3.1.2 Section 4(e) Conditions

Section 4(e) of the FPA provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the reservation. The project contains 1.87 acres held in trust by the United States under the jurisdiction of the BIA, and for which PG&E has acquired rights for project purposes. The BIA has not filed section 4(e) conditions.

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act (CWA), an applicant for a federal license or permit for an activity which may result in a discharge into United States waters

must first obtain from the s ate pollution control agency in which the discharge originates certification that any such discharge will comply with applicable water quality standards. PG&E applied to California SWRCB for water quality certification on August 18, 2009. On September 22, 2009, California SWRCB filed a letter stating that PG&E's application met the filing requirements and initiated a one-year clock from the date the application was received for the California SWRCB to act on PG&E's request. Thus, the California SWRCB response is expected by August 18, 2010.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally-listed endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

On April 23, 2008, PG&E requested that the Commission designate PG&E as the non-federal representative for informal consultation under the ESA with FWS and NMFS pertaining to project decommissioning. Pursuant to section 7 of the ESA, Commission staff granted the request in a letter issued June 16, 2008.

The federally-threatened Central Valley steelhead (*Oncorhynchus mykiss* distinct population segment [DPS]) and portions of its designated critical habitat are found in the action area of the proposed project. Early coordination for ESA section 7 consultation with NMFS included several meetings in August and December 2008. On April 30, 2009, PG&E submitted a draft biological evaluation (BE) to NMFS. Several phone communications followed, and NMFS submitted comments on the draft BE to PG&E on June 12, 2009.

On August 26, 2009, PG&E filed a draft BE with the Commission, in which PG&E determined that the Proposed Action may directly or indirectly affect listed fish species managed by NMFS, including the Central Valley steelhead. PG&E determined that the Proposed Action is not likely to adversely affect Central Valley spring-run Chinook salmon (*O. tshawytscha*), as this species is not likely to occur within the action area. Most of the components of the Proposed Action are designed and anticipated to result in long-term beneficial effects to steelhead and Chinook salmon and designated critical habitat in the action area.

On July 8, 2009, PG&E submitted a letter to FWS requesting concurrence with the determination of not likely to adversely affect the federally threatened California red-legged frog (*Rana aurora draytonii*), federally threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), and the fisher (*Martes pennanti*), a candidate species. FWS submitted a letter dated September 10, 2009, concurring with the determination, provided PG&E's proposed conservation measures for the California red-legged frog were implemented. This letter concluded informal consultation with FWS, provided there were no modifications to the project that may result in new potential effects to these species.

In response to PG&E's draft BE, the Commission requested additional information on the effects of the proposed project on the California red-legged frog and valley elderberry longhorn beetle (VELB) in a letter to PG&E dated September 16, 2009. PG&E filed a response on October 6, 2009, explaining the informal consultation that took place regarding these two species. The Commission issued a biological assessment (BA) to FWS and NMFS on May 6, 2010. The agencies have until September 23, 2010 to provide the Commission with their Biological Opinion (BO).

Our analysis of project effects on threatened and endangered species is presented in section 3.3.6, *Rare, Threatened, and Endangered Species*.

1.3.4 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires federal agencies to consult with NMFS on all actions that may adversely affect essential fish habitat (EFH). EFH has been designated for the Central Valley steelhead in Cow Creek and its tributaries. EFH for the federally threatened Central Valley spring-run Chinook salmon does not include Cow Creek or its tributaries. NMFS filed recommendations pursuant to the Magnuson-Stevens Act on July 7, 2009. In this letter, NMFS stated that the PM&E measures proposed by PG&E would satisfy the requirements of the Magnuson-Stevens Act.

1.3.6 National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties (TCPs), and objects significant in American history, architecture, engineering, and culture that are eligible for or listed in the National Register of Historic Places (National Register). The Commission is to seek concurrence with the State Historic Preservation Officer (SHPO) on any finding of effect or no effect for historic properties, and allow the Advisory Council on Historic Preservation an opportunity to comment. In the event that Indian tribe properties are identified, section 106 requires that the Commission consult with any potentially interested Indian tribes that might attach religious or cultural significance to such properties.

By letter dated April 23, 2008, PG&E requested that the Commission designate PG&E as the non-federal representative for the purpose of section 106 consultation with the California SHPO pertaining to the mitigation of the effects of the proposed project decommissioning on historic resources. Pursuant to 36 CFR § 800.2(c)(4), Commission staff granted the request in a letter issued June 16, 2008.

In March 2008, PG&E requested searches of the Native American Heritage Commission and local historical societies for records of individuals with interest or information concerning the project and its history. Based on the lists received, PG&E

distributed letters to local tribes and individuals seeking information regarding cultural resources in the project area on April 10, 2008.

By letter dated September 17, 2008, PG&E requested concurrence from the California SHPO on the following items: (1) the Kilarc and Cow Creek powerhouses are eligible for the National Register; (2) the Kilarc and Cow Creek hydroelectric systems (canals, bridges, dams, flumes, siphons, tunnels, spillways, berms, forebays, and penstocks) are not eligible individually or as components of historic districts due to their lack of integrity; and (3) avoidance of the five unevaluated prehistoric sites is appropriate for the purposes of decommissioning the systems. By letter dated November 4, 2008, the California SHPO replied with concurrence on the determination of eligibility and finding of effect, and concurred with the findings and conclusions of the section 106 technical report prepared for the project. PG&E proposed having a memorandum of agreement (MOA) between the California SHPO and the Commission to mitigate for unavoidable adverse effects to sites eligible for the National Register. An MOA is currently being developed between the California SHPO and the Commission to mitigate adverse effects associated with surrender activities. By letter dated March 22, 2010, the Commission requested comments on the surrender application and mitigation measures from the Advisory Council on Historic Preservation, as well as the California SHPO and any interested Indian tribes. No additional comments have been received to date.

Effects of the Proposed Action on cultural resources are discussed in section 3.3.11, C*ultural Resources*.

1.4 PUBLIC REVIEW AND CONSULTATION

1.4.1 Pre-Filing Consultation

The Commission's regulations (18 CFR sections 4.38 and 6.1) require that applicants consult with appropriate resource agencies, Indian tribes, and other entities before filing an application for surrender of license. Pre-filing consultation must be complete and documented according to the Commission's regulations. To begin consultation under the license surrender process, PG&E held several public meetings in Whitmore, Redding, and Palo Cedro, California, on March 27, May 15, and May 16, 2007, respectively. Notices for these public meetings and all subsequent public meetings were placed in local newspapers, and letters were sent to interested parties. During the meetings, PG&E explained the license surrender process, and solicited comments from interested parties to assist in identifying issues of concern prior to developing a preliminary proposed decommissioning plan. On June 13 and 14, 2007, PG&E hosted a public site visit at the project facilities.

At September 12 and 13, 2007, meetings in Redding and Palo Cedro, PG&E issued the preliminary proposed decommissioning plan to interested parties and discussed the scope of decommissioning. After a 30-day public comment period, PG&E reviewed comments received, developed a response to comments table, and held additional meetings on November 7 and 8, 2007, to discuss comments and resource issues to be

addressed in the LSA. Based on these meetings, PG&E finalized the scope of additional studies that would be prepared for the draft LSA.

PG&E consulted with federal and state resource agencies in spring and summer 2008, holding several meetings and conducting an environmental site review. On July 25 and August 21, 2008, PG&E distributed letters to all interested parties to inform them of project status, and PG&E issued the draft LSA at meetings held on September 9 and 10, 2008, in Redding and Palo Cedro, California. The meeting on September 9 also began a 60-day comment period for the draft LSA, which ended on November 8, 2008. PG&E collected comments from interested parties and addressed them in the final LSA.

1.4.2 Responses to Public Notice

On May 12, 2009, the Commission issued a "notice of application accepted for filing, soliciting motions to intervene and protests, ready for environmental analysis, and soliciting comments, recommendations, and terms and conditions." The deadline for filing comments was July 11, 2009, and reply comments from PG&E were due August 25, 2009.[9] Table 1 includes a record of all comments filed in response to the public notice.

Table 1. Responses to the May 12, 2009, Public Notice of PG&E's application (Source: Staff)

Commenting Entity	Date Filed	Type of Comment
Tetrick Ranch	June 12, 2009	Comment
Ruth Patrick	June 15, 2009	Protest
Tetrick Ranch	June 15, 2009	Meeting Request
KC, LLC (doing business as KC Hydro, supported by Davis Hydro)	June 19, 2009	Motion to Intervene, Comments
Nancy Martin	June 25, 2009	Comments, Protest
R. Snider	June 25, 2009	Comments, Protest
Susan Bradfield	June 29, 2009	Comments, Protest
NMFS	July 7, 2009	Motion to Intervene, Comments, Recommended Terms and Conditions
Tuscan Heights Lavender Gardens	July 6, 2009	Comments, Protest

[9] Several comments were received after the filing deadline, but were still considered in this EIS.

Commenting Entity	Date Filed	Type of Comment
DOI, Office of the Solicitor	July 6, 2009	Motion to Intervene
Paul & Maria Burnham	July 6, 2009	Comments, Protest
David W. Albrecht	July 9, 2009	Comments, Protest
TU and Friends of the River	July 9, 2009	Motion to Intervene
California SWRCB, Division of Water Rights	July 9, 2009 and July 14, 2009	Comments
DOI, Office of Environmental Policy and Compliance	July 10, 2009	Recommendations, Terms and Conditions
David W. Albrecht	July 10, 2009	Motion to Intervene
David W. Albrecht	July 10, 2009	Comments, Protest
Cal Fish and Game	July 10, 2009	Motion to Intervene, Comments, Recommendations
Save Kilarc Committee	July 13, 2009	Motion to Intervene, Comments
Shasta Historical Society	July 13, 2009	Motion to Intervene
Tetrick Ranch, Abbott Ditch Users (ADU), and Shasta County	July 13, 2009	Motion to Intervene, Comments
KC Hydro	July 13, 2009	Motion to Intervene, Comments
Shasta County	July 14, 2009	Comments, Protest
Save Kilarc Committee	July 16, 2009	Comments, Protest
KC Hydro	July 21, 2009	Reply Comments
George McCart	July 27, 2009	Comments, Protest
Save Kilarc Committee	August 17, 2009	Comments, Protest
Davis Hydro	August 25, 2009	Reply Comments
Laura Carnley, Save Kilarc Committee	August 25, 2009	Reply Comments
T. and K. Wroe and T. Kamp, Save Kilarc Committee	August 25, 2009	Reply Comments
Frank Galusha, Save Kilarc Committee	August 27, 2009	Reply Comments

Commenting Entity	Date Filed	Type of Comment
Tetrick Ranch	August 25, 2009	Supplemental Comments
PG&E	August 20, 2009	Reply to Motions to Intervene
Steve Nevares, PG&E	August 20, 2009	Affidavit in Support of PG&E's Reply
Evergreen Shasta Power, LLC	January 22, 2010	Motion to Intervene Out-of-Time
Sierra Pacific	January 22, 2010	Motion to Intervene Out-of-Time

On June 15, 2009, Tetrick Ranch filed a request for a meeting to discuss an alternative proposal; Commission staff responded on June 24, 2009, stating the request was denied.

On August 20, 2009, PG&E filed a reply to motions to intervene, comments, protests, and terms and conditions, and an affidavit in support of the reply.

On September 4, 2009, Commission staff filed a request for additional information from PG&E. PG&E filed response documents on October 2, 2009 (PG&E, 2009d).

On November 16, 2009, Commission staff filed a request for additional information from PG&E on water and aquatic resources, land use, recreation, cultural resources, and socioeconomics. PG&E filed response documents on December 23, 2009, and January 28, 2010 (PG&E, 2009f and 2009g).

On November 18, 2009, Commission staff filed a request for data from FWS regarding aquatic resource surveys along Hooten Gulch. FWS filed a response on December 15, 2009 (FWS, 2009).

By letter dated November 18, 2009, Commission staff requested information from Shasta County regarding tax assessments on the Kilarc and Cow Creek Developments. Shasta County filed a response on December 16, 2009, stating that it did not have the information requested and suggesting that the Commission contact the California State Board of Equalization. Subsequently, by letter dated December 22, 2009, Commission staff requested the information from the California State Board of Equalization. The Commission staff also requested this information from PG&E by letter dated March 10, 2010. By letter dated March 26, 2010, the state responded, providing the most recently available tax information. By letter dated April 7, 2010, PG&E responded to our additional information request with tax information not provided by the state.

On January 22, 2010, Sierra Pacific Industries filed a late motion to intervene in this proceeding. The Commission denied this motion on April 15, 2010, due to failure of Sierra Pacific Industries to demonstrate good cause. On January 22, 2010, Evergreen Shasta Power, LLC filed a late motion to intervene in this proceeding. The Commission denied this motion on June 14, 2010.

1.4.3 Scoping

The NEPA scoping process was completed as part of the opportunity for public input on the LSA. To support and assist the environmental review, the Commission formally initiated the public scoping process for the project on September 15, 2009, with issuance of the scoping document. Commission staff conducted one evening public meeting on October 19, 2009, in Palo Cedro, California, and one daytime agency scoping meeting, which was also open to the public, on October 22, 2009, in Redding, California. All interested individuals, organizations, and agencies were invited to attend one or both of the scoping meetings, and to assist Commission staff in identifying the scope of the environmental issues that should be analyzed in the EIS on the Proposed Action. There was also a public environmental site review on October 20 and 21, 2009.

Any person who was unable to attend a public scoping meeting, or desired to provide further comment, was encouraged to submit written comments and information to the Commission by October 16, 2009.[10] Table 2 includes a record of all comments filed in response to the scoping document, meetings, and environmental site review.

Table 2. Scoping Comments. (Source: Staff)

Commenting Entity	Date Filed
David W. Albrecht	October 8 and October 13, 2009
David W. Albrecht	October 14, 2009
Robert J. Roth	October 14, 2009
Robert J. Roth	October 14, 2009
Thomas "Glenn" Dye, Save Kilarc Committee	October 15, 2009
Robert J. Roth	October 16, 2009
Frank Galusha	October 16, 2009

[10] Several comments were received after the filing deadline, but were still considered in this EIS. Commission staff indicated at the public scoping meeting that staff would accept scoping comments for a reasonable amount of time after the conclusion of the October 22, 2009, meeting.

Commenting Entity	Date Filed
Tetrick Ranch	October 16, 2009
NMFS	October 16, 2009
David W. Albrecht	October 16, 2009
KC Hydro	October 16, 2009
Shasta County	October 19, 2009
Thomas "Glenn" Dye, Save Kilarc Committee	October 19, 2009
Thomas "Glenn" Dye, Save Kilarc Committee	October 22, 2009
Robert Carey	October 22, 2009
Robert J. Roth	October 23, 2009
Davis Hydro	October 26, 2009
KC Hydro	October 26, 2009
Tetrick Ranch	October 30, 2009

After the conclusion of the initial scoping period, Commission staff received additional comments that are also addressed in this DEIS, and listed in Table 3.

Table 3. Additional Comments. (Source: Staff)

Commenting Entity	Date Filed
NMFS	November 9, 2009
Sierra Pacific	November 12, 2009
Davis Hydro	November 12, 2009
NMFS	November 12, 2009
Julie Ann Garcia	November 16, 2009
Evergreen Shasta Power	November 16, 2009
Robert J. Roth	November 16, 2009
Individual	November 16, 2009
Laura Carnley	November 30, 2009
James Fletter	December 14, 2009
FWS	December 15, 2009

Commenting Entity	Date Filed
Shasta County	December 16, 2009
Maggie Trevelyan	December 18, 2009
Cal Fish and Game	December 22, 2009
Cal Fish and Game	December 24, 2009
Erik Poole	December 30, 2009
Tetrick Ranch	December 30, 2009
Sierra Pacific	December 30, 2009
Sierra Pacific	January 4, 2010
Erik Poole	January 14, 2010
Erik Poole	January 19, 2010
Maggie Trevelyan, Save Kilarc Committee	January 20, 2010
Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC	January 22, 2010
Randy Carnley	January 25, 2010
Laura Carnley	January 25, 2010
Joan and Earl Wetmore	January 25, 2010
KC Hydro	January 25, 2010
Maggie Trevelyan, Save Kilarc Committee	January 27, 2010
Sandy Winters	January 27, 2010
Thomas “Glenn” Dye	January 29, 2010
Davis Hydro	February 3, 2010
Davis Hydro	February 5, 2010
KC Hydro	February 5, 2010
Jerry and Mary Richmond	February 5, 2010
FWS	February 5, 2010
NMFS	February 8, 2010
Cal Fish and Game	February 8, 2010
Thomas “Glenn” Dye, Save Kilarc Committee	February 8, 2010
Lynette Gooch	February 8, 2010

Commenting Entity	Date Filed
Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights	February 9, 2010
PG&E	February 10, 2010
James and Sita Sherman	February 11, 2010
California SWRCB	February 11, 2010
PG&E	February 11, 2010
Brian Johnson, Trout Unlimited and Kelly L. Catlett, Friends of the River	February 16, 2010
Peter Hufford, Hufford Ranch	February 16, 2010
Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights	February 16, 2010
David W. Albrecht	February 16, 2010
Laura Carnley, Thomas "Glenn" Dye, Ruth Patrick, Kathy Roth, Friends of Cow Creek Preserve	February 16, 2010
Arthur M. Tilles	February 19, 2010
California SWRCB	February 19, 2010
Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC	February 22, 2010
KC Hydro	February 22, 2010
KC Hydro	March 26, 2010
KC Hydro	March 29, 2010
Todd Wroe	March 29, 2010
KC Hydro	April 8, 2010
KC Hydro	April 12, 2010
KC Hydro	April 16, 2010
Earl and Joan Wetmore	April 21, 2010
KC Hydro	April 21, 2010
Davis Hydro	April 26, 2010
National Marine Fisheries Service	May 10, 2010

Commenting Entity	Date Filed
Susan Gummerus	May 16, 2010

1.4.4 Summary of Comments Received

Other than PG&E's and the resource agencies' comments, the majority of the comments filed are from local resident who object to the licensee's proposed surrender of the project. The comments include recommendations for another entity to: assume power generating operations at the project; maintain the Kilarc forebay for recreational and fire-fighting purposes; maintain current flows in Hooten Gulch for continued access to existing points of diversion; and implement alternative measures to enhance fish habitat and address agency concerns regarding fish passage. The comments include statements by Shasta County and several private entities, and a petition signed by 129 individuals. Commission staff developed two Action Alternatives to address these comments. These alternatives are described in section 2.4, *Action Alternative 1*, and section 2.5, *Action Alternative 2*, and the environmental effects of these alternatives are discussed in section 3.0, *Environmental Analysis*.

Local landowners downstream of the Cow Creek Development comment that decommissioning the project would remove their source of irrigation water, which would affect their livelihoods as ranchers. These effects are addressed in section 3.3.2, *Water Resources,* and in section 3.3.10, *Socioeconomics*. Several commenters suggest that decommissioning the Cow Creek forebay may affect local groundwater availability, which is discussed in section 3.3.2, *Water Resources*. Some commenters dispute the current limitations imposed on anadromous fisheries by the existing dams or question the importance of opening fish passage. These comments are addressed in section 3.3.3, *Fisheries and Aquatic Resources*. Several commenters mention impacts to riparian and wetland habitat if flows are not available for Hooten Gulch and Abbott Ditch after decommissioning. These impacts are addressed in section 3.3.4, *Botanical Resources*.

Some commenters raise concerns about the potential loss of cultural and recreational resources, and the loss of the Kilarc forebay as a source of water for fighting forest fires; these comments are addressed in sections 3.3.7, *Recreational Resources*, 3.3.8, *Land Use*, 3.3.9, *Aesthetics*, and 3.3.11, *Cultural Resources*. Some commenters mention the loss of a renewable source of energy and the expense of decommissioning; these comments are addressed in section 3.3.10, *Socioeconomics*. One commenter expresses concern about the possibility that mine tailing contaminants may have built up behind the dam and that these could be released during decommissioning. This comment is addressed in section 3.3.1, *Geologic and Soil Resources*.

On January 22, 2010, Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC, filed a document titled an offer of

settlement, which makes several recommendations.[11] The filing makes comments and recommendations similar to those previously filed by Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power. These comments and recommendations are addressed in section 3.0, *Environmental Analysis*, under the appropriate resource sections as stated above. NMFS, Cal Fish and Game, PG&E, FWS, and TU with Friends of the River filed responses objecting to the community recommendations, on February 8, 8, 10, 11-12, and 16, 2010, respectively. California SWRCB filed a response to the recommendations on February 19, 2010, noting that it neither supports nor objects to the recommendations and maintains its independent regulatory authority. Other comments were filed objecting to or supporting the recommendations. Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC, filed reply comments on February 22, 2010.

On January 25, 2010, KC Hydro filed a request for Commission determination of voluntary licensing and termination of license surrender proceedings. PG&E filed a response on February 10, 2010.

On May 10, 2010, NMFS filed additional comments stating that it has received no convincing evidence that the proposed alternatives mentioned above (which retain existing dams, fish ladders and screens, and would divert more than 90 percent of instream flows from the river) would provide a higher conservation value for the resources than PG&E's Proposed Action.

A summary of comments received during scoping and Commission staff responses is included in Appendix A, *Staff Response to Scoping Comments*. All comments were considered during review of the surrender application.

[11] This offer of settlement is known by staff as the community recommendations, see section 2.6, *Alternative Considered but Eliminated from Further Analysis.*

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2.0 PROPOSED ACTION AND ALTERNATIVES

In accordance with NEPA guidelines, this DEIS considers the licensee's Proposed Action, the No-Action Alternative, and two Action Alternatives developed by Commission staff to address comments received in scoping.

2.1 EXISTING PROJECT FACILITIES AND OPERATIONS

The project is located in Shasta County, California, about 30 miles east of the city of Redding, near the community of Whitmore. The project covers two separate drainage areas, Old Cow Creek (Kilarc Development) and South Cow Creek (Cow Creek Development), which are part of the Cow Creek watershed. Cow Creek drains to the Sacramento River.

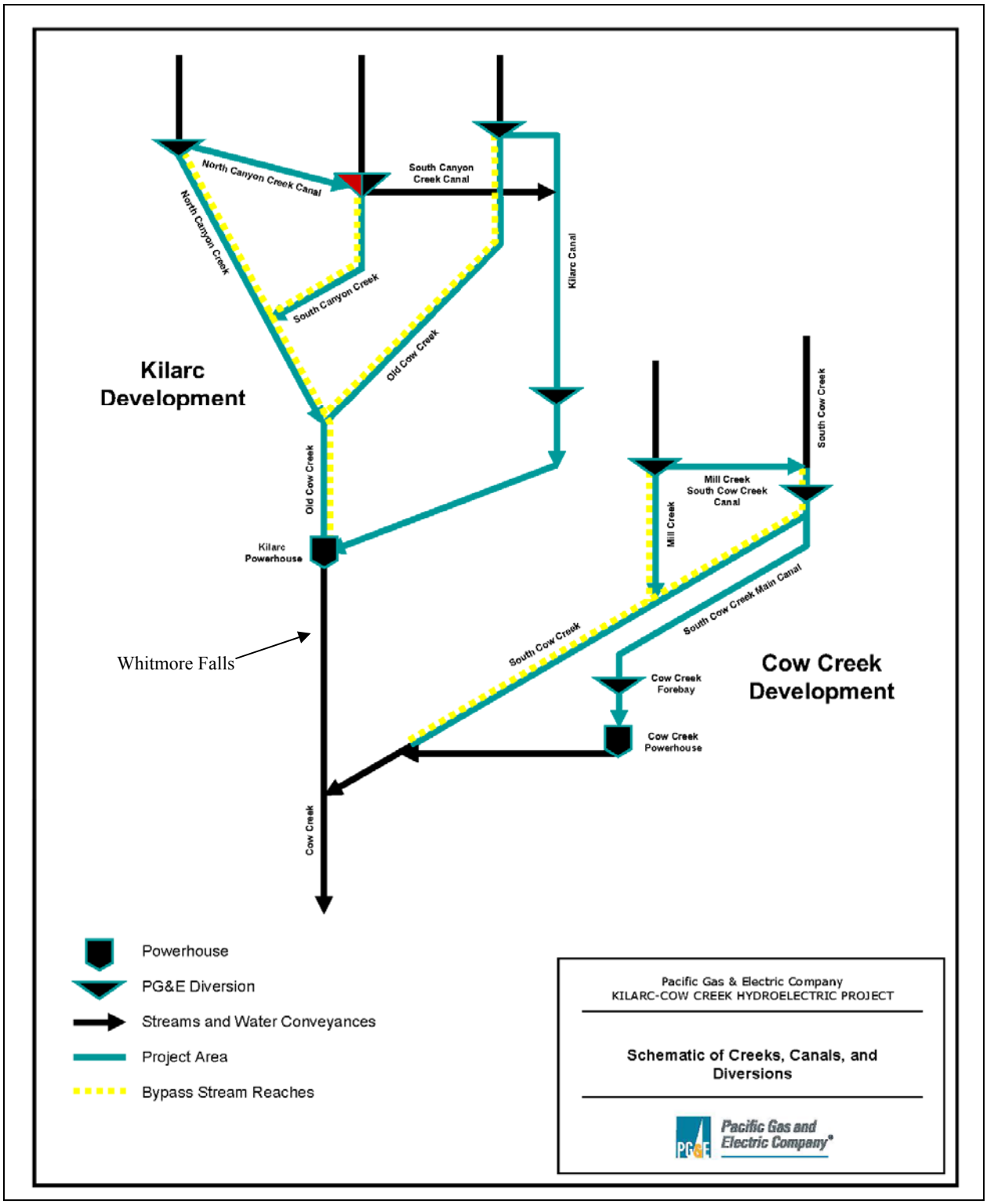
The project has a total installed capacity of 4.67 MW, has generated an average 31,100 MWh of electricity annually, and has an estimated dependable capacity of 1.6 MW. Actual annual energy production for the two developments over the past three years averaged 21,272 MWh. PG&E historically used project power to meet the needs of its electric customers. The project is an "eligible renewable energy source" under California's Renewable Portfolio Standard (California RPS), which requires that 20 percent of an electrical corporation's retail sales be procured from eligible renewable energy resources no later than December 31, 2010. In order to replace the electricity production of this project, another source of renewable energy would need to be obtained. PG&E forecasts that lower cost, emission-free, and California RPS eligible renewable energy would be available to replace it.

The Kilarc and Cow Creek Developments were constructed between 1903 and 1907. The developments are presented separately below since they operate independently and are located in two different subwatersheds.

Kilarc Development

Water is diverted from North Canyon Creek into the North Canyon Creek canal at the North Canyon Creek diversion dam (Figures 2 and 3) and is conveyed to South Canyon Creek. Water is diverted from South Canyon Creek into the South Canyon Creek canal at the South Canyon Creek diversion dam. Water from South Canyon Creek canal flows into the South Canyon Creek siphon, which conveys water into the Kilarc main canal. Water is diverted from Old Cow Creek into the Kilarc main canal at the Kilarc diversion dam. Water from the Kilarc main canal flows to the Kilarc forebay and through the penstock to the Kilarc powerhouse; water is returned to Old Cow Creek near the powerhouse about 4 miles downstream from the Kilarc diversion dam. The current minimum flow requirement at the Kilarc diversion dam is 3.0 cubic feet per second (cfs).

Figure 2. Kilarc-Cow Creek Project, Location of Existing Facilities. (Source: PG&E, 2009a)



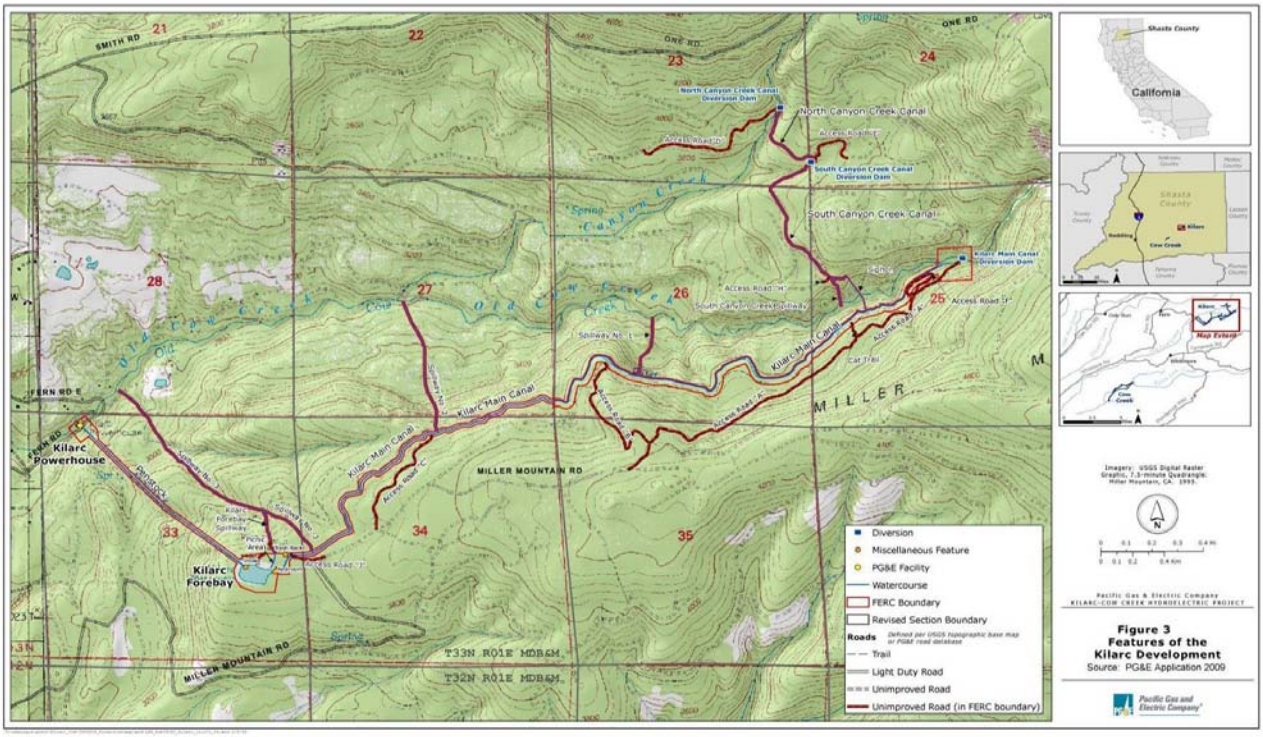


Figure 3. Features of the Kilarc Development. (Source: PG&E, 2009a)

The dam at the Kilarc forebay is earth-filled and has a maximum height of 13 feet (ft). The Kilarc penstock is 4,801 ft long and has a maximum flow capacity of 43 cfs. The spillway at the Kilarc forebay is rated for 50 cfs, which is the Kilarc main canal's approximate capacity. The elevation of the Kilarc forebay is about 3,779 feet above mean sea level (ft msl). The forebay has a gross and useable storage capacity of 30.4 acre-feet (ac-ft) and has a surface area of 4.5 acres. Water level fluctuation in the forebay during normal operation is about 1 ft. The Kilarc powerhouse is located at 2,580 ft msl and is designed for semi-automatic operation with forebay level control. The powerhouse operates unattended with alarms connected to PG&E's Pit 3 powerhouse (which is part of FERC Project No. 233). The Kilarc powerhouse is a 65-ft-wide by 40-ft-long steel frame structure composed of rubble masonry walls and a corrugated iron roof.

The Kilarc Development operates as a run-of-river facility, which uses the natural flow and elevation drop of Old Cow Creek to generate electricity. The Old Cow Creek watershed encompasses about 80 square miles (sq mi), including 25 sq mi located upstream from the Kilarc diversion dam. Average yearly runoff at the dam is 48,900 ac-ft, about 55 percent of which is diverted to the Kilarc powerhouse.

Cow Creek Development

Water is diverted from Mill Creek into the Mill Creek-South Cow Creek canal at the Mill Creek diversion dam (Figures 2 and 4). Water is diverted from South Cow Creek into the South Cow Creek main canal at the South Cow Creek diversion dam and flows to the Cow Creek forebay. From the forebay, water flows through the penstock to Cow Creek powerhouse and is discharged into Hooten Gulch,[12] and back into South Cow Creek about 4 miles downstream from the South Cow Creek diversion dam. The current minimum flow requirement at the South Cow Creek diversion dam is 4.0 cfs under normal water year criteria and 2.0 cfs under dry water year criteria.

The Cow Creek forebay dam is earth-filled and has a maximum height of 16 ft; the forebay has a surface area of 1 acre and a gross and useable storage capacity of 5.4 ac-ft. The forebay elevation is about 1,555 ft msl, and water surface elevation varies by about 1 ft during normal project operations. The Cow Creek penstock is 4,487 ft long. The spillway at Cow Creek forebay is rated for 50 cfs, which is the South Cow Creek main canal's approximate capacity. The Cow Creek powerhouse is located at 856 ft msl and is a steel truss structure that is about 53.5 ft long by 35 ft wide. The Cow Creek powerhouse is designed for semi-automatic operation, with forebay level control. It operates unattended, with alarms connected to the Pit 3 powerhouse.

[12] Hooten Gulch is an existing valley that receives augmentation flows from the Cow Creek powerhouse.

The Cow Creek Development operates as a run-of-river facility. The South Cow Creek watershed encompasses about 78 sq mi, including 53 sq mi located upstream from the south Cow Creek diversion dam. Average annual runoff at the dam is 79,500 ac-ft, about 37 percent of which is diverted to the Cow Creek powerhouse.

2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, PG&E's proposal to surrender its license for operation of the Kilarc-Cow Creek Project would not be approved and project facilities would not be decommissioned. The Kilarc-Cow Creek Project would continue to operate as it does today, under the terms and conditions of the existing annual license. There would be no disturbance of existing environmental conditions at the site, and there would be no new environmental protection, mitigation, or enhancement measures. The No-Action Alternative does not include the measures that the resource agencies would recommend under new license. The No-Action Alternative represents existing conditions and serves as our baseline for evaluating the effects of the licensee's Proposed Action and the two Action Alternatives.

The existing license for the 4.67 MW project requires PG&E to continuously discharge a minimum flow of 3.0 cfs into Old Cow Creek at the Kilarc main diversion dam. The license also requires PG&E to continuously discharge into South Cow Creek at the South Cow Creek diversion dam a minimum flow of 4.0 cfs under normal water year criteria and 2.0 cfs under dry water year criteria.

2.3 PROPOSED ACTION

The following action is proposed by PG&E in its LSA (PG&E, 2009a):

2.3.1 Proposed Decommissioning of Project Facilities

PG&E proposes to surrender the license for operation of the Kilarc-Cow Creek Project and to decommission and remove or modify several project features, including: (1) remove diversion dams and allow for free passage of fish and sediment; (2) leave in place some diversion dam abutments and foundations to protect stream banks and provide grade control; (3) leave in place and secure powerhouse structures during decommissioning with an option for preservation of powerhouse structures for future reuse; (4) remove electric generators, turbines, and other equipment; (5) grade and fill forebays; and (6) in consultation with affected landowners, leave in place, breach, or fill canal segments and remove metal and wood flume structures. Additionally, PG&E proposes to retire access roads to the project where possible. PG&E would develop detailed engineering and management plans for decommissioning of the project facilities after the Commission issues an order approving decommissioning. After the Commission approves these plans and after PG&E obtains any other required permits, PG&E would commence decommissioning activities in phases beginning with either the Kilarc or Cow Creek Development and then proceeding to decommission the other development.

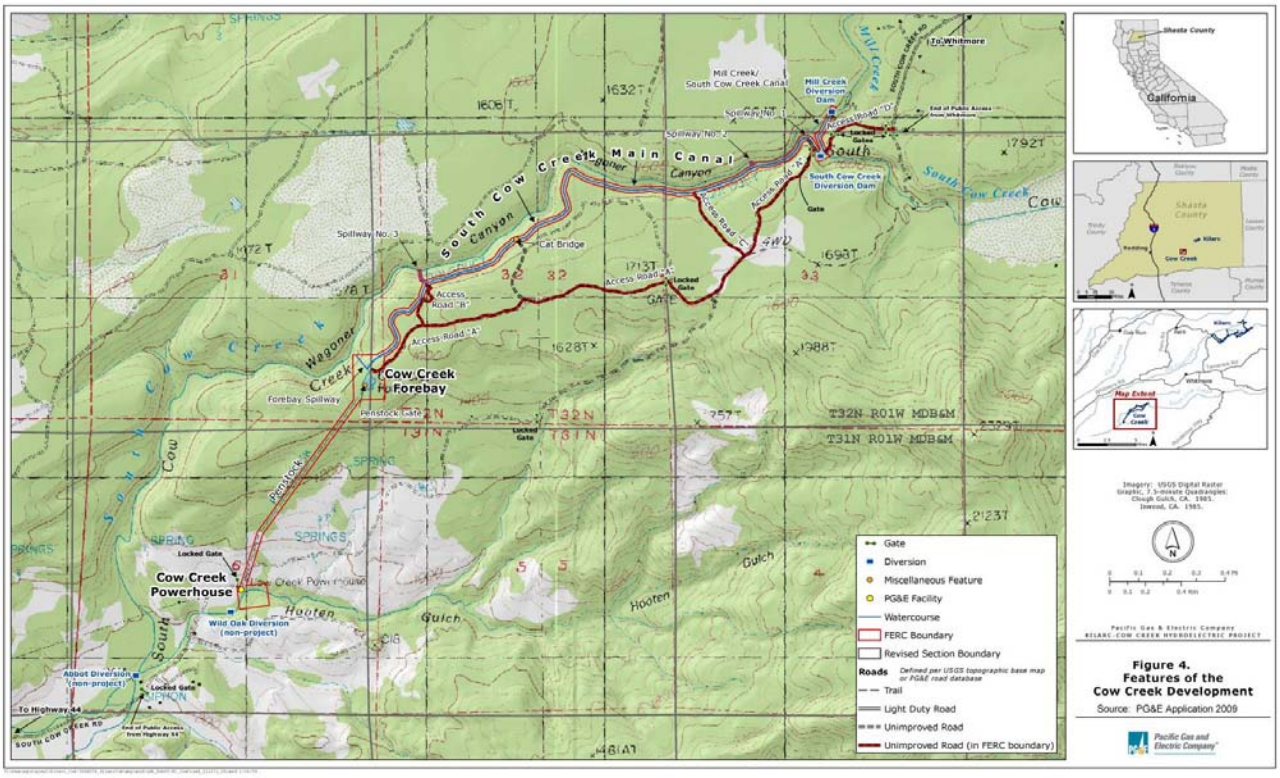


Figure 4. Features of the Cow Creek Development. (Source: PG&E, 2009a)

Table 4 presents PG&E's forecasted range of dates when decommissioning activities would take place. The dates may change as the schedule proceeds.

Table 4. Proposed schedule of decommissioning activities. (Source: PG&E, 2009a)

Description of Decommissioning Activity	**Forecast Range of Dates**	
	Start	**End**
PG&E files final LSA with the Commission	March 2009	–
The Commission prepares NEPA report; California SWRCB prepares California Environmental Quality Act report	March 2009	September 2009 to March 2011
The Commission issues order to decommission the project	December 2009 to June 2011	–
PG&E develops detailed engineering and management plans and obtains permits for decommissioning	December 2009 to June 2011	June 2010 to June 2013
PG&E decommissions project and ceases generation	June 2010 to June 2013	June 2013 to June 2016
PG&E conducts post-decommissioning monitoring	June 2013 to June 2016	June 2015 to June 2018
The Commission approves decommissioning	June 2015 to June 2018	–

2.3.2 Proposed Termination of Project Operation

PG&E would continue operating the project, or some portion thereof, until decommissioning activities make such operation infeasible. Power generation would continue until facilities required for generation are removed or decommissioned. It is expected that removal of the project facilities would take three years, followed by two years of maintenance and monitoring of the site restoration work overseen by the Commission. Any additional monitoring would be supervised by other agencies.

2.3.3 Proposed Environmental Measures

Exhibit E of the LSA contains the following site-specific protection, mitigation, and enhancement measures proposed by PG&E for decommissioning of the project.

Geology and Soils

Measure GEOL-1: Soil erosion and sedimentation control best management practices (BMPs). To ensure the effectiveness of the long-term BMPs, PG&E would conduct post-construction monitoring for two years within the stream channel and for one year in all other construction areas.

Measure GEOL-2: Stormwater pollution prevention BMPs. PG&E would identify all potential pollutant sources, including sources of sediment (e.g., areas of soil exposed by grading activities, soil/sediment stockpiles) and hazardous pollutants (e.g., from petroleum products leaked by heavy equipment or stored in maintenance areas). Also, PG&E would identify any non-storm-water discharges and implement BMPs to protect streams from potential pollutants and minimize erosion of topsoil.

Measure GEOL-3: Landslide control. PG&E would prepare detailed design plans and specifications to minimize the potential for landslides.

Geomorphology

Measure GEOM-1: Sediment release measures. Following removal of the South Cow Creek and Kilarc main diversion dams, PG&E would reshape the downstream face of the sediment wedge left in place at each diversion structure to an appropriate angle of repose. PG&E also would form a pilot thalweg to ensure temporary fish passage. The final design would be based on the best available information at the time prior to implementation, in consultation with NMFS, FWS and Cal Fish and Game. PG&E would allow the sediments remaining behind the diversions after excavation of the pilot channel to redistribute downstream during natural high flow events.

Measure GEOM-2: Bank erosion measures. PG&E would conduct monitoring for two years after removal of the Kilarc main canal and South Cow Creek diversion dams. The monitoring would be conducted after spring runoff, as soon as weather permits access to the sites and flows are low enough that the streambanks can be easily observed. PG&E would identify any areas of active erosion or undercutting, or areas that appear to be susceptible to erosion. If during the monitoring assessment, PG&E observes significant erosion or bank undercutting, then PG&E would implement and install erosion control measures, as feasible, in the channel.

Water Quality

Decommissioning project facilities may affect water quality through the addition of sediments or hazardous materials to the creeks. To address these effects, PG&E would implement measures GEOL-1 and GEOL-2.

Aquatic Resources

Measure AQUA-1: Isolated construction area. To minimize deconstruction effects at the five diversion dams and the Kilarc tailrace (where instream construction would be required), PG&E would isolate the construction area from the active stream using coffer dams or other such barriers. PG&E would route water around the construction area in pipes or by removing the dam in two or more phases, allowing the flow to move down the other portion of the stream, while the isolated portion of the dam is removed.

Measure AQUA-2: Fish rescue in isolated construction area. After a work area is isolated, PG&E would conduct a fish rescue to remove any fish trapped in the work area. PG&E would relocate these fish to an area of suitable habitat within Old Cow Creek or South Cow Creek downstream of the work area.

Measure AQUA-3: Sensitive periods for steelhead and Chinook salmon. PG&E would conduct decommissioning work at the South Cow Creek diversion dam from July through September when adult anadromous salmonids are not present in South Cow Creek. In addition, PM&E measure GEOL-2 would be implemented to control sediment input, and thus turbidity, into the stream channels through use of sediment control BMPs.

Measure AQUA-4: NMFS passage guidelines for anadromous salmonids. If the South Cow Creek diversion dam cutoff walls become fish passage barriers, PG&E would modify these cutoff walls or implement other appropriate measures to meet NMFS passage guidelines (drop, velocity, depth, roughened channel, and other site-specific factors) for anadromous salmonids. PG&E would consult with NMFS on designs to provide adequate fish passage.

Measure AQUA-5: Fish passage monitoring. To assess the efficacy of PM&E measure GEOM-1 and monitor for any potential development of long-term barriers, PG&E would monitor fish passage conditions from upstream of the current sediment accumulations above the dam to a point about 10 channel widths downstream of the dam after the diversions are removed. PG&E would conduct monitoring for two years after decommissioning of each diversion dam. In each year of monitoring, PG&E would conduct monitoring once after the first major runoff event (as access conditions and staff safety allow) and once again later in the year, during the low-flow season, when the condition of the streambed can be more easily assessed.

Measure AQUA-6: Consultation with Cal Fish and Game. PG&E would consult with Cal Fish and Game on fish management options (including reduced stocking, increased catch limits, and other measures) to reduce the number of fish in the Kilarc forebay prior to decommissioning, with the intent of minimizing the number of fish needing to be rescued.

Measure AQUA-7: Fish rescue in canals and forebays. PG&E would conduct fish rescues, as needed, to rescue any fish that remain in these waters during the decommissioning process. These fish would be relocated to suitable areas to be determined in consultation with Cal Fish and Game, FWS and NMFS.

Measure AQUA-8: Retain fish screen in South Cow Creek main canal. PG&E would retain the fish screen in the South Cow Creek main canal until after any fish rescue, if needed, is complete and the canal is closed off so fish can no longer enter the canal.

Measure AQUA-9: Cow Creek powerhouse operations. PG&E would discontinue Cow Creek powerhouse operations in the spring when natural flow is present upstream of the powerhouse to avoid fish being stranded or trapped in isolated pools and subsequently dying through predation, dehydration, or poor water quality conditions.

Measure AQUA-10: Hooten Gulch bank stability. PG&E would remove the gunite in Hooten Gulch and install replacement bank stabilization measures during the summer when the gulch is dry.

Wildlife Resources

Measure WILD-1: Pre-Construction surveys and avoidance and protection actions for amphibians, reptiles, and birds. PG&E would conduct pre-construction surveys for amphibians (foothill yellow-legged frog and California red-legged frog), reptiles (pond turtles), and any other individual at risk prior to construction activities at the diversions, forebays, and powerhouse tailraces, using standard protocols, including FWS species-specific protocols. If a California red-legged frog is found, PG&E would stop construction work and notify FWS; construction activity would recommence upon FWS approval.

PG&E would conduct pre-construction surveys for nesting birds if vegetation removal is scheduled during the breeding period (generally March 1 – September 1). If an active nest occupied by a special-status species or by other species protected by the Migratory Bird Treaty Act is found, PG&E would avoid the area and construction activities would be restricted to an appropriate distance to avoid nest disturbance until nestlings have fledged.

Measure WILD-2: Environmental training. PG&E would conduct environmental sessions with construction personnel to provide information on special-status species potentially present in the area and the avoidance/minimization measures to be implemented.

Measure WILD-3: Pre-construction surveys and avoidance and protection actions for raptors. PG&E would conduct pre-construction surveys for raptors at protocol or standard distances and at appropriate times of the day or year. If an active raptor nest is found within the survey area, PG&E would avoid the nest and

restrict deconstruction activities to an appropriate distance to avoid nest disturbance until nestlings have fledged.

Measure WILD-4: Pre-construction surveys and mitigation measures for elderberry shrubs. PG&E would conduct protocol pre-construction elderberry surveys within 100 ft of any deconstruction activities that could affect vegetation. If an elderberry shrub with one or more stems greater than 1 inch (in.) in diameter could be directly or indirectly affected by the activities, the measures provided in the biological opinion (BO) covering PG&E's service area in the range of the valley elderberry longhorn beetle (FWS, 2003, as cited in PG&E, 2009a) would be implemented.

Measure WILD-5: Pre-construction surveys for bats. If deconstruction activities are initiated between March 1 and September 30, PG&E would conduct pre-construction surveys for bats at the tunnels and powerhouses.

Measure WILD-6: Wildlife exclusion from tunnels. PG&E would seal off project tunnels at both ends for public safety, which would exclude wildlife from entry or habitation.

Measure WILD-7: Speed limit on access roads. PG&E would implement a speed limit of 15 miles per hour on project roads and temporary access roads while decommissioning activities are conducted.

Botanical Resources

Measure BOTA-1: Mitigation and monitoring plan (MMP). PG&E would prepare and implement an MMP for effects to riparian and wetland vegetation, and, in consultation with private landowners, the restoration of abandoned or temporary roadbeds to include compaction issues, seeding, mulching, and planting as part of the permitting process. The MMP would be developed in consultation with the U.S. Army Corps of Engineers (Corps), Cal Fish and Game, and California SWRCB.

Measure BOTA-2: Pre-construction surveys. PG&E would conduct pre-construction surveys for special-status plants in all areas that would be disturbed by decommissioning activities.

Measure BOTA-3: Avoidance of special-status plants. PG&E would avoid any identified populations of special-status plants to the extent practical.

Historic Resources

Measure HIST-1: Documentation. An MOA would address the unanticipated discovery of human remains, and the long-term management and treatment of the National Register-eligible powerhouses. As would be stipulated in the MOA, PG&E would prepare photographic, architectural, and written documentation that meets Historic American Building Survey and Historic American Engineering Record standards prior to commencing decommissioning activities.

Measure HIST-2: Securing Buildings. PG&E would secure the two powerhouse structures from unwanted entry, provide adequate ventilation to the interiors, shut down or modify the existing utilities and mechanical systems, and employ maintenance and monitoring measures for the buildings.

Archaeological Resources

Measure ARCH-1: Archaeological resources summary. PG&E would avoid all ground-disturbing activities in the vicinity of the five identified eligible or unevaluated archaeological sites. A qualified PG&E or consulting archaeologist would monitor project activities if they occur within 50 feet of these identified resources. If PG&E cannot avoid ground-disturbing activities at or near the five sites, PG&E would conduct formal evaluations of the sites' eligibility for listing in the National Register and California Register of Historic Resources, and contact the California SHPO prior to any disturbance.

Measure ARCH-2: Unanticipated archaeological sites. If archaeological resources are accidentally disturbed during decommissioning activities, PG&E would immediately stop all work within the immediate vicinity, contact the California SHPO, and have a qualified archaeologist evaluate the discovery and provide recommendations, if an archaeological monitor is not already present.

Measure ARCH-3: Encountering human remains. If human remains are encountered as a result of decommissioning activities, PG&E would immediately stop all work in the vicinity and immediately contact the county coroner and the California SHPO. In addition, a qualified PG&E or consulting archaeologist would be contacted immediately to evaluate the discovery, if a monitor is not already present. If the human remains are Native American in origin, then PG&E would request that the coroner notify the Native American Heritage Commission within 24 hours of this identification.

Land Use

Measure FIRE-1: Spark arrestors. PG&E would equip earth-moving and portable equipment with internal combustion engines with a spark arrestor to reduce the potential for igniting a wildland fire.

Measure FIRE-2: Fire suppression equipment. PG&E would maintain appropriate fire suppression equipment during the highest fire danger period, from April 1 to December 1.

Measure FIRE-3: Flammable materials. On days when a burning permit is required, PG&E would remove flammable materials to a distance of 10 ft from any equipment that could produce a spark, fire, or flame, and PG&E would maintain the appropriate fire suppression equipment.

Measure FIRE 4. Portable gas-powered tools. On days when a burning permit is required, PG&E would not use portable tools powered by gasoline-fueled internal combustion engines within 25 ft of any flammable materials.

2.3.4 Agency Response to Licensee's Proposal

NMFS, DOI, and Cal Fish and Game concur with the measures proposed (see Section 2.3.3, *Proposed Environmental Measures*) by PG&E. DOI reserves its authority for fishway prescriptions, but decommissioning as proposed by PG&E would remove any project-related obstacles to fish passage. California SWRCB is expected to issue a section 401 water quality certification for the proposed decommissioning by August 18, 2010; conditions in the certification are not known at this time.

2.4 ACTION ALTERNATIVE 1

Under Action Alternative 1 (AA1) the Kilarc forebay and related infrastructure would be maintained in order to provide recreational access. Features of the Kilarc Development that are not necessary for forebay maintenance would be removed as described in the Proposed Action. PG&E would decommission the Cow Creek Development as described in the Proposed Action, and PG&E would implement all of the PM&E measures proposed for that development. No power generation would occur at either project development.

In the Kilarc Development, the North and South Canyon diversions, canals, and siphon would be decommissioned as described in the Proposed Action in order to address resource agency concerns regarding fish passage. The penstock intake, penstock, powerhouse, and switchyard would also be decommissioned as described in the Proposed Action, and the tailrace would be filled as described in the Proposed Action. A fish passage facility would be designed and installed at the Kilarc main canal diversion dam to support upstream passage of steelhead trout, and fish passage would be monitored during salmon and steelhead migratory periods. A fish screen would be designed and installed at the entrance to the Kilarc main canal to block entrainment of resident and anadromous fish from Old Cow Creek into the canal (see Section 3.3.2.2.3).

In consultation with NMFS, FWS and Cal Fish and Game, the division of flows between the Kilarc main canal and Old Cow Creek channel would be evaluated under various flow conditions to optimize habitat and water quality conditions in Old Cow Creek and the Kilarc forebay. The Kilarc main canal diversion dam and canal intake would be modified as necessary to adjust for delivery of a target flow to the main canal and a revised minimum instream flow to the bypassed reach.

The Kilarc main canal structures and overflow spillways would be upgraded and maintained. Alternative configurations to maintain circulation and water quality in the Kilarc forebay would be evaluated (e.g., relocation of spillway, construction of a berm separating the diversion canal discharge and spillway, modification of penstock intake to serve as primary spillway), and the preferred configuration would be designed and

implemented. The Kilarc forebay would be left in place, and Cal Fish and Game would continue management and stocking of the forebay for a rainbow trout put-and-take recreational fishery. The access road and public facilities at the Kilarc forebay, including access for the disabled, [13] would be maintained, with installation of additional signage as necessary.

This alternative assumes that an interested entity with adequate financial resources can be identified to take over operation and maintenance of the remaining Kilarc facilities, implement improvements for fish passage, and conduct any monitoring required by resource agencies. Under AA1, PG&E would be responsible for decommissioning the Cow Creek Development and those portions of the Kilarc Development not required to maintain the Kilarc forebay. These facilities would be decommissioned as described in the Proposed Action. PG&E would not be responsible for the implementation of the upgrades to project facilities or the design and installation of fish passage facilities. Final Commission approval of the project surrender of license would be dependent upon completion of these conditions.

2.5 ACTION ALTERNATIVE 2

Under Action Alternative 2 (AA2), the South Cow Creek main canal would be maintained in order to ensure continued flow to ADU, and an upgraded fish passage facility at the South Creek diversion dam would be installed. PG&E would decommission the Kilarc Development as described in the Proposed Action, and PG&E would implement all of the mitigation and enhancement measures proposed for that development. No power generation would occur at either project development.

In the Cow Creek Development, the Mill Creek diversion dam and canal and the Cow Creek powerhouse and switchyard would be decommissioned as described under PG&E's Proposed Action. The existing fish ladder and fish screen at the South Cow Creek diversion dam would be removed, and a new fish passage facility that meets current standards would be designed and installed in its place to improve upstream passage of migratory salmonids. Fish passage would be monitored during salmon and steelhead migratory periods. A new fish screen that meets current standards would be designed and installed at the entrance to the South Cow Creek main canal to block entrainment of resident and anadromous fish from South Cow Creek into the canal.

The South Cow Creek diversion dam and canal intake would be modified as necessary to provide to the main canal a flow adequate to provide 14 cfs for ADU plus an allowance for evaporation and leakage. All flow above that required in the canal would be released to the South Cow Creek bypassed reach below the diversion dam. The main

[13] The Kilarc recreation facilities are not compliant with the Americans with Disabilities Act (ADA) guidelines, but disabled persons can and do use these facilities because there is fairly wide access across a level area to the forebay shoreline and the picnic areas and restroom can be accessed from flat terrain and nearby parking.

canal structures and overflow spillways would be upgraded and maintained. The Cow Creek forebay would be filled and graded, and the main canal extended through the former forebay area to the penstock intake. The penstock and tailrace would be maintained for discharge to Hooten Gulch.

Access and maintenance agreements would need to be developed with private landowners as necessary to maintain access roads to the South Cow Creek main canal diversion dam, canal, and penstock.

This alternative assumes that an interested entity with adequate financial resources can be identified to take over operation and maintenance of the remaining Cow Creek facilities, implement improvements for fish passage, and conduct any monitoring required by resource agencies. Under AA2, PG&E would be responsible for decommissioning the Kilarc Development and those portions of the Cow Creek Development not required to provide water to the Hooten Gulch. These facilities would be decommissioned as described in the Proposed Action. PG&E would not be responsible for the implementation of the upgrades to project facilities or the design and installation of fish passage facilities. Final Commission approval of the project surrender of license would be dependent upon completion of the conditions described for the Cow Creek and Kilarc Developments.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

By letter dated June 18, 2009, KC LLC, doing business as KC Hydro and supported by Davis Hydro LLC and Sackheim Consulting, filed *An Alternative to the Demolition of the Kilarc Hydropower Project* with the Commission. This alternative proposes to operate the Kilarc facility as a hydropower generating facility, using profits to fund fish research. The Cow Creek Development would be decommissioned as proposed by PG&E. The KC LLC proposal is supplemented by information in numerous additional filings by KC Hydro or Davis Hydro. KC LLC proposes no significant changes to project facilities, and it would maintain water diversions identical to those under the current license. Instream flows would remain identical to those under the current license.

By letter dated July 13, 2009, Tetrick Ranch, ADU, and Shasta County filed a proposal for a no-decommissioning alternative for FERC Project No. 606. These entities propose continuing operations of the Kilarc-Cow Creek Hydroelectric Project facilities by Evergreen Shasta Power, LLC (members include individuals associated with Tetrick Ranch and Sierra Pacific Industries, Inc.), thereby maintaining the operation of the Cow Creek hydro facility and water conveyance system, and Kilarc forebay as a recreation and power site.

On January 22, 2010, Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC made community recommendations to continue hydropower operations at both the Kilarc and Cow Creek Developments. The

"settlement" does not have the support of the licensee or the federal and state resource agencies and, therefore, is considered the community recommendations.[14] The allocation of flows (between the bypassed reaches and for power generation) proposed in the community recommendations do not differ substantially from those under current license conditions, particularly during low flow periods. Additionally, the community recommendations do not include any specific details regarding fish habitat protection or enhancement measures.

During scoping, Evergreen Shasta Power and Tetrick Ranch made recommendations to maintain the Cow Creek Development, increase the diversion through Hooten Gulch, and develop a salmonid restoration area in Hooten Gulch. Their recommendations included improving fish ladders and screens at the South Cow Creek diversion and constructing an additional fish ladder and screen at the Abbott Ditch diversion. NMFS stated that Evergreen Shasta Power and Tetrick Ranch did not provide a substantial basis to indicate that fisheries benefits would be likely, practical, or beneficial as a result of their recommendations. NMFS stated that they remain committed to the existing agreement previously signed by PG&E and the resource agencies, and that decommissioning and restoration remains the most viable alternative for maximizing benefits for anadromous fish.

All of the resource agencies, with the exception of California SWRCB, which neither opposes nor advocates the community recommendations, have objected to the community recommendations because they would not provide the increased instream flows considered necessary for the enhancement of aquatic resources. These specific alternatives were not analyzed throughout this DEIS separately; however, the community recommendations fall within the range of alternatives analyzed within this DEIS (No-Action Alternative, AA1, and AA2). We find that the Evergreen Shasta Power and Tetrick Ranch community recommendations would provide substantially less flows to the bypassed reach of South Cow Creek compared to AA2, especially during low flow conditions. Therefore, the community recommendations would not be as beneficial to fisheries resources as AA2.

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[14] The filing is unilateral and is a settlement agreement in name only. Neither PG&E, the licensee, nor any of the federal and state resource agencies that have played a major role in the Kilarc-Cow Creek surrender are parties to the filing. In the context of hydropower license proceedings, the Commission has stated that a "settlement" that is not supported by the licensee or any of the resource agencies with jurisdiction in the matter is not truly a settlement, but is rather simply a recitation of the filer's position in this case. See *Erie Boulevard Hydropower, L.P.*, 117 FERC ¶ 61,189 at P63 (2006). This does not mean that we will not consider and, where appropriate, adopt recommendations made by entities other than the licensee or the resource agencies. Indeed, in this instance, the community commenters' recommendations were considered as we examined the range of alternatives.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we describe the environmental setting for the Proposed Action and the scope of our cumulative effects analysis.[15] We also present our analysis of the environmental effects of the Proposed Action and Action Alternatives. Sections are organized by resource area (water resources, recreation, etc.). Under each resource area, we first describe the existing conditions (Affected Environment). The existing condition is the baseline against which the environmental effects of the Proposed Action and Action Alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures, and any potential cumulative effects of the Proposed Action. Our conclusions and recommended measures are discussed in section 4.0, *Conclusions and Recommendations*.

3.1 GENERAL SETTING

Shasta County is located in north-central California, at the northern end of the Sacramento Valley. The Sacramento River Basin covers 27,210 sq mi. The principal streams are the Sacramento River and its larger tributaries: the Pit, Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stony, Cache, and Putah Creeks to the west. Major reservoirs and lakes include Shasta, Oroville, Folsom, Clear Lake, and Lake Berryessa (Central Valley Regional Water Quality Control Board, 2007 as cited in PG&E, 2009a).

The Cow Creek watershed encompasses about 430 sq mi and drains the base and foothills of Mount Lassen in a southwest direction into the Sacramento River. The basin area is roughly bordered by Highway 299 to the north, Highway 44 to the south, and Highway 89 to the east. Cow Creek watershed is divided into five subbasins: Little Cow Creek, Oak Run Creek, Clover Creek, Old Cow Creek, and South Cow Creek.

The project is located in the foothills at the southern end of the Cascade Mountain Range. The elevation within the project area ranges from about 856 ft msl at the Cow Creek powerhouse to 3,940 ft msl at the North Canyon Creek diversion dam. The topography varies from gently rolling low hills near the Cow Creek powerhouse to steep, narrow canyons in the upper Old Cow Creek drainage. The project area encompasses a range of scenery characteristic of the foothills of the Cascades, varying from the narrow and steep river canyons and densely vegetated river banks with conifer forest in the upper watershed to open rolling foothills with grasses and oak and pine trees with a sparse and scattered overstory in the lower watershed. The lower watershed of the project area typifies livestock rangelands vegetated with sparsely occurring oak and pine.

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[15] Unless otherwise noted, the sources of our information are PG&E's LSA (PG&E, 2009a), PG&E's Additional Information Requested response letter (PG&E, 2009b), and additional information filed by PG&E.

The western flanks of the Cascade and Sierra Nevada ranges gradually rise from the eastern margin of the Great Valley of California. This gradual rise causes warm moist air coming off the Pacific Ocean to condense as it cools while moving up the slope, bringing precipitation and snow. The climate of the area fluctuates with the seasons, with warm dry summers (with possible thunderstorms) and cold wet winters, and regular snowfall above 4,000 ft msl. The mean annual temperature is 59.3 degrees Fahrenheit (°F). Temperature extremes span from a high of 110°F in July to a low of 14°F in January. Based on the record from 1920 to 1994, normal annual total precipitation is 33.99 in., with the highest monthly precipitation of 5.46 in. occurring in January.

The project is located about 30 miles east of the city of Redding, near the community of Whitmore (Figure 1). The project occupies property owned by PG&E, or property for which PG&E has acquired the necessary land rights. Land adjacent to the project is privately owned, and access too many of the project features is gained via easements over private roads and property. Much of the Kilarc Development is surrounded by property owned by Sierra Pacific Industries. Property adjacent to the Cow Creek Development has a number of private owners, including several large ranches.

Shasta County categorizes land uses of the project area as timber production, exclusive agricultural, and unclassified. These designations are intended for lands that are unimproved and are planned to remain open in character. Other land uses in the project area include national forest, hydroelectric project facilities, transportation systems, recreation, and conservation.

3.2 SCOPE OF CUMULATIVE EFFECTS

According to the Council on Environmental Quality's regulations for implementing NEPA, a cumulative effect is an effect on the environment that results from the incremental effect of the action 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. Based on information in the LSA, agency comments, other filings related to the project, and staff analysis, we have identified five resources that have the potential to be cumulatively affected by the cessation of operation and decommissioning of facilities at the Kilarc-Cow Creek Project: geologic and soil resources, water resources (flow distribution, water temperature), aquatic resources (migratory fish species), land use, and cultural resources.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the Proposed Action's effects on the resources. Because the Proposed Action would affect the resources differently, the geographic scope for each resource would vary. For water resources, the change in flow to the bypassed reaches following decommissioning of the project would affect water use and water quality, particularly water temperature.

Therefore, the geographic scope considered for analysis of the Cow Creek Development extends from the pools at the upstream diversion dams on Mill Creek and South Cow Creek to the first diversion on South Cow Creek downstream of Hooten Gulch to include the Tetrick Hydroelectric Project[16] and Abbott Ditch Diversion (Figure 4).[17] For the Kilarc Development the geographic scope for water resources extends from the project diversion dams at North Canyon Creek, South Canyon Creek, and Old Cow Creek downstream to the head pool of the Olsen Hydropower Project downstream of the Kilarc tailrace on Old Cow Creek (Figure 3).[18]

For fisheries resources, the geographic scope of analysis extends from the upstream-most project facilities downstream to the confluence of Cow Creek and the Sacramento River. This geographic scope is chosen because availability, access, and quality of fish spawning and nursery habitat for the listed Central Valley species units of steelhead trout and Chinook salmon would be affected in the Cow Creek Basin by this Proposed Action.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis includes past, present, and future actions and their possible cumulative effects on each resource. The temporal scope looks into the future, concentrating on the effect of reasonably foreseeable future actions on the resources. The historical discussion is, by necessity, limited to the amount of available information for each resource.

3.3 ANALYSIS OF PROPOSED ACTION AND ACTION ALTERNATIVES

PG&E's proposed license surrender includes: (1) remove diversion dams to stop water diversions and to allow for free passage of fish and sediment; (2) leave in place some diversion dam abutments and foundations to protect stream banks and provide

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[16] The Tetrick Hydroelectric Project (FERC Project No. 6594) is a privately owned mini-hydro facility with a generating capacity of 110 kilowatts located just downstream of the Cow Creek tailrace. This facility operates pursuant to a conduit exemption issued by the Commission in 1982 (see 21 FERC ¶ 62,446 (1982)). Project No. 6594 currently obtains water from the Cow Creek powerhouse tailrace in Hooten Gulch. This project is referred to as Wild Oak Development in the PG&E LSA and the Poulton Hydroelectric Project in comments from Tetrick Ranch/ADU.

[17] Abbott Ditch Diversion spans Hooten Gulch a few feet above its confluence with South Cow Creek and consists of an 8- to 10-ft-tall concrete weir topped with removable wooden flashboards. This diversion is not part of the Kilarc-Cow Creek Project and belongs to private land owners.

[18] The Olsen Hydroelectric Project (FERC Project No. 8361) diverts water from Old Cow Creek 1.2 miles downstream of the Kilarc powerhouse. This project operates pursuant to a minor license issued by the Commission in 1987 (see 39 FERC ¶ 62,025 (1987)).

grade control; (3) leave in place and secure powerhouse structures during decommissioning with an option for preservation of powerhouse structures for future reuse; (4) remove electric generators, turbines, and other equipment; (5) grade and fill forebays; and (6) in consultation with affected landowners, leave in place, breach, or fill canal segments and remove metal and wood flume structures. Additionally, PG&E proposes to retire access roads to the project where possible.

3.3.1 Geologic and Soil Resources

3.3.1.1 Affected Environment

The project is in the Cascade Range geomorphic province, which occupies the eastern half of the Cow Creek watershed, including the headwaters of South Cow Creek and Old Cow Creek. The most widespread rock type in the Cascade Range province is the Tuscan Formation. This volcanic formation is exposed near the Cow Creek powerhouse and forebay, as well as marine sedimentary rocks of the Chico Formation. The Tuscan Formation consists of resistant andesitic, dacitic, and basaltic volcanic breccia, tuff breccia, and interlayered flows, sand, gravel, and tuff (Bailey, 1966 as cited in PG&E, 2009a).

In general, the soils in the vicinity of project facilities are stony and rocky loam. These soils are typically composed of weathered volcanic or sedimentary rock, with low to moderately high hydraulic conductivity, and moderate available water capacity. The thickness of soil over the upper bedrock surface varies, but in general is less than 5 ft.

Under its broadest categorization, most of Old Cow Creek, South Cow Creek, and Hooten Gulch are identified as alluvial channel types. Alluvial streams are characterized by channels that can erode, transport, and deposit sediments, such that they are self-forming and self-maintained (Dunne and Leopold, 1978 as cited in PG&E, 2009a). Although the channels are predominantly alluvial types, field observations identified many short segments of the bypassed reaches dominated by bedrock interspersed between the alluvial segments. These bedrock segments are highly stable, and exert some control on the vertical bed stability throughout the alluvial segments.

PG&E studies characterized the percentage of cobble, gravel, sand, and silt that is stored behind the dams, as well as the chemical composition of the sediments in storage, focusing on the presence of heavy metals (see section 3.3.2.2, *Water Quality*). Topographic surveys were used to estimate the volume of sediment in storage behind the Kilarc main canal and South Cow Creek diversion dams; longitudinal profiles were also surveyed to quantify the local stream gradient through the diversions.

The steeper alluvial bypassed reaches of Old Cow and South Cow Creeks are considered supply-limited systems; that is, the transport capacity (ability of flow to move sediment) is much greater than the available sediment supply. Although these channels have a large sediment supply, their capacity to transport the sediment load greatly exceeds the available material. The Old Cow and South Cow Creek's channels are also supply-limited due to the abundance of relatively immobile bedrock, boulder, and cobble

material comprising the channel. Flow rates up to bank full discharge move the finer (silt, sand, and gravel) material over the more stable larger bed elements that are present. However, much higher and relatively infrequent flows are necessary to mobilize the large bed elements comprising the cascade and step-pool channel types.

In contrast, Hooten Gulch is a pool-riffle/plane-bed channel type and is considered transitional between supply-limited and transport-limited reaches. This means that finer and more easily mobilized bed material is stored along the channel (primarily in pools and mixed with the larger bed material) and the capacity to transport the finer sediments is not much greater relative to the available supply.

The diversions at Old Cow and South Cow Creeks have virtually no water storage capacity and relatively little sediment storage capacity. PG&E reports that sediments have filled the impoundments behind both the Kilarc main canal and South Cow Creek diversion dams. Consequently, under existing conditions bedload is transported along the streambed, passing over the impounded sediments and dams into the downstream bypassed reaches. The run-of-river diversion facilities on South Cow Creek and Old Cow Creek also have limited capacity to attenuate high stream flows, because both developments have limited capacity (50-52 cfs) to divert peak flows through their main canals as well as negligible storage capacity. At higher flows capable of mobilizing bed material, a relatively high percentage of the flow will pass over the diversion dams. Thus, existing project operations likely have had very limited influence on either the natural sediment regime or the sediment transport characteristics of these streams except in the immediate vicinity of the project diversions.

There are three other project diversion dams: North Canyon Creek and South Canyon Creek diversion dams in the Kilarc Development, and Mill Creek diversion dam located on Mill Creek within the Cow Creek Development. All of these impoundments are very small in size, and thus have very small volumes of stored sediment or water storage capacity and almost no effect on downstream flow and sediment transport at higher flows under existing operations.

Kilarc Development

Upstream of the Kilarc main canal diversion dam, the Old Cow Creek channel has a cascade bedform, exemplified by steep gradients, large boulder bed elements, and random distribution of bedform types. The channel of the Old Cow Creek bypassed reach is entirely classified as cascade/step-pool. The step-pool is characteristic of steep-gradient mountain channels that have short, steep plunges punctuated by flats. Hillside failures have occurred immediately upstream (about 700 ft) of the Kilarc main diversion dam. These failures periodically deliver large quantities of sediment and large woody debris to the channel. However, as discussed previously, the capacity of Old Cow Creek to transport this material is high, and storage of gravel and finer material through the bypassed reach is limited to small, interspersed pools and occasional bars. In alluvial systems, fine sediments are typically deposited in pools. The proportion of fine sediment (percent of pool surface area) present in pools in Old Cow Creek is very low. The

average pool bed surface area covered with fine sediment is similar in pools above and below the Kilarc main canal diversion dam, with 14 and 13 percent coverage respectively. Channel bed characteristics in the bypassed reach indicate that fine material (sand, silt, and clay) supplied from bank erosion in the reach is transported downstream relatively quickly.

Most of the sediment (76 to 99 percent of the sample by weight) stored in the impounded area behind the Kilarc main canal diversion dam is gravel (2 to 64 millimeter (mm) [0.08 to 2.5 in.]) or cobble- to boulder-sized (cobble is greater than 64 mm [2.5 in.], and boulder is at least 256 mm [10.1 in.]) material. PG&E estimates the potential volume of stored sediment behind the Kilarc main canal diversion dam to be about 580 cubic yards (0.36 ac-ft). The stream gradient above the Kilarc main canal diversion dam is very steep (about 6.7 percent), and below the Kilarc main canal diversion dam the gradient is about 5.3 percent. PG&E estimates that stream gradients within the impounded area would adjust to about 6.3 percent following removal of the dam. These steep gradients would promote very high sediment transport rates during bank full and higher flow events.

Cow Creek Development

Upstream of the South Cow Creek diversion dam, to almost 3 miles directly downstream of the South Cow Creek diversion dam, bank stability ratings are moderately high to high. For the entire bypassed channel length surveyed below the South Cow Creek diversion dam, bank stability rating is generally high with a few areas of low bank stability. Areas of low bank stability are primarily located near isolated hillslope failures within the gorge. In the first 750 ft of Hooton Gulch upstream of the Cow Creek powerhouse, bank material is rated moderately stable. In this reach, there was evidence that livestock grazing has caused bank erosion. Further upstream, there is low bank stability where friable mudstone is actively sliding into the channel. Downstream of the Cow Creek powerhouse to the confluence with South Cow Creek, the channel banks are moderately stable. Within the first 0.5 mile below the powerhouse, one 90-ft-long section of Hooten Gulch was actively eroding into the channel.

Overall, the proportion of fine sediments in South Cow Creek upstream of the diversion dam is low. The fine sediment storage in pools in the South Cow Creek bypassed reach is similar to that above the South Cow Creek diversion dam (11 percent). This indicates that past project operations have had little effect on the deposition and storage of fine sediments in South Cow Creek.

Hooten Gulch has a much greater amount of fine sediment covering the bed surface of its pools (56 percent average) than either Old Cow Creek or South Cow Creek. The dominant bed particle size in Hooten Gulch upstream from the Cow Creek powerhouse (within the surveyed reach) consists of cobble, with mixtures of boulder, sand, and gravel. Sand deposits are evident on the dry streambed in Hooten Gulch above the Cow Creek powerhouse.

Downstream from the Cow Creek powerhouse, the dominant particle size is gravel and cobble. Although fine sediment is not a dominant component of the bed material along Hooten Gulch, it is the dominant component of the eroding hillsides downstream of the powerhouse. This fine-grained eroded sediment is delivered to the channel and is deposited in pools or mixes with coarser particles on the bed of Hooten Gulch and downstream on South Cow Creek. Fine sediments cover most of the bed surface of the pool on South Cow Creek at the confluence with Hooten Gulch. Although there is no "delta" of fine sediment deposition at the mouth of Hooten Gulch or in South Cow Creek downstream of the confluence pool, it is obvious that Hooten Gulch is actively contributing fine sediment to South Cow Creek. Existing flows in South Cow Creek are adequate to transport and disperse fine sediments downstream and prevent accumulation of high bedloads of fine material in the vicinity of Hooten Gulch.

Most of the sediment (78 to 100 percent of the sample weight) stored behind the South Cow Creek diversion dam is gravel or cobble to boulder sized material. Although the sediment collected from this area ranges from silt to cobble-sized particles, silt is virtually absent, and sand represents less than 10 percent of the stored sediment.

3.3.1.2 Environmental Effects of Proposed Action

The two primary effects of the Proposed Action on soil and sediment resources are associated with: short-term erosion potential during deconstruction activities and filling of project infrastructure (e.g., canals, flumes, forebays, intake structures); and longer term mobilization and redistribution of sediment accumulated upstream of the project diversion dams following removal of those structures. The magnitude of change in the flow and sediment regime under existing licensed conditions compared to unregulated conditions for the Proposed Action was in part evaluated by assessing the change in the magnitude of geomorphically significant streamflow. The geomorphically significant streamflow is approximated as the bank full discharge, or the flow that occurs at an interval of about one and one-half years. Streamflows that are less than the bank full discharge can influence aquatic habitat or riparian conditions, but have very little influence on sediment transport or channel morphology. These lower streamflows are usually not adequate to transport sufficiently large volumes or particle sizes of sediments that comprise the typical bedload fraction of these waters.

Kilarc Development

Based on the general geomorphology and soil conditions at the Kilarc Development, the erosion potential would be lowest on gentler slopes with relatively high hydraulic conductivity, such as in the vicinity of the Kilarc forebay spillway near the downstream end of the Kilarc main canal down to Old Cow Creek (Aiken stony loam). Higher erosion potential of fine materials, which can adversely affect water quality, would occur on steep slopes with lower conductivity soils such as the Cohasset very stony loam, which underlies the Kilarc penstock and Kilarc forebay spillway in the vicinity of the Kilarc powerhouse. PG&E has proposed to plug, but not remove the

penstock; therefore, disturbance of this area would be minimal with only minor potential for erosion in the short-term during closing of the penstock.

The potential volume of stored sediment behind the Kilarc diversion dam that would be susceptible to scour, redistribution, and downstream transport during stream channel incision following the removal of the Kilarc main canal diversion dam is estimated to be about 580 cubic yards (0.36 ac-ft) (North State Resources, 2008). PG&E has proposed to allow sediments to be redistributed downstream by natural high flow events, specifically bank full (about 1,324 cfs) or greater. Field survey results indicate that between 40 and 50 percent of the active stream channel is occupied by boulders; thus, about 230 to 290 cubic yards (0.14-0.18 ac-ft) of this stored material in the form of boulders would not be readily mobilized except at very high flows greater than bank full.

Under the Proposed Action, accumulated sediments from behind the diversion dam would be redistributed downstream, and natural gradients, flow regimes, and sediment transport characteristics should develop similar to those characteristic of stream reaches upstream of the project diversion and downstream of the Kilarc tailrace. This process would be enhanced by the creation of a temporary artificial channel through the accumulated sediment (PM&E Measure GEOM-1). Re-establishing the natural steep gradients through the existing impoundment would promote very high sediment transport rates during bank full and higher flow events. We expect that most of the finer accumulated sediment material (cobble sized and smaller) would be readily mobilized during bank full storm events and the larger boulder sized material would be mobilized only during extreme flood events. It is unknown how long it would take for Old Cow Creek to naturally mobilize and transport this volume of sediment as the rate would be dependent upon the frequency, duration, and magnitude of flood events at bank full or higher following dam removal.

Because the diversion has had minimal effect on the higher flows through the bypassed reach under existing licensed conditions, following implementation of the Proposed Action, the magnitude and frequency of full, natural, geomorphically significant peak flows along Old Cow Creek would be virtually the same as under existing project operations. Consequently, undercutting and erosion of banks would be expected to be minimal, which should be ensured by control measures proposed by PG&E (PM&E Measure GEOM-2).

The other two diversions in the Kilarc Development (the North Canyon Creek and South Canyon Creek diversion dams) have not operated to provide flows to the Kilarc Development during the last seven years because of the requirement to meet superior downstream water rights on South Canyon Creek, maintenance costs, and the relatively small volume of water provided to the development. Sediments most likely have been passing over these small diversions into the downstream reaches throughout most of the period of the existing license. The removal of the North Canyon Creek and South Canyon Creek diversion dams during the decommissioning of project facilities would result in little to no change in magnitude and frequency of full, natural, peak runoff, and

the associated sediment transport capacity of these channels. The relatively small volume of accumulated sediment would eventually be transported downstream.

Our Analysis

The Proposed Action is likely to have short term, minor impacts to geologic and soil resources during construction and following the removal of diversion dams. Staff finds that the PM&E measures proposed by PG&E would be adequate to identify, control, and manage the potential for erosion and sedimentation in the short-term during construction activity (PM&E Measures GEOL-1, GEOL-2, and GEOL-3) and over the long-term as natural flows and hydrographs become re-established and reconfigure channel morphometry (PM&E Measures GEOM-1 and GEOM-2).

Cow Creek Development

Based on the general geomorphology and soil conditions, the erosion potential would be lowest on gentler slopes with relatively high hydraulic conductivity as found in the vicinity of the Cow Creek forebay and along portions of the South Cow Creek main canal. Underlying much of the South Creek main canal is mostly bedrock and weathered bedrock. This bedrock has a very low erosion potential and has a very low potential to deliver fine sediments to streams. There is higher erosion potential of fine materials, on the steep slopes along a portion of the penstock and in the vicinity of the Cow Creek powerhouse. PG&E has proposed to plug the penstock and leave it in place, which would minimize the potential for short-term erosion effects in this area. Except for removal of the switchyard adjacent to the powerhouse, disturbance in the vicinity of the powerhouse would be minimal and managed with appropriate BMP measures (PM&E Measures GEOL-1 and GEOL-2).

PG&E has proposed BMPs to manage storm water and control soil erosion in the vicinity of temporary access roads and where removal of project infrastructure or backfilling of canals and other project infrastructure would result in removal of protective vegetation and exposure of unprotected soil to storm water runoff. Implementation and maintenance of BMPs would be particularly important in areas with steep slopes and soils sensitive to erosion. PG&E would prepare plans and specifications to protect steep slopes vulnerable to landslides and mass wasting in the vicinity of construction activity for removal or filling of project structures (PM&E Measure GEOL-3). Although peak flows would be similar under the Proposed Action to those under the current license (see section 3.3.2.1.1, *Affected Environment*), restoration of full flows and a natural hydrograph has the potential to affect erosion of stream banks within the bypassed reach. PG&E has proposed to monitor these areas for two years after removal of the diversion dam and implement erosion control measures as needed (PM&E Measure GEOM-2)

A private landowner at the South Cow Creek diversion identified several areas with steep slopes that exhibit scars from historic work at the diversion dam and the discharge from the Mill Creek canal to South Cow Creek, and emphasized the need to reconfigure those slopes as part of the process of decommissioning to prevent slope

failure and erosion potential. This owner commented that the design specification for the alignment of the temporary artificial channel through accumulated sediment above the diversion dam must account for the location and meander of the channel below the diversion dam in order to avoid directing flows that could destabilize the right bank (facing downstream). PG&E has proposed PM&E measures that address both of these concerns (PM&E Measures GEOL-3, GEOM-1, and GEOM-2).

Channel slopes are moderate upstream and downstream of the diversion dam (about one percent). It is unknown how long it would take for Old Cow Creek to naturally mobilize and transport sediment accumulated behind the dam, as it would be dependent upon the frequency, duration, and magnitude of flood events at bank full (2,614 cfs) or higher following dam removal. We expect that most of the finer material (cobble-sized and smaller) would be readily mobilized under typical flow patterns and the larger boulder sized material would be mobilized only during extreme flood events. It is expected that most of the 1,400 cubic yards of sediment eventually would be transported downstream through the bypassed reach. PG&E has proposed to leave portions of the sill and wing walls in place as a bed elevation control and to prevent erosion of sensitive bank areas (PM&E Measure GEOM-2) in the vicinity of the diversion dam; proposed monitoring would ensure that these remaining structures do not become barriers to upstream fish migration (PM&E Measures AQUA-4 and AQUA-5).

The diversion facility on South Cow Creek typically operates as a run-of-river facility with negligible ability to attenuate high stream flows, due to the limited capacity to divert and handle peak flows in the main canal and the lack of significant water storage capacity in the upstream impoundment. Thus, the diversion dam has negligible effect on downstream passage of bank full and higher flows. Consequently, undercutting and erosion of banks would be expected to be minimal, which should be ensured by control measures proposed by PG&E (PM&E Measure GEOM-2).

Following an initial period of uncertain duration during which accumulated sediments from behind the diversion dam would be redistributed downstream, natural gradients, flow regimes, and sediment transport characteristics should develop similar to those characteristic of stream reaches upstream of the project diversion. Because the diversion has had minimal effect on the higher flows through the bypassed reach under licensed conditions, following implementation of the Proposed Action, the magnitude and frequency of full, natural, geomorphically significant peak flows along Old Cow Creek would be virtually the same as under existing project operations. Re-establishing the natural gradients through the impoundment would enhance sediment transport rates during high flow events.

Final detailed engineering design drawings for the Proposed Action and specifically removal of the diversion dam would: evaluate the hydraulic characteristics of the channel through the reaches immediately above and below the dam; provide detail of the alignment and profile of the temporary channel (PM&E Measure GEOM-1); propose adequate protection of the adjacent banks to minimize the potential for bank

destabilization and erosion (PM&E Measure GEOM-2); and provide a monitoring plan to ensure short- and long-term protection of adjacent stream bank channel and water quality (PM&E Measure GEOM-2). Appropriate detail for sediment and erosion control BMPs also would be included in this design package (PM&E Measures GEOL-1 and GEOL-2).

The impoundment associated with the Mill Creek diversion dam is small in size, with a very small volume of stored sediment. Sediments most likely have been passing over this small diversion into the downstream reach throughout most of the period of the existing license. The proposed removal of the Mill Creek diversion dam would not affect the magnitude and frequency of peak flows and the associated sediment transport capacity of this channel.

Our Analysis

The Proposed Action is likely to have short term, minor impacts to geologic and soil resources during construction and following the removal of diversion dams. Staff finds that the PM&E measures proposed by PG&E would be adequate to identify, control, and manage the potential for erosion and sedimentation in the short-term during construction activity (PM&E Measures GEOL-1, GEOL-2, and GEOL-3) and over the long-term as natural flows and hydrographs become re-established and reconfigure channel morphometry (PM&E Measures GEOM-1 and GEOM-2).

3.3.1.3 Environmental Effects of Action Alternative 1

Action Alternative 1 would ensure continued recreational access at the Kilarc forebay. Those facilities of the Kilarc Development required to maintain the forebay would be improved to provide fish passage and to increase flows to the bypassed reach. The remainder of the Kilarc Development and the entire Cow Creek Development would be decommissioned as described in the Proposed Action. No power generation would occur at either project development. The Kilarc powerhouse and switchyard, and the North and South Canyon diversion dams, canals, and siphon would be decommissioned as described under the Proposed Action, and other actions would be implemented in order to maintain the Old Cow Creek diversion dam, canal, and Kilarc forebay.

Kilarc Development

There would be potential short-term effects due to disturbance and erosion during construction of the new fish ladder and fish screen, modification of the spillway and gates at the Kilarc main canal diversion dam, and deconstruction of the North and South Canyon diversion and canal structures. Construction activity and associated soil disturbance during decommissioning of the Kilarc powerhouse and North and South Canyon diversions would have the same potential effects and associated PM&E measures (Measures GEOL-1, GEOL-2, and GEOL-3) as described for the Proposed Action at these locations. Additional short-term effects could occur at the Kilarc forebay during construction to reconfigure the location of the spillway relative to the main canal discharge to the Kilarc forebay. Effects at the forebay could be minimized by temporarily discontinuing flows through the canal and lowering the water level in the

forebay so that construction activities could be conducted on dry land with appropriate BMPs. Continued use of the existing penstock for the normal discharge from the forebay rather than modifying the existing spillway would minimize construction activities within the forebay.

Action Alternative 1 would restore flows that more closely reflect natural fine sediment transport and distribution dynamics in the Old Cow Creek bypassed reach. Most of the sediment trapped behind the existing Kilarc diversion dam would remain in place, although some material in the immediate vicinity of the dam may be released in order to construct the new fish ladder and screen and modify the spillway to increase minimum flows. After initial redistribution of sediment trapped behind the North and South Canyon Creek diversion dams, which have not operated for about seven years, sediment transport in the bypassed reaches of these two creeks would return to natural conditions, although not dissimilar to the sediment transport regime that has existed over the past seven years.

Our Analysis

Action Alternative 1 is likely to have short-term, minor impacts to geologic and soil resources during construction. Implementation of mitigation measures similar to the Proposed Action (PM&E Measures GEOL-1, GEOL-2, GEOL-3, and GEOM-2), including sediment and erosion control BMPs, and monitoring during construction activities, should minimize soil erosion. The long-term environmental effects of AA1 on geology and soil resources in and adjacent to Old Cow Creek would be similar to those effects observed under current license conditions.

Cow Creek Development

The environmental effects on geology and soils and the proposed PM&E measures at the Cow Creek Development under AA1 would be the same as described under the Proposed Action (see section 3.3.1.2, *Environmental Effects of Proposed Action*).

3.3.1.4 Environmental Effects of Action Alternative 2

Action Alternative 2 would ensure continued flow to the Hooten Gulch in order for ADU to continue to access their water right at the current point of diversion. Those facilities of the Cow Creek Development required to maintain flow to Hooten Gulch would be improved to provide fish passage and to increase flow to the bypassed reach. The remainder of the Cow Creek Development and the entire Kilarc Development would be decommissioned as described in the Proposed Action. No power generation would occur at either project development and no license would be issued by the Commission. The South Cow Creek powerhouse and switchyard, and Mill Creek diversion dam and canal would be decommissioned as described under the Proposed Action.

Kilarc Development

The environmental effects on geology and soils and proposed PM&E measures at the Kilarc Development under AA2 would be the same as described under the Proposed Action.

Cow Creek Development

Under AA2, there would be potential for short-term effects due to disturbance and erosion during removal and reconstruction of the fish ladder and fish screen, any necessary modification of the spillway and gates at the South Cow Creek main canal diversion dam, and deconstruction of the Mill Creek diversion and canal structures. These effects and associated PM&E measures (Measures GEOL-1, GEOL-2, and GEOM-3) would be similar to those described for the Proposed Action. Construction activity and associated soil disturbance during decommissioning of the Cow Creek powerhouse would have the same potential effects as described for the Proposed Action. Additional short-term effects could occur at the Cow Creek forebay during construction to fill and grade the forebay, and extend the main canal to the penstock intake. Construction activities at the Cow Creek forebay would be conducted with no flows diverted through the canal. It is anticipated that implementation of appropriate and adequate BMPs and monitoring during construction activities described above would minimize soil erosion effects and prevent potential associated adverse effects on water quality.

Most of the sediment that has accumulated upstream of the South Cow Creek diversion dam would remain in place, although a portion of the bed material in the immediate vicinity of the dam could be removed to facilitate modifications to the spillway, fish ladder, and fish screen. Accumulation of sediment behind the Mill Creek diversion dam is relatively minor. Removal of the diversion dam would result in dispersal of accumulated sediments during subsequent high flow events in Mill Creek. Following this early mobilization and downstream transport of accumulated sediments at the Mill Creek diversion dam, sediment transport would revert to more natural conditions in this stream.

Under AA2, minimum flows through the South Cow Creek bypassed reach would significantly increase from the 3-5 cfs minimum flow required under the license (see section 3.3.2.1, *Water Quantity*). Restoration of a more natural flow regime would provide more natural sediment transport and distribution dynamics in this bypassed reach, not dissimilar to conditions under the Proposed Action.

Our Analysis

Action Alternative 2 is likely to have short term, minor impacts to geologic and soil resources during construction. Implementation of mitigation measures similar to the Proposed Action (PM&E Measures GEOL-1, GEOL-2, GEOL-3, and GEOM-2), including sediment and erosion control BMPs, and monitoring during construction activities, should minimize soil erosion. The long-term environmental effects of AA2 on

geology and soil resources in and adjacent to South Cow Creek would be similar to those effects observed under current license conditions.

3.3.1.5 Environmental Effects of No Action

Kilarc Development

Under the No Action Alternative, the Kilarc Development would continue to operate and water diversions would remain the same as currently exist. Geology, soil, and sediment conditions would not change from those described in section 3.3.1.1, *Affected Environment*.

Under the No-Action Alternative, no new construction would occur that could increase the potential for erosion during runoff events. Development infrastructure and adjacent areas would continue to be well vegetated, armored, or generally protected from erosion. Occasional failure of steep banks along tributaries in the watershed is a natural occurrence and routine source of material for maintenance and replenishment of coarse gravel, cobble, and boulder substrate in streambeds. With no change in the hydrodynamics at the diversion dam and through the bypass from the existing license conditions, substrate distribution and dynamics would not change from existing conditions. Sediment accumulated upstream of the Kilarc main canal diversion dam would remain in place and would not be redistributed in the bypassed stream channel of Old Cow Creek. The scoured plunge pool below the diversion dam and other pool habitat in the bypassed reach would be unchanged with a limited supply of gravel.

Our Analysis

Long- and short-term sediment transport dynamics in Old Cow Creek and North and South Canyon Creeks below the respective diversion dams would be the same as under the current license. Potential short-term effects on soil erosion associated with construction under the Proposed Action would not occur and associated PM&E measures would not be implemented. Bank stability would be unchanged from the current conditions.

Cow Creek Development

Under the No-Action Alternative, the Cow Creek Development would continue to divert flows for power generation. With no change in the hydrodynamics at the diversion dam and through the bypass from the existing license conditions, substrate distribution and dynamics would not change from existing conditions. Sediment accumulated upstream of the Mill Creek diversion dam and the South Cow Creek main canal diversion dam would remain in place and would not be redistributed to the bypassed stream channel of South Cow Creek. The scoured plunge pool below the South Cow Creek diversion dam and other pools in the bypassed reach would be unchanged with a limited supply of gravel relative to flow capacity for mobilization of sediment material. The shotcrete armoring installed to protect the bank against erosion in Hooten Gulch at the Cow Creek powerhouse tailrace would remain in place.

Our Analysis

Long- and short-term sediment transport dynamics in South Cow Creek and Mill Creek below the respective diversion dams would be the same as under the current license. Potential short-term effects on soil erosion associated with construction under the Proposed Action would not occur and associated PM&E measures would not be implemented. Bank stability would be unchanged from the current conditions.

3.3.2 Water Resources

3.3.2.1 Water Quantity

3.3.2.1.1 Affected Environment

The project is located in the Cow Creek watershed, which encompasses 430 sq mi and drains the base and foothills of Mount Lassen in a southwest direction into the Sacramento River. The Kilarc Development is located on Old Cow Creek, while the Cow Creek Development is located on South Cow Creek (Figures 2, 3, and 4). Old Cow Creek drains an 80-sq-mi basin and originates at 6,500 ft elevation in the LaTour Demonstration State Forest. Old Cow Creek flows 32 miles, conjoining with several smaller creeks, before its confluence with South Cow Creek, three miles east of Millville. South Cow Creek drains a 78-sq-mi basin and originates at 5,800 ft elevation in the LaTour Demonstration State Forest (Beck and Rowe, 2008 as cited in PG&E, 2009a). South Cow Creek flows 28.5 miles, with several tributary streams combining before its confluence with Old Cow Creek near State Route 44.

Streamflow in Old Cow Creek and South Cow Creek originates from runoff during precipitation events, snowmelt in the winter and spring, and contributions from groundwater (baseflow) during the dry season. Both streams are affected by diversions for hydroelectric generation and agriculture. Stream flow data (collected by the U.S. Geological Survey [USGS] and PG&E) are available from several gages located throughout the Cow Creek watershed. However, there are no gages upstream of the project area on either Old Cow or South Cow Creeks. There are no recorded flow data for diversions at project facilities on North and South Canyon Creeks and Mill Creek or other non-project diversions within these sub-basins. USGS gages monitor minimum flow releases to the bypassed reaches of Old Cow Creek and South Cow Creek. PG&E records diverted flows in the Kilarc main canal and South Cow Creek main canal; however, these gages are not maintained and operated to the accuracy specifications of USGS gages.

Kilarc Development

For the Kilarc Development, PG&E diverts 2.5 cfs from North Canyon Creek, 7.5 cfs from South Canyon Creek, and 52 cfs from Old Cow Creek for use at the Kilarc powerhouse. The minimum instream flow requirement at the Kilarc main diversion dam is 3 cfs. This requirement is met by releasing water back to Old Cow Creek from the Kilarc main canal a few hundred feet downstream of the Kilarc main canal diversion

dam. A gage (USGS No. 11372325) measures the minimum instream flow by measuring the flow at the canal spillway. Based on records from this gage, average monthly minimum flow discharges since 1983 have been 3 to 4 cfs. Flows within the bypassed reach, including any spillage at the diversion dam, are not measured. The only tributary within the bypassed reach, Canyon Creek, is small and adds less than 10 percent to the flow of Old Cow Creek.

PG&E records flows in the Kilarc main canal (gage CB2) downstream of the minimum flow spillway to the Old Cow Creek bypassed reach. Table 5 presents the average, maximum, and minimum monthly flows measured by this gage between 1969 and 2000. This gage is not rated to USGS standards and gaps exist in the dataset from which these statistics were calculated; however, it provides the only available estimate of flows diverted for project use from Old Cow Creek over the period of record. Average monthly flows in the canal for this period ranged from 25 cfs in September to 46 cfs in May. During normal operations for this period, the canal minimum monthly flows ranged from 0 to 21 cfs, while the maximum flows in the main canal ranged from 34 to 108 cfs.

Table 5. Average, maximum, and minimum monthly flows (cfs) recorded by PG&E at gage CB2 in the Kilarc main canal downstream of the minimum flow return to Old Cow Creek. (Source: PG&E, 2009f, modified by staff)

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	37	51	2
February	42	85	9
March	43	53	21
April	45	62	18
May	46	57	15
June	37	52	13
July	32	49	16
August	26	38	16
September	25	34	16
October	26	36	12
November	30	48	6
December	37	108	0

Flow in the Old Cow Creek bypassed reach during the winter and storm water runoff periods can be significantly greater than minimum required flows; however, flow volumes are unknown because there is no gage that measures flows that spill over the Kilarc main diversion dam. PG&E estimated total historical flows at the Kilarc main diversion dam by developing flow statistics for USGS gages on Cow Creek at Millville (No. 113740000) and South Canyon Creek near Millville (No. 11372200) and adjusting those flows for the drainage area at the dam (23.8 square miles) (PG&E 2009a). These represent an estimate of total flows in Old Cow Creek at the Kilarc main canal diversion dam.

In order to estimate flows in the bypassed reach under licensed conditions, staff subtracted flows diverted for project use (flows in the canal summarized in Table 5) from PG&E's modeled flow data over the same time period (1969-2000).[19] Table 6 presents estimated average, maximum, and minimum flows in the Old Cow Creek bypassed reach under existing licensed conditions. The calculated difference between the data sets is occasionally negative as a result of variability and uncertainty associated with the two data sources. However, minimum flow gage records indicate that there was a monthly average minimum flow of 2 cfs in the bypassed reach during this period. Therefore, to generate the flow statistics presented in Table 6, all average monthly flow values less than 2 cfs were assumed to be at least 2 cfs. The estimated monthly average bypass flows under licensed conditions range from about 8 cfs in October to 103 cfs in January.

Table 6. Flow (cfs) in the Old Cow Creek bypassed reach under the existing license calculated from estimated unimpaired flow at the Kilarc diversion dam and flows in the Kilarc main canal diverted for project use (Source: Staff).

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	103	337	2
February	95	333	2
March	88	308	2
April	52	117	2
May	59	234	2
June	38	142	2
July	31	63	2
August	30	53	7

[19] The modeled flow data from PG&E includes flow estimates from 1950-2000, however staff limited its analysis to those years for which Kilarc canal flow data are also available (1969-2000).

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
September	14	36	2
October	8	29	2
November	25	149	2
December	57	234	2

The Kilarc forebay has a surface area of about 4.5 acres and a gross useable storage capacity of 30.4 ac-ft. The water surface elevation varies by about 1 ft during normal operations. During wildfire emergencies in the area, the Kilarc forebay is used as a water supply for fire suppression, which we discuss further in section 3.3.8, *Land Use*, and section 3.3.9, *Aesthetics*.

Groundwater recharge in the Old Cow Creek watershed is primarily from infiltration of rainfall. Based on an annual rainfall of 44 in., the project area receives a mean annual precipitation volume of 145,622 ac-ft. Regionally, groundwater discharge occurs along stream valleys and flat low-gradient meadows to the west and northwest of the groundwater basin. Groundwater basins in the vicinity of the Kilarc forebay encompass an area of 2,297 acres.

Cow Creek Development

For the Cow Creek Development, PG&E diverts 20 cfs from Mill Creek to South Cow Creek upstream of the diversion dam and 50 cfs from South Cow Creek for use at the Cow Creek powerhouse. The German Ditch diversion is located upstream from PG&E's diversion for the South Cow Creek main canal. PG&E holds shares in the South Cow Creek Ditch Association that allow the utility to retain up to 1.44 cfs in the German Ditch to be delivered to Mill Creek. The water then flows to PG&E's Mill Creek diversion dam and into the Mill Creek-South Cow Creek canal where it is diverted by PG&E for generation at the Cow Creek powerhouse. An additional 2 cfs is left in South Cow Creek at the German Ditch and diverted at PG&E's South Cow Creek main canal for generation at the Cow Creek powerhouse.

The Cow Creek Forebay has a surface area of one acre and a gross useable storage capacity of 5.4 acre feet, at an elevation of 1,537.2 ft msl. The water surface elevation of the Cow Creek Forebay varies by approximately one foot during normal operations.

The minimum instream flow requirement to the bypassed reach of South Cow Creek is 4.0 cfs under normal water year criteria and 2.0 cfs under dry water year criteria.[20] This requirement is met by releases from the South Cow Creek main canal

[20] Under the license, a dry year is defined as any 12-month period beginning May 1 in which the natural unimpaired runoff of the Sacramento River above Bend Bridge,

through the fish ladder at the South Cow Creek diversion dam. Released flows are recorded at the fish ladder (USGS gage No. 11372080); flow in the bypassed reach, including spill at the diversion dam, is not measured by this gage. Average monthly flow releases since 1984 from the fish ladder are 4 to 5 cfs.

PG&E recorded flows in the main canal (gage CB8) from 1969-1995. Table 7 presents the average, maximum, and minimum monthly flows measured by this gage over this time period. Although this gage is not rated to USGS standards and gaps exist in the dataset, it provides the best available information for flows diverted for project use from South Cow Creek over the period of record. Average monthly flows for this period ranged from 20 cfs in August to 53 cfs in April. During normal operations for this period, the minimum monthly flow recorded in the canal was 0 cfs in November and the maximum monthly flow of 168 cfs in December. During major runoff events, flows in excess of the nominal 50-cfs capacity can enter the canal, but flows in excess of the canal capacity are discharged back to South Cow Creek through a spillway located downstream of the main canal gage.

Table 7. Average, maximum, and minimum monthly flows (cfs) recorded by PG&E at gage CB8 in the Cow Creek main canal (1969-1995). (Source: PG&E, 2009f, modified by staff)

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	48	62	27
February	51	74	26
March	52	67	25
April	53	80	18
May	48	67	6
June	38	58	13
July	25	48	8
August	20	40	8
September	21	30	5
October	29	57	5
November	38	64	0
December	51	168	23

near Red Bluff, for the April 1 to July 31 period will be 70 percent or less of the 50-year average for such a period as computed by the State.

Flow in the South Cow Creek bypassed reach during the winter and storm water runoff periods can be significantly greater than minimum required flows; however, the actual volumes are unknown because there is no gage that measures flows that spill over the South Cow Creek main canal diversion dam. PG&E estimated flows at the South Cow Creek diversion dam by developing flow statistics for USGS gages on Cow Creek at Millville (No. 113740000) and South Canyon Creek near Millville (No. 11372200) and adjusting those flows for the drainage area at the dam (47 square miles) (PG&E 2009a).

In order to estimate flows in the South Cow Creek bypassed reach under licensed conditions, staff subtracted flows diverted for project use (flows in the canal summarized in Table 7) from PG&E's modeled flow data over the same time period (1969-1995). Table 8 presents estimated average, maximum, and minimum monthly flows in the South Cow Creek bypassed reach under existing licensed conditions. The calculated difference between the data sets is occasionally negative as a result of variability and uncertainty associated with the two data sources. However, minimum flow gage records indicate that there was a monthly average minimum flow of at least 4 cfs in the bypassed reach during this period. Therefore, to generate the flow statistics presented in Table 8, all average monthly flow values less than 4 cfs were assumed to be at least 4 cfs. On average, monthly flows in the bypassed reach under licensed conditions range from about 6 cfs in August and September to 204 cfs in January.

Table 8. Flow (cfs) in the South Cow Creek bypassed reach under existing license based on estimated unimpaired flow at the Cow Creek diversion dam and flow in the Cow Creek main canal (1969-1995) (Source: Staff).

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	204	711	4
February	185	588	4
March	196	671	4
April	126	264	12
May	74	312	4
June	30	210	4
July	10	44	4
August	6	25	4
September	6	21	4
October	9	45	4

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
November	55	304	4
December	123	486	4

The Cow Creek powerhouse currently discharges water into Hooten Gulch, which flows into South Cow Creek. Upstream of the powerhouse, Hooten Gulch is an ephemeral stream with flow only during periods of rain or snow melt. There is no stream flow gage on Hooten Gulch. The Tetrick Hydroelectric Project, an exempt mini-hydro facility, is located on Hooten Gulch downstream of the Cow Creek powerhouse. The facility relies on discharges from the South Cow Creek powerhouse to operate and releases all flows back into Hooten Gulch. The Tetrick Hydroelectric Project has a generating capacity of 110 kilowatts and has operated since 1984.

Abbott Ditch, an irrigation diversion downstream of the Tetrick Hydroelectric Project, diverts water from Hooten Gulch for consumptive use. The diversion dam for Abbott Ditch is presently located a short distance upstream of the confluence of Hooten Gulch with South Cow Creek. Pursuant to an adjudication of water diversions in the watershed (California SWRCB, 1969), ADU is entitled to divert 13.13 cfs from the natural flow of the east channel of South Cow Creek below the confluence with Hooten Gulch; however, this diversion was moved to its present location at the time that the Cow Creek Development was constructed.

3.3.2.1.2 Environmental Effects of Proposed Action

Kilarc Development

Under the Proposed Action, PG&E's water rights would be abandoned and flows previously diverted for power generation would remain in Old Cow Creek downstream of the diversion dam. Increased stream flows in the bypassed reaches of North and South Canyon Creeks and Old Cow Creek would result from restoration of the natural seasonal hydrograph for these waters. Table 9 presents estimated average, maximum, and minimum monthly flows in Old Cow Creek in the bypassed reach under the Proposed Action. Staff calculated flows under the Proposed Action by adding flows historically diverted for project use (Table 5) to estimates of flow in the Old Cow Creek bypassed reach under the existing license (Table 6).

Table 9: Estimated flows in the Old Cow Creek bypassed reach under the Proposed Action (Source: Staff).

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	140	388	4
February	137	419	11
March	131	361	23
April	97	179	20
May	105	291	17
June	75	194	15
July	62	112	18
August	56	91	23
September	39	70	17
October	33	65	14
November	55	197	7
December	94	342	2

Particularly during low flow periods (less than about 55 cfs), the Proposed Action would significantly increase flows through the bypassed reach of Old Cow Creek compared to the minimum instream flows of 2 to 4 cfs under licensed conditions. The removal of project features and the cessation of diversions would return the bypassed reach to more natural conditions of flow.

Table 10 presents a comparison of average monthly flows in the Old Cow Creek bypassed reach under the Proposed Action and licensed condition. During late summer-early fall (July to October) when natural flows are typically at their annual low, the percent increase in monthly average flows under the Proposed Action compared to the licensed condition is estimated between 87-313 percent. During the period of the year when natural flows are typically high (December-May) the percent increase is estimated between 36-87 percent.

Table 10. Comparison of average monthly flows in the Old Cow Creek bypassed reach under the Proposed Action and licensed conditions (Source: Staff).

Month	Proposed Action (Average Monthly Flow from Table 9) (cfs)	License Condition (Average Monthly Flow from Table 6) (cfs)	% Flow Increase Under Proposed Action
January	140	103	36
February	137	95	44
March	131	88	49
April	97	52	87
May	105	59	78
June	75	38	97
July	62	31	100
August	56	30	87
September	39	14	179
October	33	8	313
November	55	25	120
December	94	57	65

Under the Proposed Action, annual peak stream flows in the bypassed reach of Old Cow Creek would increase slightly. The estimated bank full stream flow (1.5-year recurrence) capable of sediment mobilization and stream channel maintenance for Old Cow Creek (1,047 cfs) has been reduced relatively little by project operations (4.8 percent), assuming a maximum diversion rate of 50 cfs.

The Proposed Action would eliminate the 4.5 acre Kilarc forebay and associated flows. Removal of the Kilarc diversion dam and main canal would terminate the source of water to the forebay, and the forebay would be drained, filled, and graded (see sections 3.3.3, *Fisheries and Aquatic Resources* and 3.3.4, *Botanical Resources*). The forebay would no longer provide a source of water for local forest fire suppression or recreation. The effects of the loss of this waterbody as a fire suppression resource and a recreational resource are discussed in more detail under: section 3.3.8, *Land Use*; section 3.3.9, *Aesthetics*; and section 3.3.7, *Recreational Resources*.

A groundwater study of eastern Shasta County (Department of Water Resources, Northern District, 1984) was conducted at a regional scale that does not provide details of local hydrogeologic conditions adequate to assess whether removal of the Kilarc forebay could affect local groundwater resources. In 2008, PG&E contacted 11 well-owners

identified as downgradient of the Kilarc forebay. Of these 11 well-owners, only one responded to indicate that their well was no longer in use. Shasta County and several private citizens commented that local groundwater resources would be affected by the dewatering of the Kilarc forebay. However, none of the commenters provided data on the wells that would be affected. Potential economic impacts to well-owners are discussed below in section 4.1.12 *Economic Analysis*.

Removal of the diversion dams will occur during the period of seasonal low flows. During construction activities to remove the Kilarc main canal diversion dam and excavation of the temporary channel through the accumulated upstream sediment (PM&E Measure GEOM-1), the entrance to the diversion canal will be closed and flows will be diverted around the construction activity to the downstream bypass channel (PM&E Measure AQUA-1). Over an unknown period of time natural flows would reconfigure a natural channel, mobilizing and transporting accumulated sediment upstream of the dam (see section 3.3.1, *Geologic and Soil Resources*). The existing drainage patterns in the vicinity of the development's infrastructure (e.g., canals, spillways, the Kilarc forebay, powerhouse tailrace) could change as a result of removal of these structures and regrading. These activities are expected to have minimal effects on runoff and stream flows given implementation of proposed BMPs (PM&E Measures GEOL-1 and GEOL-2).

Our Analysis

The Proposed Action would have a long-term beneficial impact on water quantity in Old Cow Creek by increasing average monthly flows (between 36-313 percent) in the bypassed reach, especially during low flow conditions. In addition, annual peak stream flows in the bypassed reach of Old Cow Creek would increase slightly.

The Proposed Action would result in a permanent loss of the Kilarc forebay. The draining, filling and grading of the Kilarc forebay under the Proposed Action may have the potential to indirectly affect water supply wells located in proximity to the forebay. We recommend that PG&E provide homeowners ample notice of its specific plans and schedule to drain the Kilarc forebay in order to give these homeowners time to implement necessary measures to meet their water supply needs.

Cow Creek Development

Under the Proposed Action, PG&E's water rights would be abandoned and flows previously diverted for power generation would remain in South Cow Creek below the diversion dam through the bypassed reach. Increased stream flows in the bypassed reaches of Mill Creek and South Cow Creek would result from restoration of the natural seasonal hydrograph. Table 11 presents estimated average, maximum, and minimum monthly flows in the bypassed reach of South Cow Creek under the Proposed Action. Staff calculated flows under the Proposed Action by adding flows historically diverted for project use (Table 7) to estimates of flow in the South Cow Creek bypassed reach under the existing license (Table 8).

Table 11. Estimated monthly flows in the South Cow Creek bypassed reach under the Proposed Action (Source: Staff).

Month	Average Monthly Flow (cfs)	Maximum Monthly Flow (cfs)	Minimum Monthly Flow (cfs)
January	252	773	31
February	236	663	30
March	249	738	29
April	179	344	29
May	122	380	10
June	68	268	17
July	35	92	12
August	26	65	12
September	27	51	9
October	38	102	9
November	93	368	4
December	174	654	27

The Proposed Action would significantly increase flows through the bypassed reach of South Cow Creek compared to the minimum monthly instream flows of 4 to 6 cfs under licensed conditions. The removal of project features and the cessation of diversions would return the bypassed reach to more natural conditions of flow. Table 12 presents a comparison of average monthly flows in the South Cow Creek bypassed reach under the Proposed Action and existing licensed condition. During summer-early fall (July to October) when natural flows are typically at their annual low, the increase in monthly average flows under the Proposed Action compared to the licensed condition is estimated between 264-334 percent. During the period of the year when natural flows are typically high (December-May), the increase in flow is estimated between 23-65 percent.

Table 12. Comparison of flows under the Proposed Action and existing licensed conditions in the South Cow Creek bypassed reach of the Cow Creek Development (Source: Staff).

Month	Proposed Action (Average Monthly Flow from Table 9) (cfs)	License Condition (Average Monthly Flow from Table 8) (cfs)	% Flow Increase Under Proposed Action
January	252	204	23
February	236	185	28
March	249	196	27
April	179	126	42
May	122	74	65
June	68	30	125
July	35	10	264
August	26	6	334
September	27	6	325
October	38	9	329
November	93	55	70
December	174	123	41

Under the Proposed Action, annual peak stream flows on South Cow Creek would increase slightly. The estimated bank full stream flow (1.5-year recurrence) capable of sediment mobilization and stream channel maintenance for South Cow Creek (2,057 cfs) has been reduced relatively little by project operations (2.4 percent), assuming a maximum diversion rate of 50 cfs.

The Proposed Action would eliminate the one acre Cow Creek forebay and associated flows. Removal of the Cow Creek diversion dam and main canal would terminate the source of water to the forebay, and the forebay would be drained, filled, and graded (see sections 3.3.3, *Fisheries and Aquatic Resources* and 3.3.4, *Botanical Resources*).

The Proposed Action would return flows in the Hooten Gulch to their natural, ephemeral condition. The Tetrick Hydroelectric Project and the Abbott Ditch water users who currently divert water from Hooten Gulch would no longer be able to access their water right from Hooten Gulch. The adjudicated (California SWRCB, 1969) consumptive water right of Abbott Ditch is described at a location on South Cow Creek below the confluence of Hooten Gulch. Under the Proposed Action, there will not be

sufficient flow in the Hooten Gulch to satisfy the ADU water right during a large portion of the year.[21] Although the Proposed Action would not change the ADU water right, the ADU would need to develop an alternative point of diversion to be able to access the full volume of their water right.

Construction of a new diversion to access these water rights would require state and federal permits outside Commission jurisdiction. PG&E states that the Federal Power Act reserves to the states jurisdiction over matters pertaining to water rights and, therefore, PG&E considers the relocation of the Abbott Diversion as not appropriate to be addressed in this license surrender proceeding. PG&E has consulted with water users potentially affected by the cessation of artificial flows to Hooten Gulch regarding the development of options for alternate points of diversion. Additional discussion of the economic effects of cessation of generating flows from the Cow Creek Development on these water users is provided in section 3.3.10, *Socioeconomics*.

PG&E holds shares in the South Cow Creek Ditch Association for a portion (1.44 cfs) of the water diverted at the German Ditch upstream of the South Cow Creek diversion dam. Upon decommissioning, PG&E proposes to divest its shares in the South Cow Creek Ditch Association under the Proposed Action. PG&E's 1.44 cfs water right would generally account for less than a 10 percent increase in unimpaired flow at the location of the South Cow Creek diversion dam even during low flow periods.

Removal of the diversion dams will occur during the period of seasonal low flows. During construction activities to remove the diversion dam and excavation of the temporary channel through the accumulated upstream sediment, the entrance to the diversion canal will be closed and flows will be diverted around the construction activity to the downstream bypass channel (PM&E Measure AQUA-1). Over an unknown period of time, natural flows would reconfigure a natural channel, mobilizing and transporting sediment accumulated upstream of the dam (see section 3.3.1, *Geologic and Soil Resources*). The existing drainage patterns in the vicinity of the development's infrastructure (e.g., canals, spillways, the Cow Creek forebay, powerhouse tailrace) could change as a result of removal of these structures and regrading. These activities are expected to have minimal effects on runoff and overall stream flows given implementation of proposed PM&E measures (Measures GEOL-1 and GEOL-2).

Our Analysis

The Proposed Action would have a long-term beneficial impact on water quantity in South Cow Creek by increasing average monthly flows (between 23-334 percent) in the bypassed reach, especially during low flow conditions. In addition, annual peak stream flows in the bypassed reach of Old Cow Creek would increase slightly.

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[21] There is no record of flows in the Hooten Gulch above project structures; therefore, staff is unable to quantify how often flow in the gulch will be insufficient to meet the ADU water right.

The Proposed Action would result in the permanent loss of the one acre Cow Creek forebay. In addition, flows in Hooten Gulch would be significantly less than under licensed conditions, but would resemble the perennial condition of the gulch as currently exists upstream of project structures. There would be a permanent loss of flow available in the Hooten Gulch which would negatively impact the ability of the ADU to access its water right at the current point of diversion. We recommend that PG&E provide ADU with advanced notice regarding the estimated date at which water delivery will stop to Hooten Gulch.

3.3.2.1.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, the diversion of flow from Old Cow Creek would continue at the Kilarc diversion dam, in order to maintain the Kilarc forebay as a recreational and fire safety resource. Under this alternative, flow would continue to be divided between the bypassed reach and the Kilarc main canal at the diversion dam. The amount of flow diverted to maintain the Kilarc forebay would be less than flows currently diverted for project operations, resulting in more flow in the bypassed reach.

Ultimately the proportion of flow delivered to the canal and the bypassed reach would need to be determined in consultation with the resource agencies and would likely require a period of monitoring and adaptive management to evaluate the optimum split. Studies of aquatic habitat and water quality conditions in the bypassed reach and the Kilarc forebay would be needed to provide a scientific basis for determining the optimum split in flow at the diversion dam under various seasonal flow conditions and during dry years versus normal and wet years. In addition, upgrades to the canal, such as lining the canal to prevent leakage, could be required in order to minimize water loss and return more flow to the bypassed reach.

For the purpose of this assessment we have assumed that increased flows to the bypassed reach are a priority. Therefore, for this analysis we assume a minimum flow to the bypassed reach of 20 cfs. Following fulfillment of the 20 cfs minimum flow to the bypassed reach, flow would be diverted into the canal up to a flow of 20 cfs to maintain the Kilarc Forebay. With the goal of maximizing flow in the bypassed reach, flow up to the capacity of the canal (50 cfs) would not be necessary to maintain the forebay and any flow in Old Cow Creek above 40 cfs (minimum bypass flow of 20 cfs plus 20 cfs in the canal) would go into the bypassed reach. Under this example, we have estimated the average monthly flows for this sample scenario in the Old Cow Creek bypassed reach and Kilarc diversion canal in Table 13. Average flow in the bypassed reach under AA1, was calculated using the estimated total flow at the Kilarc main diversion dam without project diversions (Table 9) and then adjusting to provide the 20 cfs minimum flow to the bypassed reach and up to 20 cfs in the canal to maintain the forebay. Estimated average monthly flows under this alternative would be between 20 cfs and 120 cfs. This would represent a 17 to 150 percent increase in average monthly flows in the bypassed reach compared to existing licensed conditions.

Table 13. Example of splitting flows between the main Kilarc diversion canal and the Old Cow Creek bypassed reach under AA1, and comparison to existing licensed conditions (Source: Staff).

Month	Average Monthly Flow in Bypass Under AA1 (cfs)	Average Monthly Flow in Canal Under AA1 (cfs)	% Flow Increase in Bypass Under AA1
January	120	20	17
February	117	20	23
March	111	20	26
April	77	20	48
May	85	20	44
June	55	20	45
July	42	20	37
August	36	20	21
September	20	19	43
October	20	13	150
November	35	20	42
December	74	20	30

Under AA1, the North and South Canyon Creek diversion dams would be removed as described in the Proposed Action. Full natural flows and the normal seasonal hydrograph would be permanently restored to both North and South Canyon Creeks. Note that neither of these diversions has functioned since 2002.

Our Analysis

Action Alternative 1 would have a long-term beneficial impact on water quantity in Old Cow Creek by increasing flows (estimated between 17 and 150 percent) in the bypassed reach. In addition, annual peak stream flows in the bypassed reach of Old Cow Creek would increase slightly. Action Alternative 1 would maintain Kilarc forebay in a similar condition to that which currently exists. There would be no potential to indirectly affect water supply wells located in proximity to the forebay under this alternative.

Cow Creek Development

The environmental effects on water quantity at the Cow Creek Development under AA1 would be the same as described under the Proposed Action (see section 3.3.2.1.2).

3.3.2.1.4 Environmental Effects of Action Alternative 2

Kilarc Development

The environmental effects on water quantity at the Kilarc Development under AA1 would be the same as described under the Proposed Action (see section 3.3.2.1.2).

Cow Creek Development

Under AA2, the diversion of flow from South Cow Creek would continue at the Cow Creek diversion dam, in order to provide flow in the Hooten Gulch so that the ADU can continue to access their water right at the current point of diversion. Under this alternative, flow would continue to be divided between the bypassed reach of South Cow Creek and the Cow Creek main canal at the diversion dam. The amount of flow diverted to the Hooten Gulch would be less than that currently diverted for project operations, resulting in more flow in the bypassed reach.

Ultimately the proportion of flow delivered to the canal and the bypassed reach would need to be determined in consultation with the agencies and would likely require a period of monitoring and adaptive management to evaluate the optimum split. The consumptive water right of ADU is 13 cfs. Allowing for evaporation and leakage along the canal between the South Cow Creek diversion dam and the Abbott Ditch diversion dam on Hooton Gulch, the average monthly water diversion under this alternative could be up to 20 cfs, but during the dry season this diversion rate may need to be adjusted to allow at least the minimum bypass flows under the existing license conditions. The actual diversion rate necessary to supply the ADU water right would need to be determined during an evaluation period. In addition, upgrades to the canal, such as lining the canal to prevent leakage, could be required in order to minimize water loss and return more flow to the bypassed reach.

For purposes of this assessment, we evaluate an example where a minimum flow of 4 cfs is maintained in the bypassed reach. Following fulfillment of the 4 cfs minimum flow to the bypassed reach, flow would be diverted into the canal up to a flow of 20 cfs for delivery to the Hooten Gulch. Any flow in South Cow Creek above 24 cfs (minimum bypass flow of 4 cfs plus 20 cfs in the canal) would go into the bypassed reach. We have estimated the average monthly flows in the South Cow Creek bypassed reach and Cow Creek canal under this example in Table 14. Average flow in the bypassed reach under AA2 was calculated using the estimated total flow at the Kilarc main diversion dam without project diversions (Table 11) and then adjusting to provide 4 cfs minimum flow to the bypassed reach and up to 20 cfs in the canal. Estimated average monthly flows in the bypassed reach under this alternative would be between 6 and 232 cfs. This would represent a 6 to 101 percent increase in average monthly flows in the bypassed reach compared to licensed conditions.

Table 14. Example of splitting flows between the main Cow Creek diversion canal and the South Cow Creek bypassed reach under AA2, and comparison to existing licensed conditions (Source: Staff).

Month	Average Monthly Flow in Bypass Under AA2 (cfs)	Average Monthly Flow in Canal Under AA2 (cfs)	% Flow Increase in Bypass Under AA2
January	232	20	14
February	216	20	17
March	229	20	17
April	159	20	26
May	102	20	38
June	48	20	58
July	15	20	55
August	6	20	6
September	7	20	8
October	18	20	101
November	73	20	33
December	154	20	25

This proposal would require more accurate monitoring of flows in the diversion canal and bypassed reach of South Cow Creek in order to better regulate the diversion and to document the range and variability of flows available in South Cow Creek through this reach. Studies would need to be conducted to determine the efficiency of the existing diversion canal and Hooten Gulch for delivery of water to meet the ADU water rights; specifically, how much water is lost through evaporation, leakage, and infiltration between the Cow Creek diversion dam on South Cow Creek and the Abbott Ditch diversion dam on Hooten Gulch.

Our Analysis

Action Alternative 2 would have a long-term beneficial impact on water quantity in South Cow Creek by increasing flows (estimated between 6 and 101 percent) in the bypassed reach. In addition, annual peak stream flows in the bypassed reach of South Cow Creek would increase slightly. Action Alternative 2 would maintain flows in Hooten Gulch to allow ADU to continue to access their water right at the current point of diversion.

3.3.2.1.5 Environmental Effects of No Action

Under the No-Action Alternative, the Kilarc-Cow Creek Project would continue to operate under the same conditions as the existing annual license. The quantity of water available to aquatic resources in the bypassed reaches would not change from those described in section 3.3.2.1.1, *Affected Environment*. During periods of low flow in the South Cow and Old Cow Creeks, flows through the bypassed reaches would be about 2 to 5 cfs.

Kilarc Development

Under the No-Action Alternative, the distribution of water in Old Cow Creek between the main canal and the bypassed reach would remain the same as the current licensed condition. The surface area, volume, and elevation of the Kilarc forebay would remain the same as it currently exists. Table 15 presents estimated flow conditions in the Kilarc main canal (average from Table 5) and the bypassed reach of Old Cow Creek (average from Table 6) under the No-Action Alternative as a percentage of total estimated flows in Old Cow Creek at the diversion dam (combined averages from Tables 5 and 6). During periods of naturally low flow in Old Cow Creek (July-October), on average, an estimated 77 percent of total flows would continue to be diverted for project use.

Table 15. Estimated flow conditions in the Kilarc main canal and bypassed reach of Old Cow Creek as a percentage of total estimated flows in Old Cow Creek at the diversion dam under the No-Action Alternative (Source: Staff).

Month	Average Monthly Flow in Canal (% of total) (cfs)	Average Monthly Flow in Bypass (% of total) (cfs)	Total Average Monthly Flow at Diversion Dam (cfs)
January	37 (26)	103 (74)	140
February	42 (30)	95 (70)	137
March	43 (33)	88 (67)	131
April	45 (46)	52 (54)	97
May	46 (43)	59 (57)	105
June	37 (49)	38 (51)	75
July	32 (51)	31 (49)	62
August	26 (47)	30 (53)	56
September	25 (64)	14 (36)	39
October	26 (77)	8 (23)	33

Month	Average Monthly Flow in Canal (% of total) (cfs)	Average Monthly Flow in Bypass (% of total) (cfs)	Total Average Monthly Flow at Diversion Dam (cfs)
November	30 (54)	25 (46)	55
December	37 (40)	57 (60)	94

Our Analysis

Under the No-Action Alternative, flows in Old Cow Creek would continue to be diverted for project use. During periods of low flow, on average, up to 77 percent of flow would be diverted to the Kilarc main canal, with at least 23 percent remaining in the bypassed reach. This distribution of flow does not meet resource agency objectives for fish habitat enhancement in the bypassed reach of Old Cow Creek (see section 3.3.3, *Fisheries and Aquatic Resources*). The No-Action alternative would not change any project structures or capacities; thus, water quantity conditions would be similar to historic (licensed) conditions given similar weather patterns.

Cow Creek Development

Under the No-Action Alternative, the distribution of water in South Cow Creek between the main canal and the bypassed reach would remain the same as the current licensed condition. The surface area, volume, and elevation of the Cow Creek forebay would remain the same as it currently exists. Flows from the powerhouse would continue to be discharged to the Hooten Gulch and flows would be available for the Tetrick Hydroelectric Project and the existing Abbot Ditch diversion.

Table 16 presents estimated flow conditions in the Cow Creek main canal (average from Table 7) and the bypassed reach of South Cow Creek (average from Table 8) under the No-Action Alternative as a percentage of total estimated flows in South Cow Creek at the diversion dam (combined averages from Tables 7 and 8). During periods of naturally low flow in South Cow Creek (July-October), on average, up to 77 percent of total flows would continue to be diverted for project use.

Table 16. Estimated flow conditions in the Cow Creek main canal and bypassed reach of South Cow Creek as a percentage of total estimated flows in South Cow Creek at the diversion dam under the No-Action Alternative (Source: Staff).

Month	Average Monthly Flow in Canal (% of total) (cfs)	Average Monthly Flow in Bypass (% of total) (cfs)	Total Average Monthly Flow at Diversion Dam (cfs)
January	48 (19)	204 (81)	252
February	51 (22)	185 (78)	236
March	52 (21)	196 (79)	249
April	53 (30)	126 (70)	179
May	48 (39)	74 (61)	122
June	38 (56)	30 (44)	68
July	25 (73)	10 (27)	35
August	20 (77)	6 (23)	26
September	21 (76)	6 (24)	27
October	29 (77)	9 (23)	38
November	38 (41)	55 (59)	93
December	51 (29)	123 (71)	174

Our Analysis

Under the No-Action Alternative, flows in South Cow Creek would continue to be diverted for project use. During periods of low flow, on average, up to 77 percent of flow would be diverted to the Cow Creek main canal, with 23 percent remaining in the bypassed reach. This distribution of flow does not meet resource agency objectives for fish habitat enhancement in the bypassed reach of South Cow Creek (see section 3.3.3 *Fisheries and Aquatic Resources*). There would be no negative impact to ADU and Tetrick Ranch because flows to Hooten Gulch would continue as they currently exist. The No-Action alternative would not change any project structures or capacities; thus, water quantity conditions would be similar to historic (licensed) conditions given similar weather patterns.

3.3.2.2 Water Quality

3.3.2.2.1 Affected Environment

The *Water Quality Control Plan* (Basin Plan) for the Sacramento River and San Joaquin River Basins (Central Valley Regional Water Quality Control Board, 2007) identifies the beneficial uses of all water bodies in the two basins. All waters of the Cow Creek watershed have the following designated uses: irrigation, stock watering, power, water-contact recreation, other non-contact recreation, cold freshwater habitat, coldwater migration, warmwater and coldwater spawning, and wildlife habitat.

The Basin Plan also establishes water quality objectives to protect these beneficial uses. Objectives for water quality parameters for the Cow Creek watershed that are typically relevant for hydropower projects are listed in Table 17.

Table 17. Water quality objectives for selected parameters of concern for the Kilarc-Cow Creek Project. (Source: Central Valley Regional Water Quality Control Board, 2007)

Parameter	Standard
Dissolved oxygen (DO)	Not less than 7.0 milligrams per liter (mg/l) at any time. Monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation.
Temperature	At no time or place shall the temperature be increased more than 5°F above natural receiving water temperature.
Turbidity	Waters 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: Where natural turbidity is between 0 and 5 nephelometric turbidity units (NTUs), increases shall not exceed 1 NTU. Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent. Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs. Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent. In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Exceptions to the above limits will be considered

Parameter	Standard
	when a dredging operation can cause an increase in turbidity.

Kilarc Development

PG&E conducted a water quality study of the waters of the Kilarc Development in 2003. Water samples were collected from eight stations in the Old Cow Creek watershed in March and October. Parameters measured in these samples were general chemical constituents, minerals, trace metals, nutrients, polychlorinated biphenyls, and coliform bacteria. PG&E measured DO, temperature, specific conductance, pH, and turbidity at nine stations in the watershed. These parameters were measured once each month in March, May, June, July, August, and September. PG&E also conducted continual temperature monitoring (data collected at 20-minute intervals) at these nine stations from May 14 to September 30, 2003.

In the 2003 water quality study, measured DO concentrations ranged from 8.1 to 11.1 mg/l, and thus were always above the minimum water quality objective (7 mg/l). Turbidity ranged from less than 0.1 to 5.8 NTUs, representing the natural range for undisturbed water in the watershed at the time of these measurements. Except for one minor exceedance of the pH objective, and temperature (discussed below) water quality consistently met the state's objectives for the other parameters that PG&E monitored.

In general, stream temperatures are lower at the upstream end of the project area and higher with distance downstream in the bypassed reach:

North Canyon Creek upstream of diversion	40 to 57°F
South Canyon Creek upstream of diversion	45 to 53°F
Old Cow Creek upstream of diversion	39 to 62°F
Old Cow Creek upstream of Kilarc powerhouse discharge	42 to 71°F
Old Cow Creek downstream of Kilarc powerhouse discharge	43 to 65°F

PG&E found that mean daily temperature of the bypassed reach between the Kilarc main diversion and upstream of the tailrace discharge increases by 5 to 9°F during portions of the months of July, August, and September. This increase exceeds the water quality objective of a maximum 5°F increase, but is attributable to a combination of natural warming of the creek through equilibrium with the warm summer air temperatures and reduced flow in the bypassed reach (which increases travel time in the bypassed reach and allows a longer period for equilibrium with air temperature). The return water from the powerhouse tailrace reduces mean stream temperature by up to 4°F relative to the water temperature in the bypassed reach immediately upstream of the Kilarc powerhouse.

PG&E compared water temperature monitoring data to the steelhead trout management objective for daily mean water temperature of 65°F and a maximum water temperature of 75°F for short-term (one to seven days) tolerance by trout. Daily mean water temperature upstream of the Kilarc main diversion dam does not exceed 65°F, and the maximum temperature was significantly less than 75°F. Upstream of the powerhouse tailrace in the bypassed reach the mean daily water temperature exceeded 65°F on four days during July 2003, and the maximum temperature did not exceed 75°F on any dates. Downstream of the tailrace, after mixing of bypass and powerhouse flows, the daily mean was consistently below 65°F.

PG&E also evaluated the chemical composition of the sediment stored upstream of the Kilarc main canal diversion dam because of the potential effect on water quality if sediment is disturbed during the proposed dam removal or sediment dredging. PG&E collected four sediment samples upstream of the dam. Two samples were initially analyzed for mercury, methyl mercury, copper, silver, and arsenic because of the natural occurrence of these metals in the geologic formations of the watershed. PG&E compared the results of the sediment analyses to screening values developed by several national agencies. Mercury and arsenic concentrations in the sediment were below screening levels. Silver concentrations, for which no screening levels were determined, were consistent with national background levels. Methyl mercury, for which no screening levels were determined, was present at less than one percent of the total mercury concentration, demonstrating no substantive biological conversion.

Copper concentrations (34.2 and 51.2 milligrams per kilogram [mg/kg]) were close to or above the Threshold Effect Level (TEL)[22] (35.7 mg/kg) (Buchman, 2004; Canadian Council of Ministers of the Environment, 2000), but was well below the Probable Effect Level (PEL)[23] (197 mg/kg). All four samples were then analyzed for total copper and leachable copper. Leachable copper is considered more representative of the copper that could be released to the water column and become available to organisms. In three of these four samples, total copper concentrations (37.5, 43.5, and 58.3 mg/kg) were above the TEL, but below the PEL; however, leachable copper concentrations (7.2, 8.1, and 19.1 mg/kg) were below the TEL. In the fourth sample, total copper and leachable copper concentrations (819 and 1,120 mg/kg, respectively) were above the PEL.

Cow Creek Development

In 2003, PG&E conducted a water quality study of the waters of the Cow Creek Development similar to that of the Kilarc Development. Water samples were collected from four stations in the South Cow Creek watershed in March and October. Data on DO, temperature, specific conductance, pH, and turbidity were measured at eight stations

[22] The screening level at which an effect may be caused to stream organisms.

[23] The higher screening level at which effects to stream organisms are considered probable.

once each month in March, May, June, July, August, and September; and continual temperature data (20-minute intervals) were collected at these eight stations from May 14 to September 30, 2003.

Measured DO concentrations ranged from 7.3 to 11.2 mg/l, which is above the minimum water quality objective (7 mg/l). Turbidity ranged from less than 0.1 to 8.5 NTUs, representing the natural range in the watershed at the time of these measurements.

The temperature of Mill Creek was similar upstream and downstream of the diversion (51 to 71°F). In South Cow Creek, stream temperature above the diversion was generally similar to temperature upstream of Hooten Gulch and upstream of the return of the powerhouse discharge through Hooten Gulch:

South Cow Creek upstream of diversion	45 to 80°F
South Cow Creek upstream of Hooten Gulch	48 to 79°F
Hooten Gulch downstream of powerhouse discharge	48 to 77°F
South Cow Creek downstream of Hooten Gulch	48 to 84°F

Data from the PG&E study indicate that that mean daily temperature of the bypassed reach between the South Cow Creek diversion to upstream of the tailrace discharge increased by 1 to 3°F, less than the water quality objective of a maximum 5°F increase. As with Old Cow Creek, the increase is attributable to a combination of natural warming of the creek through equilibrium with the warm summer air temperatures and reduced flow in the bypassed reach (which increases travel time in the bypassed reach and allows a longer period for equilibrium with air temperature).

PG&E compared water temperature monitoring data to the steelhead trout management objective for daily mean water temperature of 65°F and a maximum water temperature of 75°F for short-term (one to seven days) tolerance by trout. According to the study, daily mean water temperature upstream of the South Cow Creek main canal diversion dam exceeded 65°F on 27 and 28 days of July and August, respectively. The maximum temperature exceeded 75°F on 13 days during PG&E monitoring in July 2003. Upstream of Hooten Gulch, the mean daily water temperature exceeded 65°F for every day in July and August, which is slightly more frequent (seven additional days over these two months) than upstream of the diversion dam. The maximum temperature exceeded 75°F on 12 days. Downstream of the confluence of Hooten Gulch and South Cow Creek, the daily mean exceeded 65°F on 18 days in July and 31 days in August, and the maximum temperature exceeded 75°F on 19 days in July.

Except for two minor exceedances of the pH objective, water quality consistently met the state's objectives for the other parameters that PG&E monitored.

PG&E also evaluated the chemical composition of two sediment samples collected upstream of the South Cow Creek diversion dam in 2007. Mercury, copper, and arsenic

concentrations in the sediment were below screening levels, and silver concentrations were consistent with national background levels. Methyl mercury was present at less than one percent of the total mercury concentration, demonstrating no substantive biological conversion.

3.3.2.2.2 Environmental Effects of Proposed Action

The removal of project features and the cessation of diversions would return the bypassed reaches to more natural conditions of flow which could affect the water temperature regime of the bypassed reaches and associated habitat conditions for aquatic resources. The Proposed Action would affect water quality at both developments similarly.

The Proposed Action could affect water quality in the short-term in three principal ways: (1) increased turbidity during instream construction; (2) increased turbidity from stormwater runoff during construction; and (3) accidental release of oil or hazardous materials associated with construction activities. Instream construction activities that could affect turbidity include removal of all or parts of the five diversion dams, partial removal of sediment upstream of the Kilarc main canal diversion dam and South Cow Creek diversion dam, and realignment of the Old Cow Creek and South Cow Creek channels at the main diversion dams. The resource agencies concur with PG&E's approach to manage and direct the natural mobilization and redistribution of sediment trapped upstream of the project diversion dams (PM&E Measure GEOM-1). Disturbance of upland areas in conjunction with removal of upland project features and construction and upgrading of construction access roads have the potential to increase turbidity during storm water runoff events.

As we discuss above, in section 3.3.1, *Geologic and Soil Resources*, PG&E proposes to mitigate for potential effects related to soil erosion by employing BMPs for soil erosion and sedimentation (PM&E Measure GEOL-1). PG&E also proposes to minimize turbidity during instream construction work by using coffer dams or similar barriers (PM&E Measure AQUA-1). PG&E proposes to minimize the risk of accidental releases associated with construction equipment by implementing BMPs for storm water pollution prevention (PM&E Measure GEOL-2).

Kilarc Development

Under the Proposed Action, construction activities during removal of project features and filling and grading would disturb soil and have the potential to adversely affect water quality during runoff events by increasing turbidity and releasing nutrients into the water column. PG&E proposes mitigation measures including the use of BMPs (PM&E Measures GEOL-1, GEOL-2) and cofferdams or other barriers (PM&E Measure AQUA-1), in order to minimize short-term effects of construction on water quality in Old Cow Creek. The disturbance and release of sediments from behind the Kilarc main diversion dam during the removal of dam is not expected to have a measureable effect on heavy metal concentrations in the water column. Even though one sediment sample in

the Kilarc Development exhibited concentrations exceeding the TEL for copper, water column concentrations of copper in the creek do not exceed state water quality objectives, indicating no significant release of copper from the sediment to the water column.

Over the long term, the primary effect of the Proposed Action on water quality in the Old Cow Creek watershed would be changes in water temperature after the water currently diverted for power generation under the existing license remains in the bypassed reach of Old Cow Creek. According to PG&E's 2003 water quality study, mean daily stream temperature during July through September can warm by 5 to 9°F in the bypassed reach compared to water temperature upstream of the Kilarc main diversion dam. The temperature in the Kilarc forebay is generally 2 to 4°F cooler than the temperature of Old Cow Creek immediately upstream of the Kilarc powerhouse discharge. Although the discharge from the powerhouse reduces the downstream temperature of Old Cow Creek, water temperature in this reach of Old Cow Creek is still more than 5°F warmer than the temperature upstream of the Kilarc main canal diversion dam during portions of the summer.

Increased flows in the bypassed reach of Old Cow Creek under the Proposed Action, are expected to decrease the stream temperature of the bypassed reach because the increased flow would decrease travel time and would reduce the duration of exposure to higher air temperature. The potential effect of water temperature on fish is discussed below in section 3.3.3, *Fisheries and Aquatic Resources*. The return of the diverted flow to Old Cow Creek is not expected to have any measureable effects on other water quality parameters, all of which currently meet state water quality objectives.

Our Analysis

Under the Proposed Action, construction activities would disturb sediments and would likely cause minor, short-term impacts to water quality. PG&E's proposed mitigation measures (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible. Over the long-term temperatures in the bypassed reach of Old Cow Creek are likely to decrease slightly due to the increase in flows in the bypassed reach. In addition, the Proposed Action is not likely to have any long term, measureable effect on other water quality parameters, all of which currently meet state water quality objectives.

Cow Creek Development

The Proposed Action has the potential to impact water quality in the bypassed reach of South Cow Creek. Construction activities during removal of project features and filling and grading would disturb soil and have the potential to adversely affect water quality during runoff events by increasing turbidity and releasing nutrients into the water column. PG&E proposes mitigation measures including the use of BMPs (PM&E Measures GEOL-1, and GEOL-2) and cofferdams or other barriers (PM&E Measure AQUA-1), in order to minimize short-term effects of construction on water quality in South Cow Creek. In PG&E's water quality study, metal concentrations in sediments in

the Cow Creek Development area were either undetected or fell below Basin Plan criteria. Therefore, the disturbance and release of sediments from behind the Cow Creek main diversion dam, during the removal of dam, is not expected to have a measureable effect on heavy metal concentrations in the water column.

Over the long term, the primary effect of the Proposed Action on water quality in the South Cow Creek watershed would be changes in water temperature after the water currently diverted for power generation under the existing license remains in the bypassed reach of South Cow Creek. According to PG&E's 2003 water quality study, in July and August 2003, mean daily stream temperature in South Cow Creek upstream of the Cow Creek powerhouse discharge was typically 2 to 4°F higher than the temperature of the creek upstream of the South Cow Creek diversion dam. Although flows through the South Cow Creek bypassed reach would significantly improve during periods of low flow (late summer through early fall, see section 3.3.2.1 *Water Quantity*), elevated water temperatures between 70 and 80 °F would likely continue to characterize this reach, as there is minimal change in maximum water temperatures between the reach of South Cow Creek above the South Cow Creek main canal diversion dam and the lower end of the bypass above Hooton Gulch under the existing license.

Stream temperature in this reach during summer is largely influenced by equilibration with warmer air temperature; increased flows would reduce the time and exposure to higher air temperatures. Despite increased flows and shorter transit time through the South Cow Creek bypassed reach under the Proposed Action, it is unlikely that water temperatures would significantly improve to be more consistent with management objectives. The number of days during July and August when the daily mean exceeds 65°F and the maximum exceeds 75°F near the lower end of the bypassed reach could decrease slightly. We discuss the potential effect of water temperature on fish in section 3.3.3, *Fisheries and Aquatic Resources*. We would not expect the return of the diverted flow to South Cow Creek to have any measureable effects on other water quality parameters, all of which currently meet state water quality objectives.

Our Analysis

Under the Proposed Action, construction activities would disturb sediments and would likely cause minor, short-term impacts to water quality. PG&E's proposed mitigation measures (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible. Over the long-term temperatures in the bypassed reach of South Cow Creek are likely to decrease slightly due to the increase in flows in the bypassed reach. In addition, the Proposed Action is not likely to have any long-term, measureable effect on other water quality parameters, all of which currently meet state water quality objectives.

3.3.2.2.3 Environmental Effects of Action Alternative 1

Kilarc Development

Action Alternative 1 would split flows in Old Cow Creek upstream of the diversion dam between the canal and the bypassed reach in order to maintain the Kilarc forebay, and would provide higher flows to the bypassed reach than under the existing license, particularly during low flow periods, to enhance water quality and aquatic habitat. The effects of AA1 on water quality would be similar to the Proposed Action for the Kilarc Development.

Construction activities associated with AA1, including the removal of project structures that are not needed to maintain the Kilarc forebay, and upgrades to existing infrastructure to improve fish passage, have the potential to impact water quality by increasing erosion. Mitigation measures similar to PG&E's proposed mitigation measures for the Proposed Action (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible.

Over the long term, DO and turbidity, which currently meet water quality standards in the bypassed reach, would continue to meet standards with the increased flows under this alternative. Given the increased flows and shorter transit time through the Old Cow Creek bypassed reach, it is likely that water temperatures upstream of the existing Kilarc tailrace would decrease slightly, with the probability that maximum water temperatures would remain below 70°F and the mean daily water temperature would remain below 65°F throughout the year. As suggested in section 3.3.2.1.3, *Environmental Effects of Action Alternative 1,* implementation of this alternative should include an evaluation of the effect of the flow division (between the canal and the bypassed reach) on water temperatures in the bypassed reach and in the Kilarc forebay, particularly during low flow periods in summer and early fall to ensure that both continue to meet water temperature targets for coldwater fisheries (see section 3.3.3, *Fisheries and Aquatic Resources*).

Our Analysis

Under AA1, construction activities would disturb sediments and would likely cause minor, short-term impacts to water quality. Mitigation measures similar to PG&E's proposed mitigation measures for the Proposed Action (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible. Over the long-term temperatures in the bypassed reach of Old Cow Creek are likely to decrease slightly due to the increase in flows in the bypassed reach. In addition, the AA1 is not likely to have any long-term, measureable effect on other water quality parameters, all of which currently meet state water quality objectives.

Cow Creek Development

The environmental effects on water quality, and proposed PM&E measures, at the Cow Creek Development under AA1 would be the same as described under the Proposed Action.

3.3.2.2.4 Environmental Effects of Action Alternative 2

Kilarc Development

The environmental effects on water quality, and proposed PM&E measures, at the Kilarc Development under AA1 would be the same as described under the Proposed Action.

Cow Creek Development

Action Alternative 2 would split flows in South Cow Creek upstream of the diversion dam between the canal and the bypassed reach in order to continue to provide flows to Hooten Gulch, and would provide higher flows to the bypassed reach than under the existing license, particularly during low flow periods, to enhance water quality and aquatic habitat. The effects of AA2 on water quality would be similar to the Proposed Action for the Cow Creek Development.

Construction activities associated with AA2, including the removal of project structures that are not needed to provide flows to Hooten Gulch, and upgrades to existing infrastructure to improve fish passage, have the potential to impact water quality by increasing erosion. Mitigation measures similar to PG&E's proposed mitigation measures for the Proposed Action (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible.

Over the long term, DO and turbidity, which currently meet water quality standards in the South Cow Creek bypassed reach, would continue to meet standards with the increased flows under this alternative. Given the increased flows and shorter transit time through the South Cow Creek bypassed reach, it is likely that water temperatures in the bypassed reach would decrease slightly, and the number of days during July and August when the daily mean exceeds 65°F and the maximum exceeds 75°F near the lower end of the bypassed reach could decrease slightly. We discuss the effects of these temperatures on coldwater fisheries in section 3.3.3, *Fisheries and Aquatic Resources*.

Our Analysis

Under AA2, construction activities would disturb sediments and would likely cause minor, short-term impacts to water quality. Mitigation measures similar to PG&E's proposed mitigation measures for the Proposed Action (PM&E Measures GEOL-1, GEOL-2, and AQUA-1) should minimize or avoid these impacts to the extent possible. Over the long-term temperatures in the bypassed reach of South Cow Creek are likely to decrease slightly due to the increase in flows in the bypassed reach. In addition, AA2 is not likely to have any long-term, measureable effect on other water quality parameters, all of which currently meet state water quality objectives.

3.3.2.2.5 Environmental Effects of No Action

Kilarc and Cow Creek Developments

Water quality under the No-Action Alternative would remain the same as observed under the existing license, as described in section 3.3.2.2.1, *Affected Environment*. There would be no change from current operating conditions, and temperature, DO, turbidity, and sediment chemical composition are expected to remain the same as under current licensed conditions.

3.3.3 Fisheries and Aquatic Resources

3.3.3.1 Affected Environment

The distribution and abundance of fish within the Cow Creek watershed have been greatly affected by historic fish management goals and stocking activities. Cal Fish and Game has focused primarily on creating independent populations of resident and anadromous salmonids within the Cow Creek watershed. Three major stocking plans have existed since 1930 (SHN Consulting Engineers & Geologists and Vestra Resources, Inc. [SHN], 2001 as cited in PG&E, 2009a):

- From 1930 to 1940, Cal Fish and Game stocked mostly rainbow and Loch Levin brown trout fingerlings and subcatchables.
- From 1940 to the 1980s, Cal Fish and Game stocked primarily catchable rainbow trout, with the total number of fish stockings decreasing over time.
- In the 1980s and 1990s, the number of fish stocked within the watershed increased due to additional steelhead stocking by FWS. Chinook salmon were also stocked extensively during these decades.

The actual number of fish stocked within each subwatershed is unclear; however, species other than rainbow trout comprised less than 21 percent of the total number of fish stocked until 1980 (SHN, 2001 as cited in PG&E, 2009a). From 1981 to 1990, Chinook salmon comprised 67 percent and steelhead comprised 17 percent of the total number of fish stocked within the watershed. Steelhead stocking increased in 1991-2000, comprising 94 percent of the total number of fish stocked. Since 1970, Old Cow and South Cow Creeks have been important areas for resident rainbow trout stocking. Stocking of catchable rainbow trout at the Kilarc forebay began in 1951 and has continued at an approximate frequency of once every two to three weeks and before major holidays (personal communication, P. Overton, Cal Fish and Game, October 2003 as cited in PG&E, 2009a).

Kilarc Development

Rainbow trout were the most abundant species in Old Cow Creek in the vicinity of the project facilities during PG&E's relicensing studies. This species comprised more than 90 percent of the total number of fish at all sites sampled during summer and fall. Other species present include sculpin (most likely riffle sculpin) and brown trout. A few

Sacramento pikeminnow were observed at the site downstream of the Kilarc powerhouse tailrace. Sampling conducted in summer and fall 2003 indicates that population densities within the bypassed reach are generally similar to or higher than those at sampling sites upstream and downstream of the bypassed reach.

The intake at the Kilarc main canal diversion dam is unscreened; thus, fish can enter the canal from Old Cow Creek. The unlined sections of the canal provide some habitat for smaller fish, as these sections have cover in the form of cobbles and smaller boulders, as well as aquatic and overhanging terrestrial vegetation. Habitat appears to be more favorable at the upstream end of the canal. However, fish densities were higher at the downstream end of the canal near the Kilarc forebay. Rainbow and brown trout were caught in low numbers at both sampling locations in the canal. Nearly all trout captured were less than 150 millimeters (mm) in length, and more than two-thirds were less than 75 mm. Rainbow trout were the most abundant species during summer sampling, whereas brown trout were most abundant in the fall.

The Kilarc forebay provides recreational fishing opportunity that is accessible to the handicapped (see section 3.3.7 *Recreational Resources*). The forebay is stocked by Cal Fish and Game with catchable rainbow trout numerous times throughout the year. Cal Fish and Game had stocked the lake within about a week of both sampling events during the 2003 relicensing study. Only a small portion of captured rainbow trout appeared to be of wild origin. During the summer electrofishing effort, about 80 percent of the fish caught in the Kilarc forebay were naturally produced brown trout. It was suggested that these brown trout either use springs within the forebay or migrate up and potentially through the canal to spawn, as there are no natural tributaries to the impoundment. Brown trout collected during the summer sampling event ranged in size from 54 to 320 mm, but none were less than 76 mm in the fall. Hatchery-reared rainbow trout were more abundant than wild rainbow trout during both sampling events. Rainbow trout comprised 15 to 17 percent of the fish collected in the Kilarc forebay, and most of these were large (greater than 225 mm). Golden shiners were also captured during both sampling events. However, they comprised less than five percent of the total number of fish caught. Gill net sampling collected generally larger brown and rainbow trout (165-390 mm). Brown trout accounted for 69 percent of the catch in the summer gill net sampling, and rainbow trout accounted for 62 percent in the fall.

According to PG&E's habitat studies, the project bypassed reach generally provided suitable habitat for salmonids, with a good mix of riffle, run, and pool (27 to 36 percent of each major habitat type). Cover was generally abundant in each habitat type, ranging from an average of 34 percent in riffles to 59 percent in deep pools. Most cover was provided by large cobble, boulders, and surface turbulence. Large woody debris and rootwads also provided significant amounts of cover, especially in pools and within the 3 miles of the bypassed reach immediately above the Kilarc powerhouse. Aquatic and terrestrial vegetation provide minimal cover within the bypassed reach. The stream is shaded by riparian vegetation and the canyon walls. Temperature monitoring data collected in May through September 2003 show that the mean daily temperature is

consistently below 66°F throughout the bypassed reach even during summer low flow periods. These water temperatures are slightly higher than the optimal temperatures for growth and survival of steelhead fry, but well within their tolerance range (Moyle, 2002 as cited in PG&E, 2009a) and below the California SWRCB 68°F guideline for coldwater streams. Stream temperatures were lowest at the upstream end of the project area and increased progressively with distance downstream in the bypassed reach. Although temperatures increased by 7 to 9°F through the project bypassed reach, temperatures within the bypassed reach generally remained suitable for steelhead. The return water from the tailrace reduced stream temperature in Old Cow Creek by up to 4°F relative to water temperature immediately above the powerhouse, depending on time of year (see section 3.3.2.2, *Water Quality*). The cooling effect of return flows below the powerhouse was most pronounced during periods of low flow when releases to the bypass at the diversion dam were at or close to the minimum required instream flow.

Substrate within the bypassed reach was dominated by boulders (58 percent), cobble (28 percent), and bedrock (eight percent). Gravel, sand, and finer material comprised only six percent of the substrate material in the bypassed reach. Spawning gravel available within the Old Cow Creek bypassed reach main channel was rated fair to good quality for rainbow trout and steelhead, and poor to fair for Chinook salmon. About 12,400 and 13,100 square feet (ft^2) of spawning gravel were identified for steelhead and Chinook salmon, respectively. Spawning gravel preferred by resident rainbow trout was available in smaller quantities (about 5,600 ft^2). The largest areas of good to excellent quality spawning gravel observed within the Old Cow Creek bypassed reach for steelhead and rainbow trout was located in a short reach between 1.2 to 1.6 miles above the Kilarc powerhouse tailrace and 3.1 to 4.4 miles above the tailrace. The best spawning gravel for Chinook salmon was also located 3.1 to 4.4 miles above the tailrace.

Historically, Old Cow Creek was managed for anadromous fish downstream of Whitmore Falls and for resident trout upstream. Whitmore Falls is 11 river miles upstream of the confluence of Old Cow Creek with South Cow Creek and 9.3 miles downstream of the Kilarc powerhouse (Figure 2). The 12- to 14-ft high falls were considered impassable to anadromous salmonids for many years. Harvey (1997) reported that no anadromous fish or their carcasses were observed upstream of Whitmore Falls. However, upon re-evaluation by Cal Fish and Game and NMFS, Whitmore Falls was reclassified in 2003 and is no longer considered a barrier to upstream migration (PG&E, 2009f). Both resource agencies believe that salmon and steelhead may be able to pass above Whitmore Falls under high flow conditions, particularly during winter and wet years (personal communication, A. Manji, Cal Fish and Game, December 2003 as cited in PG&E, 2009a). The reclassification of the barrier at Whitmore Falls has led Cal Fish and Game and NMFS to revise their management objectives for the area in the vicinity of the Kilarc Development to include anadromous salmonids and restoration of steelhead.

The timing of salmonid migration relative to typical seasonal runoff patterns affects which anadromous species and the frequency with which they may potentially migrate upstream past Whitmore Falls to utilize the project area. Upstream migration of

steelhead trout occurs primarily between November and January when natural flows are relatively high; thus, the opportunity exists that Central Valley steelhead could pass above Whitmore Falls and utilize the project area. Spring-run Chinook salmon were not reported to inhabit Cow Creek and its tributaries in the NMFS status report, when the species was being considered for listing under the ESA (Myers et al., 1998 as cited in PG&E, 2009a); however, recent sightings in Old Cow Creek below Whitmore Falls during PG&E's relicensing studies were consistent with spring-run Chinook. The resource agencies and PG&E concur that these fish were likely strays from other streams and not a spring-run population in the Cow Creek watershed, or more specifically in the project area. Because fall-run Chinook salmon migrate upstream in August through December, they would not be able to access the project area on Old Cow Creek in most years, as flows would rarely be sufficient for them to pass above Whitmore Falls during the main portion of their migration season. However, early season storm events could provide adequate flows for opportunistic episodic passage by fall and late-fall run Chinook salmon.

One barrier still considered impassable by Cal Fish and Game and NMFS is an unnamed (OC-11) 12-ft-high falls located 2.7 miles upstream of the Kilarc powerhouse. This natural barrier prevents access to the high-quality spawning substrate identified between 3.1 and 4.4 miles above the Kilarc tailrace, except possibly under rare extreme high flows. Another barrier between this falls and the Old Cow Creek diversion dam is an unnamed boulder cascade (OC-12) about 30 ft high, with a 30 percent gradient, and less than adequate jump pools (i.e., all pools were less than 0.5 ft). Although the difficulty for salmonids to negotiate this barrier is considered high (8 to 10 on a scale of 10), barrier OC-12 is still considered passable because a side channel may provide passage at higher flows exceeding 70 cfs (ENTRIX, 2007 as cited in PG&E, 2009a).

Cow Creek Development

The bypassed reach of South Cow Creek has three geomorphically distinct sub-reaches providing distinctly different aquatic habitat: (1) Wagoner Canyon; (2) the segment immediately upstream from the canyon to the diversion dam; and (3) the segment immediately downstream of the canyon to the confluence of Hooten Gulch. Average gradient within South Cow Creek is moderate above and below Wagoner Canyon (1.5-4.3 percent), but is much greater within Wagoner Canyon, ranging from 4.9 to 8.6 percent. The morphology of both Wagoner Canyon and the areas upstream and downstream of the canyon is a V-shaped valley with incised channels. Wagoner Canyon, however, is much more confined by steep canyon walls. Below Wagoner Canyon, the level of confinement decreases and the stream is wider and shallower. Within and upstream of Wagoner Canyon, the stream is narrower and deeper.

Consistent with these habitat differences, there are distinct differences in the species composition of the fish community associated with the reach downstream of Wagoner Canyon compared to within and upstream of the canyon. The fish community below Wagoner Canyon is diverse and includes (in order of decreasing numerical

abundance) California roach, speckled dace, rainbow trout, Sacramento pikeminnow, Sacramento sucker, riffle sculpin, and smallmouth bass (ENTRIX, 2007 as cited in PG&E, 2009a). Chinook salmon were present in low numbers during summer, and were absent during fall. The reverse was true for largemouth bass. The overall density of fish in the bypassed reach below Wagoner Canyon more than doubled between the summer and fall sampling events as a result of increases in roach, dace, sucker, and pikeminnow densities. The overall density of rainbow trout decreased by 26 percent in the bypassed reach between summer and fall, but the density of larger rainbow trout (greater than150 mm in length) increased. Comparisons between the fish community in the bypassed reach below Wagoner Canyon and a reference site indicated similar species composition, but variable densities (ENTRIX, 2007 as cited in PG&E, 2009a). Overall densities were higher at the reference site in the summer, but similar between locations in the fall.

The fish community at the sites within and upstream of Wagoner Canyon exhibited very low diversity consisting of only two species, California roach and rainbow trout, with roach being more numerous than rainbow trout. The abundance of both species decreased between the summer and fall sampling periods. Rainbow trout densities were higher in the bypass sites within and upstream of Wagoner Canyon than in a reference site during the summer sampling period, but this relative difference between sites was reversed in the fall. Rainbow trout less than 75 mm long were more abundant in the bypassed reaches, but densities of larger rainbow trout were higher in the reference site. Roach were more abundant at the reference site than within and upstream of Wagoner Canyon.

California roach and riffle sculpin were the most common fish species utilizing Hooten Gulch habitat downstream of the powerhouse tailrace. Additionally, two rainbow trout were observed during the summer sampling event. Roach were the most numerous species present comprising 60 percent of the community in summer and 95 percent of the population in fall. Overall, the number of fish observed during the fall sampling event was similar to that in the summer sampling event. Anecdotal information from local residents indicates that steelhead utilize Hooten Gulch seasonally. If steelhead spawn in Hooten Gulch, fry and juveniles are susceptible to entrainment into the unscreened Abbott Ditch diversion.

The South Cow Creek canal is screened at the diversion dam to prevent fish from entering the canal; however, these screens do not meet current standards for anadromous salmonids. Sampling in the canal found three species in relatively low numbers. In order of decreasing abundance, these were California roach, rainbow trout, and lamprey. Roach comprised 50 and 65 percent of the fish caught during summer and fall, respectively. Rainbow trout represented 20 and 29 percent of the total catch, respectively.

The Cow Creek forebay primarily supported two introduced species, golden shiner and green sunfish. Additionally, two Sacramento sucker and two rainbow trout were captured. During summer the catch was equally divided between golden shiner and green

sunfish. During fall, 68 percent of the catch was golden shiner, and 16 percent was green sunfish.

Habitat was predominantly pool (65 to 70 percent) throughout the bypassed reach, with the remaining habitat divided equally between riffles and runs. The quantity of shallow and deep pools was similar. Cascade habitat was more abundant in Wagoner Canyon than above or below. Cover was generally abundant throughout the bypassed reach. Within Wagoner Canyon, cover ranged from 37 percent in runs to nearly 80 percent in riffles. Outside of the Wagoner Canyon, it ranged from 50 to 70 percent, depending on habitat. Cover was provided predominantly by large substrate components (cobble and boulder), surface turbulence, and to a lesser degree by overhanging terrestrial vegetation. Undercut banks, woody debris, root wads, and bedrock were present, but typically not abundant.

Substrate throughout the bypassed reach was dominated by boulders, cobble, and gravel, in that order. Boulders comprised a higher proportion of the substrate within the canyon than above or below it. Most spawning substrate throughout the reach was composed of larger material, suitable primarily for Chinook salmon and steelhead. Within the canyon, about 1,000 ft^2 of spawning habitat was available for both species. Spawning gravel for resident trout was also available in lesser quantities (about 550 ft^2). Outside of the canyon, about 1,550 and 1,500 ft^2 of spawning gravel was available for Chinook salmon and steelhead, respectively, with about 700 ft^2 available for resident trout (ENTRIX, 2007 as cited in PG&E, 2009a).

Between 52 and 80 percent of the available spawning habitat in the bypassed reach is rated as good to excellent quality for salmonids (ENTRIX, 2007 as cited in PG&E, 2009a). Pockets of good quality spawning gravel were located throughout Wagoner Canyon, though the largest patches of gravel were concentrated toward the top of Wagoner Canyon. Outside of the canyon, the largest amount of good quality spawning gravel was located near the South Cow Creek diversion dam. Spawning gravel was located primarily within pool habitat, especially in shallow pool habitat. Run habitat also provided a high proportion of good to excellent spawning gravel for each species.

Mean daily water temperatures in South Cow Creek ranged from about 50 to 75°F. Water temperatures in July and August frequently exceeded those considered optimal for steelhead and Chinook fry, even in the reach immediately downstream of the diversion dam. Temperatures also frequently exceeded the 68°F guideline for coldwater streams established by the California SWRCB. These elevated temperatures appear to be associated with conditions in the South Cow Creek watershed, not directly to existing project operations. Water temperatures increased about 3 to 4°F in the bypassed reach between the diversion dam and Hooten Gulch. Water discharged from the Cow Creek powerhouse through Hooten Gulch did not appear to significantly affect temperatures in South Cow Creek below the confluence of Hooten Gulch compared to upstream of the confluence.

South Cow Creek, which contains 52 miles of potential anadromous fish habitat, is managed for anadromous and resident fish, with a focus on salmonids. Central Valley fall-run and late fall-run Chinook salmon and steelhead trout are currently found in South Cow Creek (SHN, 2001 as cited in PG&E, 2009a). Steelhead have been observed to use South Cow Creek both within the bypassed reach and upstream of the South Cow Creek diversion dam. Although the fish ladder at the South Cow Creek diversion dam does not meet current standards, steelhead have been observed utilizing the fish ladder to access upstream spawning habitat. Some of the best steelhead spawning habitat has been reported over an area 3 to 5 miles upstream of the South Cow Creek diversion (Healey, 1974; Thomas R. Payne & Associates [TRPA], 1986 as cited in PG&E, 2009a). Chinook salmon have been observed to use areas in the bypassed reach, but appear to be limited by natural barriers from potential habitat upstream of Wagoner Canyon. Resident rainbow trout and brown trout are found throughout South Cow Creek wherever habitat conditions are suitable (TRPA, 1985 as cited in PG&E, 2009a).

In addition, to the South Cow Creek diversion dam, nine potential barriers to fish migration have been identified within the bypassed reach. The remaining barriers are natural falls 3 to 6 ft high or cascades that could present difficulties for upstream migration under low flow conditions, but would be passable at higher flows. Most of these barriers are located near the upstream end of Wagoner Canyon where some of the largest areas of quality spawning substrate have been identified. These barriers generally have jump pools below and resting pools above that would facilitate upstream fish passage; however, passage may be difficult under some conditions because the jump pool depths were typically less than 1.25 times the jump height, which is considered optimal for passage (Powers and Orsborn, 1985 as cited in PG&E, 2009a). The resource agencies believe that flows of at least 20 to 25 cfs would likely allow passage at all of these barriers.

3.3.3.2 Environmental Effects of Proposed Action

Kilarc Development

Removal of the main development water structures (Kilarc main canal diversion dam, Kilarc main canal, Kilarc forebay, Kilarc penstock, and Kilarc tailrace) would provide additional flow to improve aquatic habitat in the bypassed reach while eliminating artificially maintained aquatic habitat within the canal and forebay. Under the existing license conditions, steelhead could be present near the Kilarc tailrace and in the lower reaches of the bypass, as passage of migratory fish at Whitmore Falls to this area is considered to be possible under some winter high flow conditions. Cal Fish and Game and NMFS intend to manage this area for migratory salmonids.

Particularly during low flow (less than about 55 cfs) periods, it is clear that decommissioning the Kilarc Development would significantly increase flows through the bypassed reach of Old Cow Creek. The net increase in flows to the bypassed reach was estimated (section 3.3.2.1.2, *Environmental Effects of Proposed Action*) to be between 87-313 percent during the dry season (July - October) and 36-87 percent during the high

flow season (December - May). Under existing licensed conditions, minimum flows of 2-4 cfs are provided to the bypassed reach by the Kilarc Development, and flows in excess of the diversion canal capacity (50 cfs) spill to the bypass at the Kilarc diversion dam or canal spillways. However, under existing licensed conditions, flows through the main canal often have been below the capacity of the canal. The frequency, temporal distribution, and magnitude of spills at the Kilarc diversion dam are not documented. Thus, increases in flow as a result of the Proposed Action cannot be determined adequately to quantify the effects on aquatic habitat in the bypassed reach. However, the increase in flows is expected to increase water depth and velocity and channel cross-section, thus increasing the amount and quality of habitat available to resident and migratory fish.

Removal of the Kilarc main canal diversion dam would re-establish more natural flows in the bypassed reach of Old Cow Creek. Because of the steep gradients, the transit time of water at full natural flow through the bypassed reach under the Proposed Action likely would be faster than through the main canal and powerhouse under the existing license. The bypassed reach is also well shaded with steep canyon walls, thus water temperatures generally would be expected to be cooler (although they are currently suitable for salmonids) throughout the bypassed reach (see section 3.3.2.2, *Water Quality*). It is likely that restoration of full natural flows in the bypassed reach of Old Cow Creek would maintain water temperatures in the bypass below the 68°F guideline for trout waters. Water temperatures downstream of the project likely would be similar to what would have occurred naturally before the project was constructed.

Given the relatively small capacity of the Kilarc main canal to transport high flows, the affect of the existing development on the magnitude, duration, and frequency of high flows through the bypassed reach has been minimal under the current license. The Proposed Action would have no significant affect on high flow conditions in the bypassed reach. Because there would be no change in high flows through the bypassed reach or the flow regime below the Kilarc powerhouse, decommissioning is unlikely to affect the frequency and duration of periods when anadromous salmonids could pass above Whitmore Falls.

On the other hand, during periods of low flow, decommissioning the Kilarc Development would result in significantly more water (87-313 percent) flowing through the bypassed reach. Although hydraulic channel data are not available to predict changes in water depth and velocity and cross-section or how such changes would affect aquatic habitat, it is reasonable to expect that increases in flow and lower water temperatures would enhance conditions for resident fish throughout the bypassed reach and anadromous fish populations downstream of the natural fish passage barriers within the bypassed reach. Although removal of the Kilarc diversion dam will enhance flows and aquatic habitat in the bypassed reach, this action would not improve access to habitat for migratory salmonids upstream of the Kilarc diversion dam because of the impassable barrier (unnamed falls OC-11) located within the Old Cow Creek bypassed reach.

Several commenters, including Save Kilarc Committee, KC Hydro/Davis Hydro, Tetrick Ranch, and ADU, point out a lack of anecdotal evidence or confirmed sightings of anadromous fish above Whitmore Falls. Several of the commenters also note that given the timing of migration and high flows necessary to facilitate fish passage above Whitmore Falls, relatively few anadromous fish are likely to reach the project area and that only another 2.6 miles of the bypass before the next upstream impassible natural barrier would be opened to anadromous salmonids following decommissioning. Consequently, commenters question the benefit to these populations from decommissioning given that a maximum of only 2.6 miles of habitat would be gained. They also suggest that during high flow periods, any fish that is able to negotiate Whitmore Falls and the other high difficulty barriers in the bypassed reach also would be able to pass the Kilarc diversion dam at these same high flows. However, NMFS and Cal Fish and Game reiterated following the EIS scoping meeting and site visits (October 19-22, 2009) their commitment to the terms of the 2005 agreement and to management of Old Cow Creek above Whitmore Falls for anadromous salmonid recovery.

After removal of the Kilarc main canal diversion dam under the Proposed Action, the stored sediment would be mobilized and transported downstream by natural high flows (bank full at about a 1.5-year recurrence interval; 1,324 cfs or higher) over time. Until this stored sediment is redistributed, it could continue to act as a barrier to upstream migration. This barrier would be temporary. The duration that it persists would depend on the magnitude, frequency, and duration of high flows subsequent to the dam removal, the size distribution of the stored sediment, and configuration of the new channel.

To minimize the persistence of this barrier, PG&E proposed measures to promote channel formation, support sediment redistribution, and provide passage immediately after decommissioning. The proposed PM&E (Measure GEOM-1) would include: excavation of a temporary artificial channel through the stored sediment in conjunction with dam removal; the dam footing will be retained as a channel elevation control; and the depth of the temporary channel through the sediment will be cut at the downstream end to the same elevation as this footing. This temporary channel would be designed to provide an initial guide for natural flows which would eventually mobilize, transport, and redistribute substrate material and reconfigure the channel alignment and cross-section through this area. PG&E has proposed to monitor during development of the natural channel configuration and alignment and take action to prevent erosion or destabilization of adjacent banks (PM&E Measure GEOM-2). PG&E has also proposed to monitor downstream areas in the bypassed reach to ensure that accumulation of sediment transported downstream following removal of the diversion dam does not create temporary barriers to fish passage (PM&E Measures AQUA-4 and AQUA-5).

The amount of fine material released would be small relative to the sediment transport capacity of Old Cow Creek, particularly as the fine fraction accounts for less than 10 percent of the total volume of accumulated sediment. The release of fine sediment would occur during moderate to high flow events and is likely to move rapidly through the bypassed reach during such events. The quantity of fine sediment that would

be released would be small compared to the amount of suspended sediment typically carried by the high flows from upstream sources. The investigation of sediment chemistry concluded that the sediments could be left in the channel to be naturally transported downstream after the Kilarc main canal diversion dam is removed without exceeding water quality standards. It is unlikely that the release of these sediments would degrade water quality to a level that would adversely affect fish.

It is anticipated that pools within several hundred feet downstream of the dam would experience the most initial deposition of material dispersed from behind the dams, but would return to pre-dam morphology as larger seasonal high flows continue to mobilize and distribute this sediment progressively farther downstream. The plunge pool directly downstream of the dam no longer would be maintained by the energy of water discharged over the dam and likely would be partially filled on a long-term basis. PG&E has proposed monitoring to ensure that downstream sediment accumulation would not create barriers to fish migration (PM&E Measure AQUA -5).

North and South Canyon Creeks have not been sampled, but rainbow trout, sculpin, and roach are species likely to be present. The effects of deconstructing the South Canyon Creek diversion dam, and the associated canal, are expected to be similar to those described for the Kilarc main canal diversion dam, although on a much smaller scale, and as proposed, no heavy equipment would need to operate in the stream to complete this work. North Canyon Creek is ephemeral, so decommissioning would be scheduled during the dry season and no effects are expected. South Canyon Creek canal has not operated in several years; however, if water is flowing through the canal at the time of decommissioning, fish could be stranded when flows to the canal are cut off. In the unlikely event that flows are present in the canal when decommissioning takes place, the potential effects would be minimized by implementation of the proposed PM&E measures. This would include closing of the upstream end of the canal to prevent access by fish and monitoring for and recovery of stranded fish.

The Kilarc tailrace would be filled during decommissioning. This activity is not anticipated to require in-water work with heavy equipment, but could release sediments into the stream. The potential effects of filling the Kilarc tailrace include the burial of fish by fill materials and sedimentation effects associated with placement of fill material. PM&E measures (Measures AQUA -1 and AQUA-2) in the Proposed Action would minimize the potential direct effects on fish within the tailrace area, and BMPs (PM&E Measures GEOL-1 and GEOL-2) would minimize water quality effects that could adversely affect fish.

Dewatering the Kilarc main canal and forebay could strand fish within these facilities; PM&E measures (Measures AQUA-2 and AQUA-7) would minimize this potential. Sections of the canal would be deconstructed, filled in, or breached and abandoned in place, and no longer would provide aquatic habitat. Based on PG&E's studies, aquatic habitat that is available in the canal under existing conditions is not extensive and generally does not provide quality substrate for spawning and nursery

habitat. The few trout collected in the canal during PG&E studies were relatively small (sub-adults) and may opportunistically enter the upper and lower end of the canal from Old Cow Creek at the diversion dam or from the Kilarc forebay. A large proportion of the brown trout collected during the PG&E studies were of wild origin and it was speculated that they either spawn in the vicinity of springs in the forebay or move up the canal. Although unidentified, the location of any natural spawning habitat for brown trout in the canal would be lost under the Proposed Action.

The recreational fishery at the Kilarc forebay has been maintained primarily through frequent stocking of rainbow trout. PG&E has proposed PM&E measures to minimize potential effects to existing aquatic resources in the Kilarc forebay including discontinuation of the stocking program and coordination with Cal Fish and Game to modify fishing regulations and promote recreational harvest of the existing trout population (PM&E Measure AQUA-6). Under the Proposed Action, a program would be implemented as part of the PM&E measures to trap and relocate any remaining trout to an appropriate location specified by Cal Fish and Game (PM&E Measures AQUA-2 and AQUA-7).

Our Analysis

The Proposed Action includes removal of project facilities and the cessation of water diversions for hydropower production. The deconstruction activities would have minor short-term adverse effects on fish habitat and could affect fish present during the actual deconstruction actions. PG&E has proposed to perform this work primarily during July-September to avoid sensitive periods for steelhead and Chinook salmon (PM&E Measure AQUA-3). The removal of project features and the cessation of diversions would return the bypassed reaches to more natural conditions of flow and sediment transport and deposition, which is expected to result in significant long-term benefits for aquatic species. Water temperatures would generally be expected to be cooler throughout the bypassed reach, which is also expected to result in long-term benefits for aquatic species.

The release of the sediment stored behind the dam could have minor short-term adverse effects on water quality and downstream substrate associated with the release of the fine material fraction of these sediments. Another short-term adverse effect would be the temporary filling of pools immediately downstream of the dams. Given the small volume of these fine sediments, and mobilization of this fine material during high flow events, sedimentation is not expected to have a long-term adverse effect on fish or downstream spawning habitat. PG&E proposes to monitor downstream areas to ensure that accumulated sediment does not create temporary barriers to fish passage.

Short- and long-term benefits would be associated with the release of native material stored behind the dam, the bulk of which is of a size range that would enhance downstream spawning habitat. The release of gravels behind the Kilarc main canal diversion dam would be beneficial in the long-term as a source of spawning gravel for

resident salmonids. These gravels would move gradually downstream, maintaining existing spawning areas and potentially creating new spawning habitat.

Cow Creek Development

Removal of the South Cow Creek main canal diversion dam would re-establish more natural flows in the bypassed reach of South Cow Creek. Given the relatively small capacity of the main canal to transport high flows, the affect of the existing development on the magnitude, duration, and frequency of high flows through the bypassed reach has been minimal. Decommissioning would have no significant affect on high flow conditions in the bypassed reach or downstream of Hooten Gulch. On the other hand, during periods of low summer flows, decommissioning the Cow Creek Development would significantly increase flows through the bypassed reach of South Cow Creek. The net increase in flows to the bypassed reach was estimated (see section 3.3.2.1, *Water Quantity*) to be between 264-334 percent during the dry season (July - October) and 23-65 percent during the high flow season (December - May).

Removal of development structures (South Cow Creek main canal diversion dam, Cow Creek main canal, Cow Creek forebay, penstock, tailrace) as part of the Proposed Action could temporarily adversely affect aquatic habitat for migratory (steelhead trout, rainbow trout, fall-run Chinook salmon) and resident fish species (roach, dace, sculpin, pikeminnow, emerald shiner, and green sunfish) in the South Cow Creek bypassed reach, and permanently affect habitat in the canal, forebay, and Hooten Gulch. PG&E has proposed to perform this work primarily during July-September to avoid sensitive periods for steelhead and Chinook salmon (PM&E Measure AQUA-3).

Under the existing license, steelhead and fall-run Chinook salmon could utilize aquatic habitat in the vicinity of the confluence of Hooten Gulch with South Cow Creek and upstream through the bypassed reach. The existing fish ladder at the diversion dam, although not meeting current standards, is known to provide access for steelhead to upstream aquatic habitat. The additional flows and removal of the diversion dam would enhance access to this habitat. Potential barriers to migration of anadromous fish in Wagoner Canyon are expected to be generally passable at flows greater than 20-25 cfs. Based on PG&E's unimpaired flow analysis, removal of the diversion dam and restoration of full natural flows under the Proposed Action generally would make these barriers passable even during low flow periods.

Under existing licensed conditions, minimum flows of 3-5 cfs are provided to the bypassed reach by the Cow Creek Development, and flows in excess of the diversion canal capacity (50 cfs) spill to the bypass at the Cow Creek diversion dam or canal spillways. However, under licensed conditions, flows through the main canal often have been below the capacity of the canal (see section 3.3.2.2, *Water Quality*). Under the Proposed Action, removal of the Cow Creek diversion dam would restore more natural flows in the bypassed reach of South Cow Creek. Hydraulic channel data are not available to predict changes in water depth, velocity and channel cross-section with increased flow during summer dry periods or how such changes would affect aquatic

habitat. However, it is reasonable to expect that increases in flow would enhance conditions for resident and migratory fish throughout the bypassed reach.

Maximum and mean daily water temperatures upstream of the Cow Creek diversion dam, within Hooten Gulch, and in South Cow Creek downstream of Hooten Gulch often exceed California SWRCB criteria under the current license from June through September. Under the Proposed Action, the water transit time through the South Cow Creek bypassed reach at full natural flow is likely to be faster than through the main canal, Kilarc forebay, and Hooten Gulch. Much of the bypassed reach is well shaded with steep canyon walls, particularly in Wagoner Canyon. Thus, water temperatures would generally be expected to be cooler throughout the bypassed reach with full natural flows than under the existing license. However, peak water temperatures during natural low flow summer periods are still likely to be higher than optimal for salmonids and greater than the 68°F standard for cold water streams set by the Central Valley Regional Water Quality Control Board (CVRWCB).

After removal of the Cow Creek main canal diversion dam, the stored sediment would be mobilized and transported downstream by natural high flows (bank full at about a 1.5-year recurrence interval; 2,614 cfs or higher) over time. Until this stored sediment is redistributed, it could continue to act as a barrier to upstream migration. This barrier would be temporary, and, how long it persists would depend on the magnitude, frequency, and duration of high flows subsequent to the dam removal, the size distribution of the stored sediment, and channel configuration. To minimize the persistence of this barrier, PG&E proposed measures to promote channel formation, support sediment redistribution, and provide passage immediately after decommissioning. The proposed PM&E measures (Measure GEOM-1) would include: (1) excavation of a temporary artificial channel through the stored sediment in conjunction with dam removal; (2) the dam footing will be retained as a channel elevation control and; (3) the depth of the downstream end of the temporary channel through the sediment will be cut to the same elevation as the footing, decreasing upstream to the head of the impounded area. This temporary channel would be designed to provide an initial guide for natural flows which would eventually mobilize, transport, and redistribute substrate material and reconfigure the channel profile and alignment through this area. PG&E has proposed to monitor this channel during development of the natural channel configuration and alignment, and take action to prevent erosion or destabilization of adjacent banks (PM&E Measure GEOM-2).

Another potential short-term effect would be the temporary filling of pools downstream of the dams. It is anticipated that pools within several hundred feet downstream of the dam would experience the most initial deposition of material dispersed from behind the dams, but would return to pre-dam morphometry as larger seasonal high flows continue to mobilize and distribute this sediment farther downstream. The plunge pools directly downstream of the dam would no longer be maintained by the energy of water discharged over the dam and likely would be partially filled on a long-term basis. PG&E has also proposed to monitor downstream areas in the bypassed reach

to ensure that accumulation of sediment transported downstream following removal of the diversion dam does not create temporary barriers to fish passage (PM&E Measures AQUA-4 and AQUA-5).

The release of the sediment stored behind the dam could have short-term effects on water quality and downstream substrate associated with the release of the fine material fraction of these sediments. The amount of fine material released would be small relative to the sediment transport capacity of South Cow Creek, particularly as the fine fraction (sand or finer) accounts for less than 10 percent of the total volume of sediment stored. The release of this fine sediment would occur during moderate to high flow events and is likely to move rapidly through the bypassed reach during such events. The additional fine sediment that would be released would be small compared to the amount of suspended sediment already carried by the high flows from upstream sources. Given the small volume of these fine materials and short duration of these events, transport of this fine material would not be expected to have an adverse effect on fish or downstream spawning habitat. The investigation of sediment chemistry concluded that the sediments could be left in the channel to be naturally transported downstream after the Cow Creek main canal diversion dam is removed without causing the water column to exceed water quality standards. Therefore, the release of these sediments would not degrade water quality or adversely affect fish.

Short- and long-term benefits would be associated with the release of native material stored behind the dam, given that the bulk of this material is likely to enhance substrate in downstream spawning areas. The release of gravels accumulated behind the Cow Creek main canal diversion dam would be beneficial as a source of spawning gravel for resident salmonids. This material would move gradually downstream, maintaining existing spawning areas and potentially creating new spawning habitat.

The Cow Creek tailrace on Hooten Gulch would be filled during decommissioning. This activity is not anticipated to require in-water work with heavy equipment, but could release sediments into the stream. The potential effects of filling the Cow Creek tailrace include the burial of fish by fill materials and sedimentation effects associated with placement of fill material. Termination of powerhouse flows would occur during spring when natural flows from upstream in Hooten Gulch would prevent stranding of fish (PM&E Measure 9). Work on the tailrace would be timed to coincide with the seasonal period when Hooten Gulch would be dry without project flows and fish rescue actions would be implemented as proposed by PG&E (PM&E Measure AQUA-7). This would minimize the potential effects on aquatic biota. Gunite lining portions of the stream channel and bank to prevent erosion in Hooten Gulch in the vicinity of the powerhouse tailrace would be removed and natural substrate conditions would be restored (PM&E Measure AQUA-10).

Mill Creek has not been sampled, but rainbow trout, sculpin, dace, and roach are fish species likely to be present. The effects of deconstructing the Mill Creek diversion dam and associated canal, are expected to be similar to those described for the South Cow

Creek main canal diversion dam, although on a much smaller scale, and no heavy equipment would need to operate in the stream. If flows are present in the canal when decommissioning takes place, the potential effects would be minimized by implementation of the proposed PM&E measures including discontinuation of the diversion flows and trapping, recovery, and relocation of stranded fish (PM&E Measures AQUA-1, AQUA-2, and AQUA-7).

Dewatering the South Cow Creek main canal and forebay could strand fish within these facilities. Sections of the canal would be deconstructed, filled in, or breached and abandoned in place and would no longer provide aquatic habitat. Aquatic habitat that is available in the canal under the existing license is not extensive and does not provide quality substrate for spawning and nursery habitat. The few trout collected in the canal during PG&E studies were relatively small (sub-adults) and may opportunistically enter the canal from the Cow Creek forebay. The existing fish screen at the diversion dam, although not meeting current standards for anadromous species, is effective to some extent in preventing access for fish to the canal. Fish remaining in the forebay and canal would be trapped and relocated (PM&E Measure AQUA -7) and the fish screen would be retained until flow to the canal is terminated and fish rescue activities are completed (PM&E Measure AQUA-8).

Similarly, the effects of decommissioning on Hooten Gulch would relate to cessation of flows from the Cow Creek powerhouse, which currently supports perennial flows in Hooten Gulch downstream of the powerhouse. In the short-term, cessation of generation flows could result in stranding of fish in isolated pools. The adverse effect of these actions on stranded fish would be mortality through predation, dehydration, or poor water quality conditions that develop as these pools dry up. The potential effects would be minimized by implementation of the proposed PM&E measures (AQUA-7 and AQUA-9) to monitor, trap, remove, and relocate stranded fish.

Over the past 100 years, generation flows from the Cow Creek powerhouse have artificially supported perennial aquatic habitat and a diverse aquatic community including the seasonal occurrence of adult steelhead trout. Under the Proposed Action, flows in Hooten Gulch below the powerhouse would revert to the natural ephemeral conditions similar to those in Hooten Gulch upstream of the powerhouse; these conditions would not support the aquatic resources existing under the current license conditions.

Our Analysis

The Proposed Action includes removal of project facilities and the cessation of water diversions for hydropower production. The deconstruction activities would have short-term adverse effects on fish habitat and could affect fish present during the deconstruction actions. PG&E has proposed to perform this work primarily during July-September to avoid sensitive periods for steelhead and Chinook salmon (PM&E Measure AQUA-3). The removal of project features and the cessation of diversions would return the bypassed reaches to more natural conditions of flow and sediment transport and deposition, which is expected to result in long-term benefits for aquatic species. Water

temperatures would generally be expected to be cooler throughout the bypassed reach, which is also expected to result in long-term benefits for aquatic species.

The release of the sediment stored behind the dam could have short-term adverse effects on water quality and downstream substrate associated with the release of the fine material fraction of these sediments. Another short-term adverse effect would be the temporary filling of pools immediately downstream of the dams. Given the small volume of these fine sediments, and mobilization of this fine material during high flow events, sedimentation is not expected to have a long-term adverse effect on fish or downstream spawning habitat. PG&E proposes to monitor downstream areas to ensure that accumulated sediment does not create temporary barriers to fish passage.

Short- and long-term benefits would be associated with the release of native material stored behind the dam. The gravels accumulated behind the South Cow Creek diversion dam would be beneficial over the long-term as a source of fish spawning gravel for resident salmonids. These gravels would move gradually downstream, maintaining existing spawning areas and potentially creating new spawning habitat.

3.3.3.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, the diversion of flow from Old Cow Creek would continue at the Kilarc diversion dam in order to maintain flows and aquatic habitat at the Kilarc forebay as a recreational and fire safety resource, but at a reduced amount compared to the existing license. The restored flows to the Old Cow Creek bypassed reach would be less than under the Proposed Action. This alternative proposes to divide unimpaired flows at the diversion dam. Ultimately the proportion of flow delivered to the canal and the bypassed reach would need to be determined in consultation with the resource agencies and would likely require a period of monitoring and adaptive management to determine an optimum split to support resources in both areas. Studies of aquatic habitat and water quality conditions in the bypassed reach and Kilarc forebay would be needed to provide a scientific basis for determining the optimum split in flow at the diversion dam under various seasonal flow conditions.

Action Alternative 1 would increase flows in the bypassed reach above the current license requirement of 2-4 cfs. This would enhance bypass habitat particularly during periods when flows in Old Cow Creek are less than the hydraulic capacity of the canal (about 50 cfs). It is clear that the resource agencies would, at a minimum, require a significant (although unspecified) increase in minimum flows through the bypassed reach to support restoration and enhancement of anadromous salmonids if diversions at the Kilarc main canal diversion dam were to continue. This order of magnitude increase in bypass flow when natural flows are low compared to the existing license (2-4 cfs) would increase inundation, water depth, and velocity in the bypass channel, expanding available habitat.

These increased flows would not improve the opportunity for upstream fish passage at the natural barrier (unnamed falls OC-11) in the bypassed reach during periods of low to moderate flows; however, neither would full natural flows during these periods. The resource agencies have determined that passage of steelhead at Whitmore Falls is possible at high flow winter conditions. If passage is possible under high flow conditions at any of the natural barriers downstream of the Kilarc diversion dam under the Proposed Action, then passage would be possible under the same flow conditions with AA1. Installation of a fish ladder at the Kilarc main canal diversion dam could facilitate upstream access for anadromous salmonids that are able to negotiate other natural barriers (Whitmore Falls and OC-11) downstream of the diversion dam. This alternative also would require installation of a screen at the entrance to the Kilarc main diversion canal to preclude resident and migratory fish in Old Cow Creek from entering the canal and moving downstream to the Kilarc forebay. A natural flow regime would be permanently re-established in North and South Canyon Creeks with removal of the diversion dams and canals enhancing habitat for resident fish.

Higher flows under AA1 would decrease the transit time through the Old Cow Creek bypassed reach and sustain cooler water temperatures in the channel between the Kilarc diversion dam and Kilarc tailrace. Maximum daily and daily mean water temperatures above the Kilarc diversion dam and below the Kilarc tailrace are consistent with California SWRCB criteria under the existing license, and maximum temperatures exceed the criteria only occasionally during July. It is likely that the increased minimum flows in the Old Cow Creek bypassed reach proposed for AA1 would improve water temperatures, although it cannot be determined from the available data whether maximum daily water temperatures would then be consistently below 68°F.

Sediment mobilization and transport in Old Cow Creek are not likely to change under AA1 because the frequency and magnitude of bank full or higher flows would not be affected. Sediment accumulated behind the diversion dam would remain in place and would not contribute to fish spawning substrate downstream. The volume of sediment held behind the North and South Canyon diversion dams is relatively small, but would be distributed downstream by periodic, geomorphologic high flows associated with channel maintenance.

Action Alternative 1 would continue to support existing aquatic and riparian habitat along the Kilarc diversion canal. This alternative also would retain the Kilarc forebay and the associated recreational facilities and fishery.

Our Analysis

Overall, AA1 would provide less water in the Old Cow Creek bypassed reach than under the Proposed Action, but improved flow conditions compared to the current license. The increase in bypass flows would benefit habitat in the long-term for aquatic resources relative to the current license conditions particularly during periods of low flow; however, habitat improvements are likely to be less than under the Proposed Action, which would restore full natural flows. Flows to the diversion canal would

continue to sustain uses and resources of the Kilarc forebay, but would likely be lower during dry periods than under the current license. In the short-term, flows and associated habitat in the bypassed reach would be variable during an evaluation period to determine an optimum division of flow between the bypassed reach and the main diversion canal supporting the Kilarc forebay.

Cooler water temperatures in the bypassed reach would have a long-term beneficial effect on fish habitat. Sediment mobilization and transport in Old Cow Creek are not likely to change under AA1, and sediment accumulated behind the diversion dam would remain in place and would not contribute to spawning substrate downstream, as is the case under the Proposed Action.

With the available information it is uncertain whether the quantity of water in Old Cow Creek can be adequately divided to balance the habitat requirements of resident and migratory fish in the Old Cow Creek bypassed reach while sustaining the recreational fishery in the Kilarc forebay. The primary issues that would need to be addressed by a prospective operator in consultation with the resource agencies during this evaluation include: (1) determination of an appropriate flow split to ensure adequate water temperatures to support cold water species in both the Kilarc forebay and the Old Cow Creek bypassed reach; and (2) determination of flows in the bypassed reach that would be necessary to support upstream migration of anadromous species during the months of their respective spawning runs. This alternative would require installation and maintenance of new stream gages that comply with USGS standards to provide more accurate flow and temperature monitoring in the diversion canal and bypassed reach of Old Cow Creek. This alternative also would require the design and installation of a fish ladder and fish screen at the diversion dam and canal. Action Alternative 1 does not include power generation. In the absence of economic support from power generation, the potential new owner of the remaining facilities would need to demonstrate the financial capacity for design and installation of the fish ladder, screens, and stream gages, as well as long-term operation and maintenance of these and all remaining project structures (see section 3.3.10 *Socioeconomics*).

Cow Creek Development

Our Analysis

Under AA1 the Cow Creek Development would be decommissioned as described in the Proposed Action. The environmental effects on aquatic resources at the Cow Creek Development and proposed PM&E measures under AA1 would be the same as described for the Proposed Action (see section 3.3.3.2, *Environmental Effects of Proposed Action*).

3.3.3.4 Environmental Effects of Action Alternative 2

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described under the Proposed Action. The environmental effects on aquatic resources at the Kilarc

Development and proposed PM&E measures under AA2 would be the same as described for the Proposed Action (see section 3.3.3.2, *Environmental Effects of Proposed Action*).

Cow Creek Development

Under AA2, flows in the Cow Creek main canal would be maintained to support the non-consumptive water rights of the conduit exemption, Tetrick Hydroelectric Project and the consumptive water rights of ADU, but at a reduced amount compared to the existing license. This alternative proposes a split of the unimpaired flows at the diversion dam to support aquatic resources in the South Cow Creek bypassed reach and the water rights of users that currently withdraw water from Hooton Gulch downstream of the Cow Creek powerhouse tailrace (see section 3.3.2.1.4, *Environmental Effects of Action Alternative 2*). The restored flows to South Cow Creek would be less than under the Proposed Action.

Action Alternative 2 could increase flows in the bypassed reach compared to flows under the existing license (2-4 cfs). This action likely would enhance aquatic habitat in the bypassed reach particularly during periods when natural flows at the South Cow Creek diversion dam are less than the hydraulic capacity of the canal. It is clear that the resource agencies would, at a minimum, require a significant (although unspecified) increase in minimum flows through the bypassed reach to support restoration and enhancement of anadromous salmonids if diversions at the South Cow Creek main canal diversion dam were to continue. This increase in bypass flow when natural flows are low compared to the current license would increase inundation, water depth, and velocity in the bypass channel expanding available habitat for resident and migratory species. Information necessary to quantify the change in habitat and benefit to fish or the difference compared to the Proposed Action is not available. The largest differences and benefits are likely to be generated during periods of low flow depending on the relative split (specifics would have to be determined) in flow between the bypassed reach and the canal.

When flows in the bypass reach 20-25 cfs, all natural barriers in the South Cow Creek bypassed reach would be passable for steelhead and Chinook salmon. The increased bypass flows proposed in AA2 would increase the opportunity for upstream fish passage through Wagoner Canyon during periods of low to moderate flows. Several potential barriers to migration identified in Wagoner Canyon are considered passable with minimum flows of 20-25 cfs. Under moderate to high flow conditions, if passage is possible at any natural barriers downstream of the South Cow Creek diversion dam under the Proposed Action, then passage also would be possible under AA2. A natural flow regime would be re-established in Mill Creek with removal of the diversion and canal.

Higher flows under AA2 would decrease the transit time through the South Cow Creek bypassed reach and promote cooler water temperatures in the channel between the South Cow Creek diversion dam and Hooton Gulch compared to the existing license conditions, although water temperatures would likely continue to exceed criteria due to natural conditions in the watershed. Daily maximum and average water temperatures

above the Cow Creek diversion dam, within Hooten Gulch, and in South Cow Creek below Hooten Gulch often exceed California SWRCB criteria under the existing license during June through September. It is likely that the increased minimum flows in the South Cow Creek bypassed reach proposed for AA2 would improve water temperatures in the bypassed reach, but it is not likely that maximum and average water temperatures would be consistently below 68°F.

Sediment mobilization and transport are not likely to change under AA2 because the frequency and magnitude of bank full or higher flows would not be affected. Sediment accumulated behind the South Cow Creek diversion dam would remain in place and would not contribute additional material to spawning habitat substrate downstream.

The capacity of the South Cow Creek main canal is about 50 cfs with a requirement for minimum instream flows to the South Cow Creek bypassed reach of 2-4 cfs under the current license requirement. Flows through the canal in recent years have more typically been between 30 and 40 cfs except during periods of high natural flow. Thus, flows in Hooten Gulch between the Cow Creek powerhouse tailrace and the Abbott Ditch diversion dam are typically 30-50 cfs under existing license conditions. Flows in Hooten Gulch below the Abbott Ditch diversion to South Cow Creek are typically between 17 and 37 cfs with about 13 cfs diverted to Abbott Ditch under existing conditions. Action Alternative 2 would generally provide flows in Hooten Gulch between the Cow Creek tailrace and the Abbott Ditch diversion adequate to meet the water rights of ADU. During dry periods, flows diverted to the canal and Hooten Gulch could be less that the allocated ADU water right. Below this diversion, flows returning to South Cow Creek generally would be less than 5 cfs. These continued flows to Hooten Gulch would support aquatic habitat year-round, unlike the Proposed Action; however, the flows would be lower than under the existing license. It is unknown what the effect of the reduction in flows to Hooten Gulch would be to aquatic habitat in the reach between the powerhouse tailrace and South Cow Creek. The short reach of Hooten Gulch between the Abbott Ditch diversion and South Cow Creek would receive considerably lower flows than under the existing license.

Steelhead reportedly use Hooten Gulch as spawning habitat where perennial flows are maintained below the powerhouse tailrace. Action Alternative 2 would continue to provide perennial flows to this reach that are less than under the existing license, but higher throughout most of the year than under the Proposed Action. Under AA2, it is uncertain that adult steelhead could negotiate the low flows in Hooten Gulch below the Abbott Ditch diversion dam without modification of the channel configuration and construction of a fish ladder. An unknown percentage of young steelhead hatched in Hooten Gulch would continue to be susceptible to entrainment into the Abbott Ditch diversion without construction of a fish screen at the entrance to the ditch.

Our Analysis

Overall, AA2 could slightly increase flows in the bypassed reach compared to flows under the existing license. This would enhance aquatic habitat in the bypassed

reach, thus providing a long-term benefit to aquatic species. However, AA2 would provide less water in the South Cow Creek bypassed reach than under the Proposed Action, with flow and aquatic habitat conditions similar to the current license during periods of low flow. Flows to the diversion canal would continue to sustain uses and resources of Hooten Gulch below the Cow Creek powerhouse, but likely would be lower during dry periods than under the current license. In the short-term, flows and associated habitat in the bypassed reach would be variable during an evaluation period to determine the diversion flow necessary to support the water right of ADU.

With the available information it is uncertain whether the quantity of water in South Cow Creek can be adequately divided to balance the habitat requirements for resident and migratory fish in the South Cow Creek bypassed reach and the Hooten Gulch users. This alternative would require installation and maintenance of new stream gages that comply with USGS standards to provide more accurate flow and temperature monitoring in the diversion canal and bypassed reach of South Cow Creek. It also would be necessary to design and install a new fish ladder and screen at the South Cow Creek diversion dam. In the absence of economic support from power generation, under AA2 the potential owner of the remaining Cow Creek Development facilities would need to demonstrate the financial capacity to design and install the fish ladder, screen, and stream gages, and for long-term operation and maintenance of these structures.

3.3.3.5 Environmental Effects of No Action

Kilarc Development

The No-Action Alternative provides a baseline for evaluation of the Proposed Action and the two alternative actions. For the Kilarc Development, the No-Action alternative would result in continued operation under existing annual license conditions. The existing conditions as described in section 3.3.3.1, *Affected Environment*, would not change. These conditions would not be supportive of the conditions in the MOA or management goals identified by Cal Fish and Game and NMFS for anadromous salmonids in the Cow Creek watershed, and specifically in the affected area of the project including the bypassed reaches and upstream on Old Cow Creek.

Our Analysis

The ranges and seasonal trends of water temperatures in the bypassed reaches would be unchanged compared to the current license. Except for a few days during July, maximum daily water temperatures in Old Cow Creek would continue to be in compliance with the California Regional Water Quality Control Board (CRWQCB) cold water criteria of 68°F for coldwater fisheries and within the optimum range for spawning and growth of anadromous and resident salmonids. Mean daily water temperatures would be several degrees below the 68°F criteria.

Cal Fish and Game and NMFS management objectives are for restoration of anadromous salmonids (steelhead and fall-run Chinook) in the Cow Creek watershed. Whitmore Falls below the Kilarc tailrace is considered by the resource agencies to be

passable for anadromous salmonids (steelhead in particular) under winter high flow conditions in most years. Opportunities for Chinook salmon are more limited given the timing of their spawning run relative to the typical winter period of high flows. An additional unnamed barrier (OC-11) in the Kilarc bypassed reach may be passable, but only under extreme high flow conditions. The frequency and magnitude of high flows in Old Cow Creek are not significantly affected by the operation of the Kilarc Development; thus, under the No-Action alternative, upstream migration by these species would not change compared to the existing license. Sediment and spawning substrate for resident and migratory salmonids would not change compared to the existing license.

Cow Creek Development

The No-Action Alternative provides a baseline for evaluation of the Proposed Action and the two alternative actions. For the Cow Creek Development, the No-Action Alternative would result in continued operation of the two developments under existing annual license conditions. The existing conditions as described in section 3.3.3.1, *Affected Environment*, would not change. These conditions would not be supportive of the conditions in the MOA or management goals identified by Cal Fish and Game and NMFS for anadromous salmonids in the Cow Creek watershed, and specifically in the affected area of the project including the bypassed reaches and upstream on South Cow Creek.

Our Analysis

Maximum daily water temperatures in South Cow Creek would continue to frequently exceed CRWQCB criteria for cold water streams and the optimum temperature range for anadromous and resident salmonids between May and September. Daily mean water temperatures would continue to exceed 68°F during July.

Several potential barriers to fish passage in the Wagoner Canyon reach of the South Cow Creek bypassed reach exist at low flow conditions under the existing license. The minimum existing instream flows of 2-4 cfs to the bypassed reaches would continue during periods of low flow under the No-Action Alternative; thus, these barriers, which require a minimum flow of 20-25 cfs for fish passage, would continue to be impassible during low flow periods. Sediment and spawning substrate for resident and migratory salmonids would not change compared to the existing license.

3.3.4 Botanical Resources

3.3.4.1 Affected Environment

Existing botanical resources for the project area are based on vegetation mapping using available aerial photographs and field checks. Surveys were also conducted to describe and delineate: wetlands in general; and wetlands associated with Hooten Gulch below the tailrace from the Cow Creek powerhouse; riparian vegetation; and to determine the presence of elderberry shrubs, host plants for the valley longhorn elderberry beetle (VLEB), a special status beetle (see section 3.3.6, *Rare, Threatened and Endangered*

Species). A literature review was conducted to determine special status plant species that could be present in the project boundaries. Field surveys were conducted to check for the presence of special status plant species. Unless otherwise noted, the information in this section originates in the Kilarc-Cow Creek Project botanical, and terrestrial and aquatic wildlife resources report (ENTRIX, Inc., 2007) contained within the LSA (PG&E, 2009a).

As described in previous sections (see section 3.3.1, *Geologic and Soil Resources*), the watershed in which the project area is located varies in topography, elevation, and soil, all of which contribute to diverse botanical resources. Plant communities identified and mapped within the project area include:

- Sierran mixed coniferous forest
- Ponderosa pine plantation
- Interior live oak woodland
- Blue oak-foothill pine woodland
- White alder riparian forest
- Northern mixed chaparral
- Annual grassland
- Wetlands (freshwater marsh and seeps)
- Developed/disturbed

In general, higher elevations support coniferous forests; middle elevations support blue oak-foothill pine woodland and interior live oak forests; and lower elevations support blue oak-foothill pine woodlands and non-native grassland.

Kilarc Development

Sierran mixed conifer forest is dominated by a mix of Ponderosa pine, incense cedar, Douglas fir, and white fir found primarily from 3,000 to 6,000 ft in elevation. This vegetation community is also the most common vegetation cover type within the Kilarc Development. Once primarily associated with moist sites with well-drained soil, Sierran mixed conifer forest has replaced much of the area once dominated by Ponderosa pine forest as a result of fire suppression. Ponderosa pine dominated forest within the Kilarc Development now occurs as pine plantations planted after forested areas were burned in 1988. Part of the Ponderosa pine plantation and surrounding area were again burned in a fire in 2002. Black oak also may be associated with Sierran mixed conifer forest.

An area of blue oak-foothill pine woodland is located in the lower reaches of the development near the Kilarc powerhouse. Pasture, annual grassland-chaparral-forest, and non-native annual grassland vegetation communities are also located within the Kilarc Development but in limited areas. Non-native annual grasslands are characterized as open, tree-less areas in the vegetation study area and include all grazing lands. Species of

introduced annual grasses such as wild oats, ripgut brome, barley, and fescue intermingle with native species of perennial forbs that commonly include California poppy, butter n'eggs, and Sierra foothill silverpuffs, which comprise the most common grassland species. Exotic species such as yellow starthistle, medusahead grass, Klamath weed, dalmation toadflax, and bull thistle are characteristic invasive species within the grassland vegetation community.

Developed land in the vicinity of the Kilarc Development includes the area surrounding the Kilarc powerhouse and residence, slide areas on steep slopes, and areas disturbed by human activities, particularly logging. Any vegetation present consists of species that pioneer the area from surrounding vegetation communities or weedy species typical of disturbed areas. Disturbed areas resulting from human activities that were large enough to map were found along Old Cow Creek and were primarily related to logging activities.

Cow Creek Development

Vegetation communities within the Cow Creek Development are more typical of lower elevations. Interior live oak is the most extensive vegetation cover type in the Cow Creek Development and is associated with California bay, blue oak, buckeye, and poison oak. Blue oak-foothill woodlands occur within the Cow Creek Development on rocky or exposed shallow soils on foothill slopes from the valley floor to more than 3,500 ft in elevation. Species found as co-dominants with blue oak and foothill pine include: whiteleaf manzanita, interior live oak, and buckbrush. The understory may contain small specimens of interior live oak, and shrubs of California buckeye, whiteleaf manzanita, poison oak, and California redbud. Moist areas of blue oak-foothill pine woodland may have an understory that contains black oak and poison oak, while drier areas of blue oak foothill pine woodland may have an understory of non-native grasses and chaparral species. Non-native annual grasslands characterized as open, tree-less areas are found in the vicinity of the Cow Creek powerhouse and along access roads. Species of introduced annual grasses such as wild oats, ripgut brome, barley, and fescue intermingle with native species of perennial forbs that commonly include California poppy, butter n'eggs, and Sierra foothill silverpuffs, which comprise the most common grassland species. Exotic species such as yellow starthistle, medusahead grass, Klamath weed, Dalmation toadflax, and bull thistle are characteristic invasive species within the grassland vegetation community. Northern mixed chaparral is found in a small area along the northern central boundary of the Cow Creek Development. Northern mixed chaparral is dominated by manzanitas and ceanothus shrubs that can form an impenetrable thicket.

Wetlands

Within the project area, wetland vegetation communities include freshwater marsh, seeps and swales that occur adjacent to Old Cow and South Cow Creeks. Freshwater marsh occurs along the edges of ponds and creeks at lower elevations within the project area. The extent of fringe wetlands varies with water level and periodic inundation/dry seasons and as a result is not quantified in this discussion. Seeps or

springs occur in wet areas within non-native grasslands or meadows and are often associated with geological fractures, faults, or materials.

Kilarc Development

Kilarc Development wetland delineations were limited to lands within the project boundary for the development. Freshwater marsh occurs along edges of ponds and creeks and along edges of the Kilarc forebay. Freshwater marsh supports emergent vegetation species such as: broadleaf cattail, tules, rushes, and sedges. Open water areas include the 4.5 acre Kilarc forebay and the open water of Old Cow Creek and the Kilarc main canal. Three small seeps were mapped within the Kilarc Development: one small seep (0.002 acre) adjacent to the Kilarc main canal, one small seep (0.01 acres) adjacent to the Kilarc forebay, and a third seep/spring (0.04 acre) at the Kilarc powerhouse. The seep/spring at the powerhouse meets all the criteria for a jurisdictional wetland (hydrology, soils, and vegetation) under the federal CWA.

Cow Creek Development

The Cow Creek Development delineation study included lands within the project boundary and lands outside the project boundary that may be encroached upon during the Proposed Action. Seeps observed during the vegetation surveys were mostly too small to map. Two small seeps (totaling 0.006 acre) were mapped adjacent to an access road at the Cow Creek Development. One seep was dominated by rushes, but all other sweeps were dominated by perennial herbaceous species of grasses that are associated with moist or wet soils. Open water areas include the 1-acre Cow Creek forebay and the open water of South Cow Creek, Hooten Gulch, and the South Cow Creek Main Canal.

A single vernal swale (0.005 acre) was identified in the Cow Creek Development located on a terrace along an access road to the Cow Creek Development and was connected to an intermittent stream that drains the terrace. Wetland species observed in the swale include: slender popcorn flower, woolly marbles, water star-wort, bicolor lupine, and Mediterranean barley.

Freshwater marsh occurs along edges of ponds and creeks at lower elevations and along edges of the Cow Creek forebay. Species of emergent vegetation in the freshwater marsh fringing the open water areas within the Cow Creek Development include similar species to those found in the Kilarc Development: cattails, tules, rushes and sedges.

Riparian Habitat

Vegetation studies were conducted in the Kilarc and Cow Creek Developments in addition to the bypassed and Hooten Gulch reaches to determine the type, extent, and condition of riparian vegetation. All of the riparian survey areas were located in steep narrow canyons. As a result of the existing topography, bedrock channels, and fast-flowing water, riparian vegetation communities tended to be narrow in extent in the upper limits of the project area, with the exception of Hooten Gulch and portions of Old Cow Creek.

Kilarc Development

Riparian vegetation in the Kilarc Development includes the bypassed reaches of Old Cow, North Canyon, and South Canyon creeks. Riparian vegetation along the Old Cow Creek bypassed reach was generally described as a narrow strip ranging from 15 to 100 ft wide (average total of both banks including mid-channel islands or bars when present). Dominant riparian species include: white alder, big leaf maple, and mountain dogwood in the canopy; Fremont cottonwood is present as individual trees or small pockets in several locations along the creek. Understory riparian species include: shrub specimens of canopy trees, willows, vine maple, Himalayan blackberry, and creek dogwood. The herbaceous layer was considered fairly sparse in the riparian strips along both banks and commonly includes: Indian rhubarb, brickellbush, arrow butterweed, sedges, and grasses. The exotic noxious species, Klamath weed, was also found in the herbaceous layer. Where conditions allowed, riparian vegetation was found on mid-channel islands and bars. In some reaches, upland plant species such as interior live oak, Ponderosa pine, incense cedar, white fir, Douglas fir, and Pacific yew intermingled with riparian species adjacent to the stream.

Vegetation in the riparian areas along North Canyon Creek was similar to that identified along Old Cow Creek. The riparian area along North Canyon Creek ranged from 5 to 10 ft in width and meets all the criteria (hydrology, soils, vegetation) for jurisdictional wetlands under the CWA.

Cow Creek Development

Areas of riparian vegetation within the Cow Creek Development include bypassed reaches of South Cow Creek, Mill Creek, and the valley Hooten Gulch, which receives augmentation flow from the Cow Creek powerhouse.

The riparian area along South Cow Creek is comprised of species such as; white alder, bigleaf maple, Oregon ash, and California bay. Fremont cottonwoods are found as individual trees or in small clusters in several locations along South Cow Creek. Dominant understory riparian species include willows, Himalayan blackberry, poison oak, Indian rhubarb, California wild grape, sedges, and grasses. Upland species such as Ponderosa pine, canyon live oak, interior live oak and black oak were occasionally found within the riparian zone adjacent to Cow Creek. The riparian zone along South Cow Creek ranged from 10 to 60 ft wide (average total of both banks including mid-channel bars when present). The herbaceous layer was comprised of Indian rhubarb and sedges growing sparsely between boulders or on the edges of banks and bars within the channel. A few western sycamores were observed in the vicinity of the Cow Creek powerhouse. The riparian area along South Cow Creek meets all criteria (hydrology, soils, and vegetation) for a jurisdictional wetland under the federal CWA.

The riparian zone associated with the Mill Creek bypassed reach is dominated by white alder. California bay and Oregon ash are co-dominant riparian species. Willows, Himalayan blackberry, California wild grape, Indian rhubarb, sedges, and grasses form a

dense riparian understory. The riparian zone along the Mill Creek bypassed reach varies from 20 to 30 ft wide.

The Hooten Gulch riparian area generally occurs as a narrow strip between 15 and 35 ft in width and is dominated almost entirely by canopy and understory species with only a very sparse herbaceous layer. Dominant riparian tree species found within Hooten Gulch include: white alder, Fremont cottonwood, valley oak, and California black walnut. The understory contained similar species to other riparian areas within the Cow Creek Development and a few scattered California buckeyes.

Invasive/Noxious Plants

Kilarc and Cow Creek Developments

During the botanical surveys, 45 species of exotic plants, including 12 species of invasive/noxious plants, were identified within the project area encompassing both the Kilarc and Cow Creek Developments. The 12 species of invasive/noxious weeds identified are: ripgut brome, soft chess, yellow star thistle, bullthistle, dogtail, red-stem filaree, Klamath weed, Himalayan blackberry, cut-leaved blackberry, Medusa-head, moth mullein, and hairy vetch.

Special Status Plant Species

Based on a literature review, a list of 29 special status plant species with the potential to occur in the Kilarc and Cow Creek Developments was developed. Botanical surveys were conducted throughout the project area where accessible. Surveys were initiated in May 2003 and included the Cow Creek Development and the lower elevations of the Kilarc Development (forebay, penstock, powerhouse, diversion, and portions of the canal areas). Late spring snows negated the opportunity to complete surveys at the higher elevations in the Kilarc Development during May. Botanical surveys were also conducted in the project area in June and August 2003 for summer and late summer bloom periods. Botanical surveys were conducted again in 2008. None of the species identified during the literature review as potentially occurring within the project area were observed during the botanical surveys; however, two additional special status species, mountain lady's slipper and big-scale balsam-root, were observed during the 2003 and 2008 surveys.

Plant surveys to determine the presence and extent of elderberry shrubs were included with the surveys for special status plants to determine the potential for habitat to support the valley elderberry longhorn beetle (see section 3.3.6, *Rare, Threatened and Endangered Species*). Two elderberry shrubs were located in the vicinity of the South Cow Creek canal and trail.

Kilarc Development

Special status plant survey areas within the Kilarc Development included the: Kilarc forebay, Kilarc penstock, Kilarc powerhouse, Kilarc main canal diversion dam, and parts of the Kilarc main canal.

Mountain Lady's Slipper—Mountain lady's slipper (*Cypripedium montanum*) is a native perennial herbaceous species that is defined by the California Native Plant Society (CNPS) as a List 4[24] species. Though widely distributed, most occurrences of this species are limited to small numbers of stems. It is found in broadleaf and coniferous woodlands from 600 to 7,300 ft in elevation. Most occurrences of this species are limited to small numbers of stems. Two stems of Mountain lady's slipper were observed at the base of an above-ground reach of the Kilarc main canal in 2003, at the top of a steep, bare slope failure. The surrounding vegetation community was Sierran mixed coniferous forest (CNPS, 2009b).

Butte County Fritillary—A commonly occurring fritillary, the scarlet fritillary (*Fritillaria recurva*), was observed along the Kilarc penstock, and at several locations along the South Cow Creek main channel and the slopes above South Fork Cow Creek in 2003 and 2008. Because of similarity of appearance, it was thought feasible that some of the plants could be Butte County fritillary (*Fritillaria eastwoodiae*), a CNPS List 3[25] species (species requiring more data to determine rarity). The Butte County fritillary is a perennial herbaceous species found in chaparral, mountain side woodlands, and montane coniferous forest between 130 and 4,925 ft in elevation. The species uses habitats containing a variety of soils, including serpentine, clay, and sandy loam, and prefers dry slopes, but can be found in wet areas. Surveys were inconclusive as to the presence of Butte County fritillary because many plants during the surveys were not identifiable to species due to the existing plant conditions (undeveloped or lost flowers; lost fruit) or inaccessibility.

Cow Creek Development

Special status plant survey areas within the Cow Creek Development included: project access roads, Mill Creek diversion dam, South Cow Creek diversion dam, Mill Creek-South Cow Creek canal, South Cow Creek main canal, Cow Creek penstock, and Cow Creek powerhouse.

Big-Scale Balsam-Root—A population of big-scale balsam-root (*Balsamorhiza macrolepis* var. *macrolepis*) was found at a proposed temporary access road site for the Cow Creek Development. The area is surrounded by blue oak-foothill pine woodland. Big-scale balsam-root is a native, endemic, perennial herbaceous species that grows in mountainside woodlands and valley and foothill grasslands from 115 to 3,280 ft in elevation (CNPS, 2009a). This species is included on the CNPS List 1B[26] for species that are RTE in California and elsewhere.

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[24] CNPS List 4 plants are species that are limited in distribution and may become rarer.

[25] CNPS List 3 plants are species requiring more data to determine rarity.

[26] CNPS List 1 plants are species that are rare, threatened, or endangered in California and elsewhere.

3.3.4.2 Environmental Effects of Proposed Action

Botanical Resources

In general, the effects on upland vegetation would occur from the temporary loss of vegetation as a result of the Proposed Action at the Kilarc and Cow Creek forebays, canals, and diversions. Disturbance to vegetation would be temporary and vegetation would re-establish in time after completion of the Proposed Action. Additional temporary loss of upland habitat would occur during removal of intake structures, spillways, flumes, tunnels, and siphons, although disturbance at tunnels and siphons would be expected to be minimal because most of the activity would be in small areas at the ends of the structures. The penstocks of both developments would be left in place, under the Proposed Action, and closing the ends of the penstock would not result in measurable effects on vegetation. Additional adverse effects on vegetation would occur as a result of the construction of temporary access roads or the improvement of existing roads to facilitate removal.

Because seepage from facilities such as canals and flumes within the Kilarc and Cow Creek Developments can create moist conditions that support wetlands, effects on vegetation associated with wetlands, swales, and seeps could be adversely affected by the Proposed Action. Where seeps and small wetland areas exist as a result of the presence of water due to operation of the two developments, these wetlands/seeps may be permanently lost when dewatering occurs. In addition, disturbance during facility removal may cause temporary vegetation loss within wetlands, seeps, or riparian areas adjacent to and within the footprint of proposed construction activities.

Kilarc Development

About 11.5 acres of vegetation (including 4.5 acres of the Kilarc forebay and the unvegetated canals) would be disturbed within the Kilarc Development under the Proposed Action. Removal of the Kilarc main canal diversion dam, including mechanisms and concrete, could disturb Sierran mixed conifer forest as a result of proposed activity and any required access improvements into the diversion components. The removal of the Kilarc forebay would include dismantling and removing intake and control equipment, filling the forebay, and demolishing and filling the overflow spillway. Picnic tables and bathrooms at the Kilarc forebay would be removed. Upland vegetation surrounding the Kilarc forebay consists of Ponderosa pine plantation and would not be significantly affected by activity associated with the removal of the Kilarc forebay; however, limited areas of Ponderosa pine plantation could be affected by road construction to improve access to the forebay for deconstruction work. Short-term, minor, adverse impacts would occur to existing upland vegetation communities as a result of the Proposed Action. Over time, upland vegetation would be expected to re-establish from the existing seed bank and pioneering of surrounding vegetation species. Filling of the forebay would result in the creation of about 4.5 acres of new vegetation. Initially, the licensee would back fill the forebay with excavated bank material and seed to stabilize the area and prevent erosion. Pioneering species would establish from the

seed bank contained within the bank material and from natural pioneering of surrounding plant species.

The Kilarc main canal would be dewatered over its 3.65-mile length as a result of the Proposed Action. Vegetation in the vicinity of the main canal would be disturbed as a result of proposed construction activity and access during canal removal. Sierran mixed conifer forest and less than 1 acre of Ponderosa pine plantation are expected to be disturbed. Over time upland vegetation would be expected to re-establish from the existing seed bank, natural pioneering of surrounding vegetation species, and the proposed reseeding; eventually the areas would re-establish into natural native woodlands. Short-term, minor adverse impacts to existing upland vegetation resources would result from the Proposed Action at the Kilarc main canal.

Activities at the Kilarc powerhouse resulting from the Proposed Action would primarily disturb the developed area surrounding the structures, and as a result no adverse effects to natural vegetation in the vicinity are expected from the Proposed Action. The Kilarc penstocks would be left in place but plugged at the head of the penstock at the forebay; temporary, minor adverse impacts would result from disturbance to existing herbaceous ground cover.

Most roads to be used for the Proposed Action are existing roads on private property. Several short, new road segments are being considered to facilitate work on the Kilarc Development canals. The proposed road segments would constitute about 0.5 miles (0.7 acres) of ground disturbance in areas previously logged.

Reseeding the areas that are cleared, as proposed, would re-establish vegetation; however, the existing vegetation communities would be altered for the long-term. After the completion of activities associated with the Proposed Action, natural pioneering by adjacent species and establishment of plants from the existing seed bank would create a successional vegetative process for the cleared areas, and eventually the areas would re-establish into natural native woodlands. No specific PM&E measures have been developed for impacts to upland vegetation; however, the implementation of BOTA-1 would result in the development of a mitigation and monitoring plan (MMP) that would implement restoration of disturbed areas and abandoned or temporary roadbeds. Restoration would be conducted in consultation with private landowners where appropriate and may include reseeding with appropriate seed mixtures or planting. Native plant and seed mixtures would be used as available; sterile cereal seed mixtures may also be used for erosion control, if available.

Wetlands and Riparian Vegetation—At the Kilarc Development, an existing riparian wetland area adjacent to the North Canyon Creek canal is not expected to be affected by the Proposed Action. The riparian wetland is located upslope of the North Canyon Creek canal and is associated with two intermittent streams that drain into the canal. The water supply to this wetland does not occur as a result of project operation; therefore, the wetland function would not be affected by the Proposed Action.

The small seep (0.002 acre) adjacent to the Kilarc main canal and the seep/spring wetland area (0.04 acre) at the Kilarc powerhouse would be adversely affected when water to the seep is eliminated as a result of dewatering. The small seep adjacent to the Kilarc main canal could be permanently lost as a result of dewatering; however, though unlikely, the seep/spring may continue to exist if a water source (a possible spring in the vicinity) remains.

Freshwater wetland fringing the shoreline of the Kilarc forebay, a small seep (0.01 acre) adjacent to the Kilarc forebay, and another would be adversely affected by the proposed dewatering and back-filling of the Kilarc forebay. The fringe emergent wetland surrounding the perimeter of the forebay, small stands of cattail, and a small seep (about 0.01 acre) would be lost as a result of dewatering the forebay. The Kilarc forebay would be back filled with excavated bank material and reseeded with an appropriate seed mix. Depending on the conditions that remain, the former Kilarc forebay area may re-establish as riparian habitat offsetting loss of existing riparian/wetland vegetation communities.

It is expected that vegetation would re-establish where conditions remain appropriate and, although these areas cannot be expected to be restored to pre-project conditions, the riparian and wetland areas within the Kilarc Development would return to a riparian and possibly a wetland system, more natural to the seasonal and cyclic hydrologic conditions that prevailed prior to the existence of the project. Depending on remaining hydrologic conditions after the Kilarc forebay has been drained, filled, and reseeded, there is potential for the development of an additional riparian area within the former footprint (4.5 acres) of the reservoir. A riparian area that develops within the former Kilarc forebay area may gradually succeed to a species composition of upland vegetation consisting with surrounding vegetation communities.

Under the Proposed Action, mitigation and restoration of riparian and wetland areas would minimize effects through the implementation of PM&E measure BOTA-1, which would require the development and implementation of the MMP. The MMP would include goals, methodologies, and performance measurement criteria for mitigation and restoration that include a two-year monitoring program to ensure that riparian habitat is re-established in areas where construction activities may result in clearing or disturbance. These measures would help preserve wetland and riparian habitat during and after the Proposed Action by minimizing the loss of riparian and aquatic habitat and facilitating the long-term regeneration of disturbed areas. Reseeding with seed mixtures or planting of species appropriate to the surrounding vegetation communities and use of sterile seed would allow areas of disturbance and clearing to develop into natural plant communities consistent with the surrounding area over time. The implementation of proposed BMPs (PM&E GEOL-1) that restore natural drainage paths and re-contour slopes to reduce erosion and sedimentation would improve soil conditions and stability and allow vegetation to re-establish. Bank erosion monitoring and erosion control measures implemented in consultation with Cal Fish and Game would also include vegetation plantings consistent with the MMP. Also included in the MMP would be the condition that any riparian and wetland vegetation monitoring may be

implemented under the authority of permitting or resource agencies such as Corps or California SWRCB for a total of five years.

As a result of the Proposed Action, adverse effects to riparian and wetland vegetation within the Kilarc Development are expected to be minor and short-term depending on location and extent of disturbance.

Special Status Plant Species—Because of its location, the population of mountain lady's slipper growing at the base of an above-ground reach of the Kilarc main canal is expected to be unavoidably affected by removal activities. To the extent practical, the population would be avoided; PM&E BOTA-2 would implement pre-construction surveys in all areas that would be disturbed to determine locations of sensitive species and develop an avoidance approach. However, if not avoidable, with the implementation of PM&E BOTA-3, the licensee proposes to stockpile the top 10 in. of soil from the disturbed area, protect the soil from possible establishment of weeds, and potentially restore the seed bank containing seeds of the species when stockpiled soil is returned to the area of disturbance during restoration after activities have ceased. Consultation with Cal Fish and Game or CNPS staff knowledgeable in the life requisites of mountain lady's slipper prior to disturbance and the restoration process would ensure that the seed bank would be distributed within the appropriate habitat and under necessary conditions to maximize the potential for success of plant restoration.

Our Analysis

Minor adverse impacts to about 11.5 acres of vegetated communities within the Kilarc Development would occur as a result of the Proposed Action. These impacts would be short-term as vegetation is re-established through reseeding and restoration planting of native species; implemented monitoring of restored areas would minimize additional impacts from erosion and ensure that vegetative cover is successfully established. Over the long-term, these areas would go through natural successional processes and return to natural vegetation communities represented within the existing Kilarc Development. PM&E measures proposed are consistent with recommendations by state and federal agencies to mitigate for adverse impacts that would occur.

Cow Creek

About 10 acres of vegetation is expected to be disturbed mostly along canals and the Cow Creek forebay (1 acre) under the Proposed Action. A combination of removal and abandonment in-place is proposed at the Cow Creek diversion dam. Upland vegetation in the area of the diversion dam includes Sierran mixed conifer forest. Activities associated with the Proposed Action at the Cow Creek forebay would not significantly affect the interior live oak woodland that dominates the area, though access road improvements and construction work areas necessary for the draining and back-filling of the Cow Creek forebay would disturb limited areas of interior live oak woodland. Access to canals, flumes, tunnels, and siphons present within the Cow Creek Development would disturb Sierran mixed conifer forest and interior live oak woodland

along the Cow Creek canal; less than 1 acre of interior live oak woodland would be disturbed. Activities at tunnels and siphons would temporarily disturb very small areas of vegetation at the ends of the structures and adverse effects would be minor. Vegetation surrounding the Cow Creek powerhouse is characterized as interior live oak woodland, blue oak-foothill pine woodland, and non-native annual grassland, with the area immediately surrounding the powerhouse primarily non-native grassland. Disturbance as a result of activities associated with the closing of the powerhouse would not significantly affect vegetation in the vicinity of the powerhouse. The Kilarc penstocks would be left in place but plugged at the head of the penstock at the forebay; short-term, minor adverse impacts would result from disturbance to existing herbaceous ground cover. No new access roads are proposed for completion of the Proposed Action at the Cow Creek Development.

As discussed for the Kilarc Development, reseeding the areas that are cleared would re-establish vegetation; however, the existing vegetation communities would be altered for the long-term. After the completion of activities associated with the Proposed Action, natural pioneering by adjacent vegetation community species and establishment of plants from the existing seed bank would create a successional process for the cleared areas, and eventually the areas would re-establish into natural native woodlands. Mitigation and restoration of upland vegetation would minimize effects through the implementation of PM&E measure BOTA-1, which would require the development and implementation of an MMP. The MMP would include goals, methodologies, and performance measurement criteria for mitigation and restoration that include a two-year monitoring program to ensure that vegetation is re-established in areas where construction activities result in clearing or disturbance. These proposed measures would help preserve vegetation by minimizing the loss of vegetation and facilitating the regeneration of disturbed areas. BOTA-1 also would implement re-seeding of disturbed areas including temporary work areas, filled and graded areas, and areas associated with rehabilitated and temporarily constructed roads. The implementation of BMPs (PM&E GEOL-1) that restore natural drainage paths and re-contour slopes to reduce erosion and sedimentation would improve soil conditions and stability and allow vegetation to re-establish. Bank erosion monitoring and erosion control measures implemented in consultation with Cal Fish and Game would also include vegetation plantings consistent with the MMP. The proposed re-seeding would use native seed types or sterile cereal seed.

Wetlands and Riparian Vegetation—Up to 0.15 acre of riparian vegetation adjacent to the Cow Creek diversion dam would be disturbed during the Proposed Action. Two seeps and a vernal swale at the Cow Creek Development were mapped adjacent to access roads and may be adversely affected by proposed road construction/preparation activities. The freshwater emergent wetland fringe along the shoreline of the Cow Creek forebay would be adversely affected by the Proposed Action, under which the forebay would be dewatered, backfilled, and reseeded with an appropriate seed mixture. Depending on remaining hydrologic conditions after the Cow Creek forebay has been drained, filled,

and reseeded, there is potential for the development of an additional riparian area within the former footprint (1.0 acre) of the reservoir. A riparian area that develops within the former Cow Creek forebay area may gradually succeed to a species composition of upland vegetation consistent with surrounding vegetation communities, offsetting the loss of riparian/wetland vegetation communities.

As a result of the Proposed Action, adverse effects to riparian and wetland vegetation within the Cow Creek Development is expected to be minor and range from short-term to long-term or permanent depending on location and extent of disturbance. Under the Proposed Action, mitigation and restoration of riparian and wetland areas would minimize effects through the implementation of PM&E measure BOTA-1, which would require the development and implementation of the MMP. The MMP would include goals, methodologies, and performance measurement criteria for mitigation and restoration that include a two-year monitoring program to ensure that riparian habitat is re-established in areas where construction activities result in clearing or disturbance. These measures would help preserve wetland and riparian habitat by minimizing the loss of riparian and aquatic habitat, facilitating the regeneration of disturbed areas, and ensuring native soils within cleared and disturbed areas are not subject to erosion. Reseeding with seed mixtures or planting of species appropriate to the surrounding vegetation communities and use of sterile seed would allow areas of disturbance and clearing to develop into natural plant communities consistent with the surrounding area. Bank erosion monitoring and erosion control measures implemented in consultation with Cal Fish and Game would also include vegetation plantings consistent with the MMP. The implementation of BMPs (PM&E GEOL-1) that restore natural drainage paths and re-contour slopes to reduce erosion and sedimentation would improve soil conditions and stability and allow vegetation to re-establish. Also included in the MMP would be the condition that any riparian and wetland vegetation monitoring may be implemented under the authority of permitting or resource agencies such as Corps or California SWRCB for a total of five years. It is expected that riparian and wetland areas within the Cow Creek Development would return to a riparian and wetland system more naturally adapted to seasonal and cyclic hydrologic conditions that prevailed prior to the existence of the project.

Hooten Gulch—The existing riparian area within Hooten Gulch may be reduced in extent as augmentation of flows downstream of the Cow Creek powerhouse would end under the Proposed Action. Tetrick Ranch, Shasta County, and ADU commented that Hooten Gulch is a complete riparian habitat that would be dewatered, receiving only storm runoff with the removal of the Kilarc and Cow Creek Developments. The implementation of proposed botanical resource PM&E measures (BOTA-1, BOTA-2, and BOTA-3) would minimize effects on the riparian and wetland areas within Hooten Gulch. As presented in PM&E AQUA-9, and further recommended by Cal Fish and Game, DOI, and NMFS, ceasing Cow Creek powerhouse operations should occur during the spring when natural seasonal flows are present. This measure would continue to provide water to riparian vegetation during the growing season and benefit natural

riparian and wetland vegetation by returning Hooten Gulch to a more natural system; this measure is consistent with agency recommendations prepared by Cal Fish and Game and DOI.

Special Status Plant Species—Big-scale balsam-root growing adjacent to the access road in the Cow Creek Development may be adversely affected by road improvements to facilitate completion of the Proposed Action. Effects on big-scale balsam-root may be avoided by conducting pre-construction surveys for special status plant species, as proposed, in all areas that would be disturbed and avoiding any identified populations to the extent practical. If temporary disturbance occurs to a portion of the population, DOI and Cal Fish and Game recommend that the licensee "stockpile" the top 10 in. of soil from the area to be disturbed, protect the soil from exposure to weed seeds, and return the stockpiled soil when activities are complete. Commission staff concurs with the resource agencies. This action would safely protect the seed bank and allow the plants to re-establish in the area after deconstruction is completed.

Under the Proposed Action, BOTA-2 and BOTA-3 include avoidance and minimization of effects on vegetation communities to the fullest extent possible by implementing: (1) pre-construction surveys for special status plant species including surveys for elderberry shrubs (to avoid effects on the host plant for VELB); (2) the placement of an on-call biological monitor responsible for conducting worker environmental awareness training for construction personnel on special status species present in the area and avoidance and minimization measures to be implemented; and (3) the restoration of abandoned or temporary road beds and disturbed areas.

The MMP that would be developed in consultation with Corps, Cal Fish and Game, and California SWRCB would provide guidelines for the restoration of abandoned or temporary roadbeds discussed above for terrestrial vegetation. DOI and Cal Fish and Game have each provided recommendations for license surrender that are consistent with the licensee's PM&E measures.

Our Analysis

Minor adverse impacts to about 10 acres of vegetated communities within the Cow Creek Development would occur as a result of the Proposed Action. These impacts would be short-term as vegetation is re-established through the proposed reseeding and restoration planting of native species; implemented monitoring of restored areas would minimize additional impacts from erosion and ensure that vegetative cover is successfully established. Over the long-term these areas would go through natural successional processes and return to natural vegetation communities represented within the existing Kilarc Development.

Hooten Gulch would receive long-term, beneficial effects from the Proposed Action as it returns to a more natural system consistent with natural riparian and wetland systems. Over the long-term, Hooten Gulch would return to a natural system that is sustained by a natural, seasonal hydrologic cycle and the existing vegetation communities

should return to native species of vegetation that are better adapted to the pre-project conditions.

PM&E measures proposed are consistent with recommendations by state and federal agencies to mitigate for adverse impacts that would occur.

Invasive/Noxious Plants

Kilarc and Cow Creek Developments

Existing invasive non-native and noxious plant species have been identified during vegetation community surveys within the Kilarc and Cow Creek Developments. Activities that result in soil disturbance such as ground disturbance/vegetation removal associated with the Proposed Action and road construction/improvements and alterations in water levels may provide mechanisms for the establishment and spread of invasive plant species. Because of their aggressive nature, invasive and noxious plant species may compete with native vegetation species during the period when vegetation is re-colonizing disturbed areas.

To minimize the potential for the spread of noxious weeds and non-native invasive plant species, the licensee has agreed in PM&E BOTA-1 to use native seed mixes or sterile cereal seed, and certified weed-free straw as available when re-seeding disturbed areas. NMFS comments included the recommendation that an appropriate seed mixture be used in the restoration of cleared construction areas and temporary roads. DOI commented that their objective is to ensure that control of non-native/noxious species minimizes their effects on terrestrial habitats, and Cal Fish and Game commented that where possible, the spread of invasive plant species should be reduced or reversed. Recommendations in BOTA-1 under the Proposed Action, are consistent with NMFS, DOI, and Cal Fish and Game's comments.

Our Analysis

Invasive non-native and noxious plant species are well-established in the Kilarc and Cow Creek project area as noted by the identification of 12 species during the botanical surveys. Under the Proposed Action, it is likely that noxious species will spread, resulting in adverse impacts. Restoration of disturbed or cleared areas by reseeding will hasten growth of vegetation cover and minimize soil erosion. PM&E BOTA-1 and recommendations by resource agencies are consistent and in favor that native seed be used in the restoration process, and the use of sterile cereal seed, or if not available, other sterile seed, be considered. Priority should be given to the use of native seed rather than cereal or other seed even if certified as sterile in all areas where reseeding would be conducted. Monitoring for pioneering by noxious species should be conducted in areas of reseeding to minimize opportunistic growth of noxious weed species.

3.3.4.3 Environmental Effects of Action Alternative 1

Action Alternative 1 proposes to remove the Cow Creek Development and partially remove structures within the Kilarc Development; specific activities would be undertaken as described under the Proposed Action. Implementation of AA1 would result in the disturbance or removal of vegetation at the Cow Creek Development and the North and South Canyon diversions, canals, and siphon at the Kilarc Development. Vegetation would be disturbed or removed during construction activities associated with the proposed upgrades and modifications to the Kilarc main canal structures, diversion dam, and canal intake. In general, the amount of vegetation adversely affected would be less than under the Proposed Action since not all of the Kilarc Development would be decommissioned. Disturbance/removal of vegetation would be temporary in nature, and once activities are completed, it is expected that vegetation would re-establish resulting in no permanent loss of vegetation. As discussed under section 3.3.4, *Botanical Resources,* PM&E measures BOTA-1, BOTA-2, and BOTA-3 would minimize the effects of the Proposed Action at the Cow Creek Development and those portions of the Kilarc Development that would be upgraded, modified, or decommissioned.

Kilarc Development

The removal of the North and South Canyon diversions canals, siphon and penstock, penstock intake, and switchyard at the Kilarc Development would result in disturbance or removal of vegetation. Riparian and wetland vegetation is limited within the Kilarc Development; however, with monitoring to ensure re-establishment where conditions remain appropriate, riparian and wetland areas within the Kilarc Development would return to a riparian and wetland system more naturally adapted to seasonal and cyclic hydrologic conditions that prevailed prior to the existence of the project. The existing riparian wetland upslope of the North Canyon Canal is hydrologically connected to two intermittent streams that drain into the canal; removal of the canal would not affect the function of the wetland. The Kilarc forebay would be left in place. Under AA1 the 4.5 acres of open water habitat at the forebay would not be converted to a plant community. No effects to plant communities surrounding the Kilarc forebay would occur; and fringe wetlands would remain as under current conditions. Additional disturbance or temporary removal of vegetation would be likely during the installation of a fish passage facility at the Kilarc main canal diversion dam but would be minor and short-term. As part of the MMP, disturbed areas would be re-seeded with native species or sterile cereal seed as available. Activities associated with AA1 would be mitigated with the implementation of PG&E's proposed measures BOTA-1, BOTA-2, and BOTA-3 as described for the Proposed Action. As a result, minimal, short-term adverse impacts resulting from limited disturbance and removal of upland, riparian, and wetland vegetation would occur for AA1. Over the long-term, vegetation would re-establish after disturbance or clearing as mitigation and enhancement measures are implemented.

Because the Kilarc main canal would remain in place under AA1, the small population of mountain lady's slipper located at the Kilarc main canal should not be

affected. Pre-construction surveys as recommended in BOTA-2 and avoidance measures proposed in BOTA-3 should be performed prior to any upgrading or other work activity surrounding the canal.

Our Analysis

Limited effects to vegetation within the Kilarc development are likely because AA1 proposes limited removal activities at the Kilarc Development. Minimal adverse impacts would occur to Sierran mixed conifer, Ponderosa pine, and herbaceous ground cover as well as non-native annual grasslands and developed areas (surrounding the Kilarc powerhouse and other facilities). Adverse impacts would be short-term as long-term restoration of disturbed areas would occur. No adverse effects would occur to fringe wetlands surrounding the Kilarc forebay under AA1. The small population of mountain lady's slipper adjacent to the Kilarc main canal also should be unaffected by activities associated with AA1. Action Alternative 1 would therefore result in minor, limited effects to vegetation communities in the Kilarc Development.

Cow Creek Development

The effects of implementing AA1 at the Cow Creek Development would be the same as for the Proposed Action. Disturbance to and temporary removal of vegetation would occur and would result in minor adverse effects on riparian areas (0.15 acre) and seeps (0.006 acre). The narrow fringe of emergent freshwater wetland along the shoreline of the Cow Creek forebay would be adversely affected by the dewatering and backfilling of the Cow Creek forebay. As previously stated, the forebay area (1.0 acre) would go from open water to an area with re-established vegetation, after reseeding with the appropriate seed mixture. This would be supplemented over the long-term by re-growth from the existing seed bank in the bank material used in backfilling and the natural pioneering of species from nearby vegetation communities. Over the long-term it is expected that the forebay area would undergo successional stages of plant re-growth that may include new riparian areas depending on the sustaining hydrology and soils. Hooten Gulch would return to a more natural seasonal hydrologic regime.

The special status species, big-scale balsam-root, possibly would be adversely affected during roadway improvements necessary for the implementation of the Proposed Action. However, the implementation of proposed pre-construction surveys and avoidance of identified populations would minimize the potential for adverse effects. PM&E measures BOTA-2 and BOTA-3 implement pre-construction surveys for special status plant species and also provide for the placement of an on-call biological monitor responsible for conducting worker environmental awareness training for construction personnel on special status species present in the area and avoidance and minimization measures to be implemented. In addition, if temporary disturbance occurs to a portion of a population, DOI and Cal Fish and Game recommend that the licensee "stockpile" the top 10 in. of soil from the area to be disturbed, protect the soil from exposure to weed seeds, and return the stockpiled soil when activities are complete. Commission staff concurs with this recommendation from the resource agencies. This action should safely

protect the seed bank and allow the special status plants to re-establish in the area after deconstruction is completed, and is consistent with PM&E BOTA-3.

Proposed PM&E measures BOTA-1, BOTA-2 and BOTA-3 are consistent with the terms and conditions and recommendations made by Cal Fish and Game, DOI, and NMFS and would work to protect vegetation, wetlands, and riparian areas including special status species at the Cow Creek Development, resulting in minor adverse impacts to botanical resources within the Cow Creek Development.

Our Analysis

Action Alternative 1 would result in the same impacts to vegetation at the Cow Creek Development as those that would occur under the Proposed Action. Minor adverse impacts to vegetation communities within the Cow Creek Development would occur as a result of the Proposed Action. These impacts would be short-term as vegetation is re-established through reseeding and restoration planting of native species; implemented monitoring of restored areas would minimize additional impacts from erosion and ensure that vegetative cover is successfully established. Over the long-term these areas would go through natural successional processes and return to natural vegetation communities represented within the existing Cow Creek Development. Big-scale balsam-root populations within the Cow Creek Development would be avoided as practicable during activities, and proposed measures BOTA-2 and BOTA-3 would be implemented to protect and mitigate this sensitive plant species.

Hooten Gulch would receive long-term, beneficial effects from the Proposed Action as it would return to a more natural system consistent with natural riparian and wetland systems.

PM&E measures proposed for implementation under the Proposed Action would be used to offset adverse affects at the Kilarc Development under AA1 and are consistent with recommendations from state and federal agencies to mitigate for the adverse impacts that would occur.

3.3.4.4 Environmental Effects of Action Alternative 2

Effects on vegetation including riparian, wetland, and special status plant species as a result of the implementation of AA2 would result in the disturbance or removal of vegetation as described for the Proposed Action, but would be specific to AA2 activities at the Kilarc Development and for the decommissioning of the Mill Creek diversion dam, canal, powerhouse, and switchyard at the Cow Creek Development. As discussed under the Proposed Action, PM&E measures BOTA-1, BOTA-2, and BOTA-3 would minimize the adverse effects of activities at the Kilarc Development and those portions of the Cow Creek Development that would be upgraded, modified, or decommissioned.

Kilarc Development

Vegetation would be disturbed or removed during construction activities associated with the proposed upgrades and modifications to the Kilarc main canal

structures, diversion dam, and canal intake. Disturbance/removal of vegetation would be temporary in nature and once activities are completed, it is expected that vegetation would re-establish. As previously stated, the Kilarc forebay area (4.5 acres) would go from open water to an area with re-established vegetation. This vegetation would be supplemented over the long-term by re-growth from the existing seed bank in the bank material used in backfilling and the natural pioneering of species from nearby vegetation communities. Over the long-term it is expected that the forebay area would undergo successional stages of plant re-growth that may include riparian area depending on the sustaining hydrology and soils.

The special status plant species, mountain lady's slipper, adjacent to the Kilarc main canal likely would be unavoidably adversely affected as described for the Proposed Action in section 3.3.4, *Botanical Resources*. PM&E measures BOTA-2 and BOTA-3 implement pre-construction surveys for special status plant species and also provide for the placement of an on-call biological monitor responsible for conducting worker environmental awareness training for construction personnel on special status species present in the area and avoidance and minimization measures to be implemented. In addition, if temporary disturbance occurs to a portion of a population, DOI and Cal Fish and Game recommend that PG&E "stockpile" the top 10 in. of soil from the area to be disturbed, protect the soil from exposure to weed seeds, and return the stockpiled soil when activities are complete. Commission staff concurs with this recommendation from the resource agencies. This action should safely protect the seed bank and allow the plants to re-establish in the area after deconstruction is completed, and is consistent with PM&E BOTA-3.

Proposed PM&E measures BOTA-1, BOTA-2, and BOTA-3 are consistent with the recommendations made by Cal Fish and Game, DOI, and NMFS and would work to protect vegetation, wetlands, and riparian areas including special status species at the Cow Creek Development.

Our Analysis

Action Alternative 2 would result in the same impacts to vegetation at the Kilarc Development as those that would occur under the Proposed Action. Minor adverse impacts to vegetation communities within the Cow Creek Development would occur as a result of the Proposed Action. These impacts would be short-term as vegetation is re-established through reseeding and restoration planting of native species; implemented monitoring of restored areas would minimize additional impacts from erosion and ensure that vegetative cover is successfully established. Over the long-term these areas would go through natural successional processes and return to natural vegetation communities represented within the existing Kilarc Development.

Unavoidable loss of the population of mountain lady's slipper is likely. PM&E BOTA-3 would potentially restore the seed bank containing seeds of the species when stockpiled soil is returned to the area of disturbance during restoration after activities have ceased. The recommended consultation with Cal Fish and Game or CNPS staff

knowledgeable in the life requisites of mountain lady's slipper prior to disturbance and the restoration process would ensure that the seed bank was distributed within the appropriate habitat and under necessary conditions to maximize the potential for success of restoration.

PM&E measures proposed for implementation under the Proposed Action would be used to offset adverse affects at the Kilarc Development under AA2 and are consistent with recommendations by state and federal agencies to mitigate for adverse impacts that would occur.

Cow Creek Development

The removal of the of the Mill Creek diversion dam, canal, powerhouse, and switchyard at the Cow Creek Development would result in disturbance/removal of vegetation. As previously described for the Proposed Action, once activities were suspended, re-growth of vegetation would be expected in the long-term. Fringe freshwater wetlands along the shoreline of the 1-acre Cow Creek forebay would be adversely affected as the forebay is dewatered, filled, and graded. Water flow to Hooten Gulch would be maintained and existing vegetation resources within Hooten Gulch would continue under current conditions.

Big-scale balsam-root growing adjacent to an access road to Cow Creek potentially would be affected by construction activities if road improvements are required to complete the tasks associated with removal of the selected portions of the Cow Creek Development. BOTA-2 and BOTA-3 would require pre-construction surveys and avoidance of identified special status plant species, and would be implemented as applicable at Cow Creek Development in AA2.

Our Analysis

Action Alternative 2 proposes limited removal activities at the Cow Creek Development; therefore, limited effects to vegetation within the development are likely. Minor adverse impacts would occur to interior live oak, blue oak foothill pine woodland, non-native annual grasslands, and herbaceous ground cover, and developed areas surrounding the powerhouse and other facilities. Adverse impacts would be short-term as long-term restoration of disturbed areas would occur.

Hooten Gulch would continue to receive flow. Flow above that required in the main canal would be released to South Cow Creek. Continued long-term benefits to riparian and wetland habitats within Hooten Gulch and South Cow Creek would result.

Loss of the 1-acre Cow Creek forebay from dewatering and backfilling would result in the permanent loss of fringe wetland habitat; however, backfilling with existing bank material may result in a net increase of riparian habitat within the footprint of the forebay (1 acre). Over the long-term it is uncertain if moisture conditions within the soil filling the forebay would remain to sustain riparian habitat; the area may succeed over time into a more upland vegetation community structure. The one acre gain in vegetation would result in a long-term terrestrial benefit to the project area by providing habitat.

By implementing PM&E measures BOTA-2 and BOTA-3, prior to any road improvements that might be necessary, populations of big-scale balsam-root should be unaffected by activities associated with this AA2. Action Alternative 2, would therefore result in minor, limited effects to vegetation communities in the Cow Creek Development and long-term benefits to riparian and wetland habitat within Hooten Gulch and along South Cow Creek.

3.3.4.5 Environmental Effects of No Action

Kilarc Development

Under the No-Action alternative, the botanical resources within the Kilarc Development would continue under the current license conditions. Upland vegetation dominated by Sierran mixed conifer forest and Ponderosa pine plantation would remain unchanged. Episodes of fire, disease, and insect infestation would continue to affect the condition, diversity, and extent of vegetation independent of project operations. In general, riparian areas, seeps, and wetlands within the Kilarc Development are limited as a result of topography and the presence of exposed bedrock. These systems have adapted to existing conditions within the project and the hydrologic regimes resulting from project operations. As a result, riparian habitat, seeps, and wetlands would continue to exist where hydrologic conditions are favorable. Fringe wetlands surrounding the Kilarc forebay would remain, though extent would continue to be subject to water levels and availability of adequate moisture as a result of continued operation of the project. Episodes of flooding and inundation would continue to occur within the watershed and on occasion result in scouring or inundation of riparian and wetland areas along Old Cow Creek. As in the past, after flooding, riparian areas and wetlands would be expected to recover.

The small population of mountain lady's slipper may remain but its location adjacent to the Kilarc main canal is precarious; conditions may continue that would provide the life requisites to maintain and perhaps enhance the population, but conditions may also change in the future as a result of fire, disease, or other natural disturbances and it may be extirpated over time.

Our Analysis

Continued operation of the Kilarc Development under current conditions and operational requirements would have no impact on upland vegetation resources within the project boundary. The existence and operation of the Kilarc Development for more than 100 years has resulted in a series of vegetation communities that are adapted to project operations and the resulting hydrologic regime. Natural phenomena, disease and fires would continue to affect vegetation communities independent of continued project operations. Riparian areas and wetlands are limited in extent within the Kilarc Development and would continue with no direct impacts resulting from continued project operations; periodic flooding and inundation would affect riparian areas along Old Cow Creek as a result of meteorological events.

The existing small population of mountain lady's slipper may or may not continue to exist at its present location in the future; continued existence would be determined by conditions independent of project operations.

Cow Creek Development

Under the No-Action alternative, the botanical resources within the Cow Creek Development would continue under current conditions of project operations. Upland vegetation dominated by interior live oak and blue oak-foothill woodlands would be subject only to natural disturbances such as periodic fires, disease, and insect infestations. In general, existing riparian areas, seeps, and wetlands within the Cow Creek Development have adapted to the project operations and resulting hydrologic regimes; as a result, riparian habitat, seeps, and wetlands would continue to exist where hydrologic conditions are conducive. Fringe wetlands surrounding the Cow Creek forebay also would remain subject to water levels and moisture regimes as a result of continued operation of the project. Episodes of flooding will continue to occur within the watershed and on occasion result in scouring and inundation of riparian and wetland areas. As they have done in the past after flooding, riparian areas and wetlands would be expected to recover.

Hooten Gulch riparian and wetland plant communities would continue to exist as a result of continued augmented flows under the No-Action Alternative. Current conditions resulting from augmented flows would provide a relatively reliable source of water to Hooten Gulch that would continue to artificially sustain the existing riparian and wetland vegetation as it has for the life to the Kilarc Development. The riparian system within Hooten Gulch has adapted to the reliability of a source of water, and the species characterizing the riparian and wetlands within Hooten Gulch would continue.

The populations of big-scale balsam-root would continue to exist subject only to disturbances such as fire, disease, insect infestation, meteorological events, or competition from non-native noxious weed species.

Our Analysis

Continued operation of the Cow Creek Development under the No-Action Alternative, would continue to provide a long-term benefit to the riparian habitat and wetlands of Hooten Gulch and the project area. Riparian areas and seeps that occur as a result of project operations (flows and leakage) would also continue to benefit by remaining undisturbed and subject only to periodic flooding/inundations as a result of meteorological events. Upland vegetation would remain undisturbed and subject only to periodic fires, insect infestations, or disease. The populations of big-scale balsam-root would remain undisturbed and may continue, decline, or be enhanced independent of existing project operations. No impacts to upland vegetation or big-scale balsam-root would occur during continued operation of the Cow Creek Development under the No-Action Alternative.

3.3.5 Wildlife

3.3.5.1 Affected Environment

Kilarc and Cow Creek Developments

Wildlife resources were assessed for the project area by conducting a literature review; through agency consultations; and through reconnaissance level field surveys. Field surveys for terrestrial wildlife habitats were conducted in the project area in April and June 2003. Wildlife habitats were identified, and all wildlife observed or detected through diagnostic sign (i.e., track, scat, feather, carcass, etc.) were identified to species. For sensitive species, surveys were conducted in representative habitat to determine the potential for the species in the vicinity of the Kilarc and Cow Creek Developments. RTE species are discussed in section 3.3.6, *Rare, Threatened, and Endangered Species*. Because wildlife in general are mobile and the project area contains large tracts of undeveloped habitat that can act as corridors for wildlife, species can occur within appropriate habitats anywhere within the project area. As a result, the discussion of wildlife resources for the Kilarc and Cow Creek Developments is presented by wildlife associated with habitat found within the project area rather than by each specific development. Sensitive species, where possible, are presented by development when they occur only in a single development.

Unless otherwise noted, the information in this section originates in the Kilarc-Cow Creek Project botanical, and terrestrial and aquatic wildlife resources report (ENTRIX, Inc. 2007) contained within the LSA (PG&E 2009a).

As a result of the diverse vegetation within the Kilarc and Cow Creek Developments (see section 3.3.4.1, *Affected Environment*), wildlife resources are also diverse and include common, resident and migratory species. A wide variety of game species occur within the Kilarc and Cow Creek Developments, including game birds such as chukar, California quail, and mourning dove, though mourning doves are occasional in the Kilarc and Cow Creek Developments and are far too limited in abundance to provide a significant hunting resource. Mammal species that are hunted include mule deer, western gray squirrel, black-tailed jack rabbit, brush rabbit, and desert cottontail rabbit. Mule deer require cover (dense brush or timber) and open areas of brush or timber stands where it forages on a wide variety of vegetation.

Forested areas within the Kilarc and Cow Creek Developments provide habitat for small mammals (chipmunks, western gray squirrel, deer mouse, and bats) and larger mammals (gray fox, black bear, and mule deer). Ponderosa pine plantation may on occasion function as a wildlife corridor during deer migration and can be extremely important for deer nutrition during migration. Dead trees (snags) and large trees provide nesting sites for predatory birds (raptors) such as red-tailed hawks and owls. Other species of birds typically found in forested habitat include: dark-eyed junco, mountain chickadee, Steller's jay, western wood-pewee, mountain quail, western scrub jay, and northern flicker. Western fence lizard may also occur on the forest floor. The interior

live oak woodland vegetation community found along South Cow Creek within the Cow Creek Development provides habitat for species that are reliant on acorns as food. Many species of birds such as western scrub jay and yellow-billed magpie utilize acorns as a primary food source; western gray squirrel, California ground squirrel, and chipmunks also rely on acorns. This vegetation community also provides habitat to reptiles represented by gopher snake, king snake, and racers.

Mixed chaparral occurs adjacent to the previously described oak woodlands primarily within the South Cow Creek area of the Cow Creek Development. Wildlife using chaparral habitat is varied and may include: mountain quail, calliope hummingbird, dusky flycatcher, alligator lizards, and Belding's ground squirrel.

Nonnative grassland occurs in both developments and extends into openings within oak woodlands and Sierran mixed conifer forest. Common wildlife species typical of grassland habitat include western fence lizard, western rattlesnake, and mammals such as California ground squirrel, Botta's pocket gopher, western harvest mouse, California vole, black-tailed jackrabbit, and coyote. Birds of open grasslands include soaring species such as turkey vulture and American kestrel.

White alder riparian forest is the primary riparian forest community in the project area and is found along sub-drainages and along stream and creek edges. In general, riparian habitat within the developments is limited to narrow, linear strips due to steep slopes, bedrock channels, and fast-flowing water. Wildlife species using riparian habitat include amphibians such as Pacific tree frog and California newt; birds such as yellow warbler, American dipper, plumbeous vireo, and song sparrow. Mammals found in this habitat include gray fox, long-tailed weasel, long-tailed vole, and western harvest mouse. Freshwater emergent wetlands are used by aquatic and semi-aquatic species of wildlife including frogs and the western aquatic garter snake, and wading birds (egrets and herons) and waterfowl (ducks and geese). Mammals that may occur in the freshwater wetlands include muskrat and ornate shrew.

Other habitat used by wildlife within the project area includes the open water associated with the creeks and forebays of both developments. Generally, open water provides resting and foraging habitat for aquatic bird species (grebes, waterfowl, wading birds, shorebirds, gulls, and terns) and aerial insect foragers such as swifts, swallows, flycatchers, and bats. Fish-eating species such as osprey, bald eagle, and belted kingfisher are also found around open water. Many common mammals use open water as a source of drinking water and raccoons forage for prey along the shoreline.

The developed areas surrounding the facilities of both developments attract species that are tolerant of human activity and have adapted to maintained vegetation (lawns and landscaped areas). Typical species include: rock pigeons, western scrub jay, northern mockingbird, house finch, house sparrow, opossum, raccoon, and striped skunk.

3.3.5.2 Special Status Species

RTE species protected under the ESA or candidates for listing under the ESA are discussed in section 3.3.6, *Rare, Threatened and Endangered Species*. Special status wildlife species discussed in this section include species that may be protected by the state of California as endangered or threatened, California species of concern, California fully protected species, species identified as watchlist species by Cal Fish and Game, and other species identified as special animals by Cal Fish and Game. Species that have been removed from federal listing as recovered but that are still protected by state or other legislation are also discussed in this section. Consideration of these species is consistent with DOI's comment that they remain concerned about federally delisted species, and those species not listed under the ESA but designated by another agency or entity.

Amphibians and Reptiles

A list of six species of amphibians and two species of reptiles considered as potentially occurring in the project area was developed from literature searches. The Shasta salamander, western tailed frog, western spadefoot toad, Cascades frog, and the California horned lizard were determined "unlikely to occur" within the project area as a result of no habitat availability or the project being outside of the normal range of the species. There were no recorded observations of those species within a 5-mile radius of the Kilarc and Cow Creek Developments. California red-legged frog, foothill yellow-legged frog, and northwestern pond turtle were all either documented within the project area or had suitable habitat within the developments. California red-legged frog is discussed in section 3.3.6, *Rare, Threatened and Endangered Species*.

Foothill Yellow-Legged Frog (Rana boylii) − California State Species of Concern (CSC)

The foothill yellow-legged frog is found in foothill and mountain streams within a variety of habitats and generally prefers faster water habitat than other foothill frog species. Most records documenting occurrence are from habitat below 3,500 ft in elevation. The home range of the foothill yellow-legged frog is small, but individuals may move several hundred meters to find suitable spawning sites. Spawning occurs when water temperatures reach 53.7 to 59°F, usually between mid-March and May. The breeding season lasts for about two weeks, and eggs hatch in about five days. Tadpoles transform in three to four months, and in time disperse from spawning habitat to calm, shallow water. Juvenile and adult frogs bask on mid-stream boulders or in adjacent terrestrial habitat.

Within the project area, foothill yellow-legged frogs are found in the Cow Creek Development. Locations where individuals were observed include: South Cow Creek at the downstream end of the bypassed reach, in the downstream portion of Hooten Gulch where the Cow Creek powerhouse tailrace augments summer flow, and upstream of the Cow Creek powerhouse. Occurrences have been reported by Cal Fish and Game from South Cow Creek, downstream of the confluence with Hooten Gulch.

Northwestern Pond Turtle (Actinemys marmorata marmorata) – CSC

The northwestern pond turtle is uncommon to common throughout California, west of the Sierran crest from sea level to 6,000 ft in elevation where habitat provides suitable basking sites (partially submerged logs, rocks, mats of floating vegetation, or open mud banks). Eggs are laid from March to August depending on local conditions, and incubation ranges from 75 to 80 days. One northwestern pond turtle was observed in Hooten Gulch during field surveys, and appropriate habitat is present within the Kilarc and Cow Creek forebays, upstream from the diversion on South Cow Creek, and in Old Cow Creek. In addition, four records were found in the Cal Fish and Game database for occurrences of northwestern pond turtle within 5 miles of both developments.

Birds

After literature review and based on field surveys and documented habitats within the Kilarc and Cow Creek Developments, 16 species of birds were considered to occur or could potentially occur within the Kilarc and Cow Creek Developments based on available habitat and species' ranges. Another species not on the original list, Lewis' woodpecker, was observed during surveys in 2003.

Osprey – (Pandion haliaetus) Watch List (WL)

Primarily a fish-eating species, the osprey is found along seacoasts, lakes, and rivers. Large snags or open-topped trees usually within 1,000 ft of large, clear open waters are required for nesting. The breeding season occurs from March to September, after which individuals migrate to Central and South America for the winter months.

Suitable foraging habitat occurs at the Kilarc and Cow Creek forebays, and an osprey was observed foraging at the Kilarc forebay in June 2003. Although nesting has not been documented, suitable nesting habitat also occurs at the Kilarc forebay.

Bald Eagle (Haliaeetus leucocephalus) – Federal Delisted (FD), State Endangered (SE), California Fully Protected (CFP)

The bald eagle was removed from the endangered species list in 2007 by DOI; however, it continues federal protection under the Bald and Golden Eagle Protection Act and the federal Migratory Bird Treaty Act, and state protection as endangered under the California Endangered Species Act.

The bald eagle in California is a permanent resident and uncommon winter migrant with breeding populations in 28 counties. It is typically found in coniferous forest habitats with large, old growth or dominant trees near permanent water with abundant fish, adjacent snags, or other perches. Nests are found in large trees with open branches 50 to 200 ft above the ground. The nesting season occurs from February through July with the peak of activity occurring from March to June. No bald eagles or bald eagle nests were observed in the Kilarc and Cow Creek Developments during surveys, and there are no occurrences reported within a 5-mile radius of the Kilarc and

Cow Creek Developments, although there are at least 18 pairs resident at Lake Shasta about 15 miles to the northwest of the project area.

Northern Goshawk (Accipiter gentilis) − CSC

Optimal habitat for the northern goshawk contains mature, dense coniferous trees with a closed canopy of greater than 50 percent and open spaces for maneuverability in middle to higher elevations. The northern goshawk feeds mostly on other birds and uses snags and dead treetops as observation perches. Most individuals move to lower elevations in winter but some individuals may remain year-round in their breeding territory. Breeding occurs from April to June and incubation lasts 36 to 41 days. Fledging occurs 45 days after hatching.

In the project area, the northern goshawk may forage in riparian, blue oak-foothill pine woodland, or mixed coniferous vegetation communities in the Kilarc and Cow Creek Developments, and there are two records documenting observations of northern goshawk about 5 miles east of the Kilarc and Cow Creek Developments. No northern goshawks were seen during project area surveys.

Swainson's Hawk (Buteo swainsoni) – State Threatened

Swainson's hawk is restricted to portions of the Central Valley and Great Basin where suitable nesting and foraging habitat (riparian systems near large, open grasslands or agricultural areas) is still available. Riparian woodlands in the Kilarc and Cow Creek Developments may provide nest sites, and foraging could occur in grasslands, particularly in the southern portion of South Cow Creek. No Swainson's hawks were observed during surveys and there are no reported occurrences within a 5-mile radius of the Kilarc and Cow Creek Developments.

Golden Eagle (Aquila chrysaetos) – WL, CFP

Golden eagles are protected under the same federal legislation as bald eagles and are also fully protected in California and considered a watch list species. Golden eagles use a wide variety of habitats for foraging including rolling foothills, mountain areas, sage-juniper flats, and desert. Nesting occurs on cliffs and in large trees in open canyons and escarpments from late January through August. Golden eagles feed primarily on rabbits and rodents, though other mammals, carrion, and birds and reptiles are eaten. Golden eagles were observed in flight over the Cow Creek forebay on two occasions in 2003 but were not documented during focused raptor surveys. No other reported occurrences within a 5-mile radius have been documented. Golden eagles may forage over grasslands in the Kilarc and Cow Creek Developments and could nest in oak woodlands or mixed coniferous woodlands.

American Peregrine Falcon (Falco peregrinus americana) – FD, SE, CFP

Breeding American peregrine falcons have been documented in the Cow Creek watershed, and the American peregrine falcon may use riparian areas and inland wetlands for foraging; however, no American peregrine falcons or their nests were observed in the

Kilarc and Cow Creek Developments during focused raptor surveys. No other occurrences were documented within a 5-mile radius of the Kilarc and Cow Creek Developments.

Lewis' Woodpecker (Melanerpes lewis) – Special Animal (SA)

Lewis' woodpeckers are uncommon, local winter residents in open oak savannah, broken deciduous, and coniferous habitats where they nest in a cavity located in snags or dead branches of live trees. The breeding season occurs from May through July with peak activity occurring in late May and early June. Lewis' woodpecker was observed downstream from the Cow Creek Development along South Cow Creek and may use oak woodland and mixed coniferous habitats in the Kilarc and Cow Creek Developments. There were no previous documented observations of Lewis' Woodpecker within a 5-mile radius of the developments.

Little Willow Flycatcher (Empidonax traillii brewsteri) – SE (Nesting; all subspecies)

The little willow flycatcher is a subspecies of willow flycatcher that is a rare to locally uncommon summer resident in wet meadow and montane riparian habitats. It is most common where there is a lush growth of willows. The peak of nesting season occurs in June and young are hatched and fledged within about 30 days. Breeding habitat for the little willow flycatcher is marginal within the project area, and no little willow flycatchers were observed during surveys or have been reported within a 5-mile radius of the Kilarc and Cow Creek Developments. Occasional little willow flycatchers may forage in riparian habitats found within the Kilarc and Cow Creek Developments.

Mammals

A review of literature as well as state and federal species lists and field surveys determined that 12 species of special status mammal species potentially could occur in the Kilarc and Cow Creek Developments. Of the 12 species, eight are bats. Sierra Nevada red fox and California wolverine are not considered likely to occur in the Kilarc-Cow Creek Developments as the developments are not within the documented distribution of the species. Two other species, Pacific fisher and ringtail, may occur in the project area as appropriate habitat is available; however, no reported occurrences of either species has been documented within a 5-mile radius. Pacific fisher is discussed in section 3.3.6, *Rare, Threatened and Endangered Species*; ringtail and the eight species of bats are discussed below.

Bats

The silvered-haired bat (*Lasionycteris noctivagans*, SA) may occur anywhere in the Kilarc and Cow Creek Developments, although it is unlikely to be found using project buildings or tunnels. No individuals were observed during surveys and there is one recorded observation within a 5-mile radius of the Kilarc and Cow Creek Developments.

The Yuma myotis (*Myotis yumanensis*, SA) is tolerant of human activity and roosts by day in buildings, trees, mines, caves, bridges, and rock crevices; night roosts are in buildings, bridges, and other man-made structures. The long-eared myotis (*Myotis evotis*, SA) may use mines, caves, and buildings during the day where individuals occupy crevices and fissures; nocturnal roosts are in caves, mines, bridges, buildings, and rock crevices. Fringed myotis (*Myotis thysanodes*, SA) may occupy valley foothill woodland and mixed coniferous habitat as well as project facilities including the powerhouses and tunnels of both developments. Long-legged myotis (*Myotis volans*, SA) may use bridges, caves, mines, or buildings for nocturnal roosts. Small-footed myotis (*Myotis ciliolabrum*, SA) may use uplands and project facilities (powerhouses and tunnels). The spotted bat (*Euderma maculatum*, CSC) roosts in rock crevices and on cliffs as well as caves and buildings; within the project area, this species may use structures (powerhouses and tunnels) as well as mixed coniferous forest. Finally, the pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*, CSC) may occur in the Kilarc and Cow Creek Developments in moist habitats and within project facilities such as tunnels and powerhouses. These species may occur within the facilities of Kilarc and Cow Creek Developments, but no individuals were observed during surveys, and there are no reported observations within a 5-mile radius of the Kilarc and Cow Creek Developments.

Ringtail (Bassariscus astutus) – CFP

The ringtail is a common to uncommon, widely distributed permanent resident in riparian habitats and brushy areas of most forest and shrub habitats at low to middle elevations in California. It nests in rock recesses, hollow trees, logs, snags, abandoned burrows, or woodrat nests. The ringtail may occur in forested area in the Kilarc and Cow Creek Developments; however, no individuals were observed during surveys and there are no reported occurrences within a 5-mile radius of the Kilarc and Cow Creek Developments.

3.3.5.3 Environmental Effects of Proposed Action

General Wildlife Effects

Kilarc and Cow Creek Developments

Noise, lighting, and human activity during all aspects of the Proposed Action at both developments, including the construction and improvement of access roads, as proposed would result in temporary disturbance to wildlife species. Species intolerant of disturbance that are mobile enough to flee or avoid the areas of activity would leave until activity subsides. Activity associated with the Proposed Action may also result in the mortality of non- or minimally mobile wildlife species. Save Kilarc Committee commented that they are concerned about the effects of heavy machinery used during construction activities associated with the Proposed Action on wildlife species.

In general, the effects would be short-term and temporary and not severe enough to affect the survival of a species or population. PM&E measures WILD-2, WILD-3, and WILD-7 proposed by the licensee in the LSA would minimize adverse effects resulting

from the Proposed Action. According to PM&E measures WILD-1 and WILD-3, the licensee would conduct pre-construction surveys to determine the presence or absence of special status wildlife species, capture and relocate special status species as applicable; place avoidance or restrictions on activities as necessary and provide exclusion fencing around construction areas. PM&E measures WILD-1, WILD-2, WILD-3, and WILD-7 are all consistent with recommendations by Cal Fish and Game and DOI.

The licensee also proposes to provide environmental training for personnel involved in the activities associated with the Proposed Action (PM&E WILD-2) that would provide personnel with information on special status species potentially present in the area and avoidance or disturbance minimization actions to implement. Training would include descriptions of special status species that potentially may occur and the distribution of a brochure or pamphlet containing descriptions and instruction on careful driving and avoidance of amphibians, reptiles, or mammals in the path of construction vehicles. PM&E WILD-7 provides for the implementation of a speed limit on project roads and temporary access roads while activities are being conducted that would minimize injury or mortality to wildlife in roadways. PM&E measures proposed also provide measures to restore and rehabilitate vegetation communities affected by activities associated with the Proposed Action so that wildlife habitat may return as quickly as possible after the cessation of activity.

DOI and Cal Fish and Game have each recommended conditions for license surrender that are consistent with the licensee's PM&E measures WILD-1 through WILD-7 as described in the LSA and more specifically below as they apply to specific species or groups of animals.

Amphibians and Reptiles

The removal of the Kilarc main canal diversion dam and the South Cow Creek diversion dam may result in short-term loss of turtle and frog habitat directly below the dams as a result of the release of sediments from behind the dam, though these areas are not known to be used by foothill yellow-legged frogs. Reduced flows in Hooten Gulch resulting from the proposed removal of the South Cow Creek diversion dam may adversely affect northwestern pond turtles, foothill yellow-legged frogs, and the potential summer habitat for California red-legged frogs. The discontinuation of Cow Creek powerhouse operations during spring, as proposed, would return Hooten Gulch to a regime of natural ephemeral flow conditions during the season when natural flows are present that subside naturally. This would minimize potential effects on amphibians and turtles from rapid loss of aquatic habitat. Upon removal, the disappearance of backwater pools that have existed at the diversions would result in the loss of suitable pond habitat for other amphibian species and the northwestern pond turtle.

To offset potential adverse effects on amphibians and reptiles, PG&E has developed PM&E WILD-1 and PM&E WILD-2 which include conducting pre-construction surveys and the installation of exclusion fencing around construction areas. Should individuals of any special status species be found, the capture and safe relocation

of any individuals of amphibians (foothill yellow-legged frog and California red-legged frog) and reptiles (northwestern pond turtles) in construction areas would be implemented. As discussed in the *General Wildlife Effects* section above, the licensee also would provide for a biological monitor and construction personnel training to avoid and minimize any actions that may result in effects on wildlife including special status amphibians and reptiles.

Over the long-term, foothill yellow-legged frogs would benefit from the expected increase in summer flows to South Cow Creek which would result in increased breeding habitat for the species.

DOI and Cal Fish and Game each recommend the implementation of the proposed PM&E measures proposed to minimize Proposed Action effects. The conditions recommended by DOI and Cal Fish and Game include pre-construction surveys for amphibians and pond turtles, and implement avoidance and protection actions for any located species. Proposed avoidance and protection actions include capture and relocation of any foothill yellow-legged frogs and pond turtles to appropriate habitat outside the area of disturbance. If California red-legged frogs are located at any time, DOI would be notified and any ongoing work stopped until DOI approves start-up.

Birds

As previously discussed under *General Wildlife Effects*, noise and human activity associated with the Proposed Action at the Kilarc and Cow Creek Developments could result in disturbance to birds including raptors and special status species. Some individuals may temporarily abandon the area.

Because 13 of the special status bird species (white-tailed kite, sharp-shinned hawk, northern goshawk, Swainson's hawk, golden eagle, American peregrine falcon, western burrowing owl, Vaux's swift, rufous hummingbird, loggerhead shrike, hermit warbler, Lawrence's goldfinch, and little willow flycatcher) have not been observed within the Kilarc and Cow Creek Developments, it is unlikely that the proposed activities at Kilarc and Cow Creek would adversely affect any of these special status species. Minor adverse effects on existing potential habitat for these species may occur from the Proposed Action, especially those that result in removal of trees, saplings, shrubs, or other available nesting habitat, especially little willow flycatcher. For non-status bird species that may nest in vegetation communities at the Kilarc and Cow Creek Developments, unavoidable removal of vegetation planned during the nesting season may result in nest abandonment, direct loss of nests, and the loss of a breeding season for the affected species.

Lewis' woodpecker was observed downstream from the Cow Creek Development along South Cow Creek and may use oak woodland and mixed coniferous habitats in the Kilarc and Cow Creek Developments. As a cavity nesting species, removal of dead standing trees during activities within the nesting season would have the potential to adversely affect nesting of this species within the Cow Creek Development. Foraging

individuals would not be affected by activities as the species is highly mobile and would likely avoid areas of human or construction activity; foraging habitat would not be affected by activities.

Although not documented in the Kilarc-Cow Creek area, the little willow flycatcher uses riparian habitat, especially thickets of willows; marginal nesting habitat for little willow flycatcher does exist within the project area (South Cow Creek) and the species may forage in riparian habitats in the Kilarc-Cow Creek Developments. Disturbance/removal of riparian vegetation may occur as a result of the Proposed Action, particularly riparian areas near the South Cow Creek diversion dam and Cow Creek forebays. The implementation of PM&E BOTA-1 would provide for the preparation and implementation of an MMP for effects on riparian and wetland vegetation. The proposed MMP would be developed in consultation with Corps, Cal Fish and Game, and California SWRCB. The proposed MMP would include mitigation areas (e.g., the South Cow Creek diversion dam and Cow Creek forebays), goals, species to be assessed, methodologies, and performance measurement criteria, including a two-year monitoring program after completion of the Proposed Action for riparian and wetland vegetation requiring restoration or mitigation. These proposed measures would help preserve riparian habitat that may provide potential habitat for the little willow flycatcher.

Some open-water wildlife habitat would be lost from the dewatering of forebays, intake structures, spillways, and Hooten Gulch. The loss of open water of the Kilarc and Cow Creek forebays would reduce the foraging habitat for wading birds, raptors such as osprey and bald eagles, and aerial foragers such as swallows and swifts that are often associated with open water habitat. Save Kilarc Committee commented that the open water of Kilarc reservoir provides habitat for migrant and resident waterfowl, bald eagles, and osprey, and the loss of open water would affect these species. Additional comments of Save Kilarc Committee note that osprey and bald eagles are regularly observed. Although the loss of open water habitat within the project area would be permanent, most of these species are capable of foraging in other habitats, and adequate foraging over perennial creeks would be available for swifts and swallows. Ospreys and bald eagles are known to travel widely to find food and appear to be infrequent users of foraging habitat in the Kilarc and Cow Creek Developments; other sources of open water in the area may suffice as foraging habitat. Therefore, no long-term adverse effects are expected from the loss of open water foraging habitat for bird species including special status species.

To minimize effects of the Proposed Action on bird species including Lewis' woodpecker, little willow flycatcher, osprey, bald eagles, and other raptor species, the licensee has proposed PM&E WILD-3 for pre-construction surveys for raptors and nesting birds be implemented as conditions of the license surrender. Surveys for nesting birds would occur if vegetation is scheduled for removal during the breeding season (March 1 – September 1). If active nests of any raptors, special status species, or species protected under the Migratory Bird Treaty Act are observed, avoidance of the area would be implemented along with restricted distances for construction activities until nestlings have successfully fledged. DOI and Cal Fish and Game concur with the PM&E measures

as part of the proposed license surrender. In addition, as discussed under the *General Wildlife Effects* section above, PM&E WILD-2 includes a provision for a biological monitor who would provide training and guidance to construction personnel to ensure that all personnel are educated and aware of the potential for special status species to occur within the project area, their descriptions, and the actions to take upon identification of special status species (stop work, notification of the biological monitor, relocation, etc.).

Mammals

Ringtail is not documented in the Kilarc or Cow Creek Developments, and it is unlikely that the Proposed Action would have an effect on this species. Minor effects on potential habitat for ringtail may occur from disturbance resulting from noise, lighting, and human activities, and may cause disturbance if animals are located in the area. PM&E WILD-2 would establish training of construction personnel in special status species and provide a biological monitor who would provide proactive education and awareness of the potential for this species to be in the construction area.

Although none of the special status bat species have been observed in the Kilarc and Cow Creek Developments, the closure and removal of structures or sealing of tunnels associated with the Kilarc and Cow Creek Developments could cause disturbance or direct mortality to bat species that may roost in structures undergoing closure activities.

PM&E-WILD-5 as proposed by PG&E would require pre-construction surveys for bats associated with the Kilarc and Cow Creek Development tunnels and powerhouses. Surveys would be conducted for deconstruction activities that would occur between March 1 and September 30 when bats are most likely to be present. (DOI recommends surveys between October 1 and February 28 only if known or potential hibernation roost sites would be disturbed.) Surveys would occur as internal and external surveys of tunnels and powerhouses and night surveys in or near facilities with roosting bats. If bats are found using project tunnels, the tunnels would be sealed at both ends to prevent wildlife, especially bats from entering, living, or roosting in the tunnels. The licensee-proposed PM&E WILD-6 would require the installation of one-way exclusion devices on active entry points and would be left in place until all bats are excluded. PM&E WILD-5 and WILD-6 are also recommended by Cal Fish and Game and DOI. Commission staff concurs with these resource agency recommendations. As a result, negligible impacts to bat species that may occur within the project area are expected.

Our Analysis

The Proposed Action would result in short-term, minor adverse impacts to wildlife species inhabiting the Kilarc and Cow Creek Developments and vicinity due to disturbance from construction activities and traffic as well as human activities associated with the proposed removal processes. Mobile wildlife species would leave areas of activity and could return upon cessation of activity. Mortality of less mobile species of invertebrates, reptiles, and amphibians may occur during removal activities and would

result in short-term, minor adverse impacts. Loss of open-water habitat from the dewatering of the 4.5 acre Kilarc and 1-acre Cow Creek forebays would result in the relocation of some species and direct or indirect mortality of other less mobile species as a result of the construction activity or loss of riparian/wetland habitat associated with the forebays. Proposed measures that implement pre-project surveys avoid impacts to sensitive species and habitat to the extent practicable, and employee education and awareness, would minimize impacts to species removal activities associated with the Proposed Action.

Over the long-term, foothill yellow-legged frogs would benefit from the expected increase in summer flows to South Cow Creek that would result in increased breeding habitat for the species. Over the long-term, populations of wildlife species in the project area would be able to sustain their populations despite the potential for some mortality resulting from the Proposed Action.

No significant impacts to any wildlife species are expected from the implementation of the Proposed Action and associated PM&E measures.

3.3.5.4 Environmental Effects of Action Alternative 1

Environmental effects to wildlife as a result of implementation of AA1 would be similar to effects discussed for the Proposed Action under section 3.3.5, *Wildlife.* PM&E measures applicable to wildlife and previously discussed for general wildlife environmental effects would minimize any adverse effects on wildlife. A discussion of specific potential environmental effects by development follows.

Kilarc Development

Effects on wildlife at Kilarc would primarily occur as a result of localized disturbance in the vicinity of the North and South Canyon diversions, canals, and siphons. The open water of the Kilarc forebay would remain and would continue to provide foraging habitat for mammals and birds. Maintenance of a minimum instream flow in the bypassed reach would provide a more consistent water source and would benefit wildlife, especially amphibians and foraging species. Over the long-term, wildlife in the project area would benefit from the maintenance of water flows and the presence of the Kilarc forebay. The forebay has been recognized as providing foraging habitat for species such as osprey and aerial foraging bird species. PM&E measures previously discussed in *General Wildlife Effects* under section 3.3.5, *Wildlife,* would minimize any adverse effects on wildlife.

Our Analysis

The types of effects expected at the Kilarc Development as a result of implementation of AA1 would not be different from those expected under the Proposed Action. Action Alternative 1 would minimize the extent of activity, limiting it to the North and South Canyon facilities, so the effects on any wildlife would also be limited. Disturbance for noise, human activity, and construction activity, and some direct mortality to less mobile wildlife species would occur as short-term, minor adverse

impacts for areas where activity occurs. Because the Kilarc forebay would be left in place, wildlife species including sensitive species such as osprey and bald eagle would continue to have foraging habitat associated with the open water system and fringe wetlands along the shoreline. Maintaining the Kilarc forebay would result in a long-term benefit to wildlife species that regularly use the open water habitat.

Cow Creek Development

Decommissioning of the Cow Creek Development would result in disturbance to wildlife species in the vicinity of activities as under the Proposed Action. Foothill yellow-legged frog and the northwestern pond turtle that have been observed in the South Cow Creek bypassed reach and Hooten Gulch may be adversely affected by initial activity; however, over time the foothill yellow-legged frog and northwestern pond turtle would benefit from the continuation of flow in the South Cow Creek bypassed reach as in AA1, which would provide long-term enhancements to riparian habitat used by both species.

In response to potential effects on amphibians and reptiles, PG&E has developed PM&E WILD-1 and PM&E WILD-2 that include conducting pre-construction surveys and installing exclusion fencing around construction areas. Should individuals of any special status species be found, the capture and safe relocation of any individuals of amphibians (foothill yellow-legged frog and California red-legged frog) and reptiles (northwestern pond turtles) in construction areas would be implemented. As discussed in *General Wildlife Effects*, under section 3.3.5, *Wildlife*, the licensee would also provide for a biological monitor and construction personnel training to avoid and minimize any actions that may result in effects on wildlife including special status amphibians and reptiles.

DOI and Cal Fish and Game each recommend the implementation of PG&E's PM&E measures proposed to minimize effects. The conditions recommended by DOI and Cal Fish and Game include pre-construction surveys for amphibians and pond turtles, and implement avoidance and protection actions for any located species. Avoidance and protection actions include capture and relocation of any foothill yellow-legged frog and pond turtles to appropriate habitat outside the area of disturbance. If California red-legged frogs are located at any time, DOI would be notified and any ongoing work stopped until DOI approves start up. No significant impacts to wildlife resources would be expected with the implementation of the proposed mitigation measures.

Our Analysis

No significant impacts are expected from implementation of AA1 at the Cow Creek Development. Environmental effects on wildlife resources resulting from the implementation of AA1 at the Cow Creek Development would result in general short-term disturbance to species and habitat as previously discussed. Over the long-term, foothill yellow-legged frog and northwestern pond turtle could benefit from the

restoration of flow within the bypassed reach of South Cow Creek as a result of riparian enhancement along the reach.

3.3.5.5 Environmental Effects of Action Alternative 2

Environmental effects to wildlife as a result of implementing AA2, which includes the decommissioning of the Kilarc Development and partial dismantling of Cow Creek Development, would be similar to effects discussed for the Proposed Action in section 3.3.5, *Wildlife*. PM&E measures applicable to wildlife and previously discussed would minimize any adverse effects on wildlife. A discussion of specific potential environmental effects by development follows.

Kilarc Development

The loss of 1-acre open-water habitat for aerial foraging birds, waterfowl, and piscivorous species such as osprey and bald eagle would occur with the dewatering and backfilling of the Kilarc forebay. The forebay has been recognized as foraging habitat for species such as osprey and aerial foraging bird species. As mobile species, birds that have previously used the open waters of Kilarc forebay would relocate to another water source to forage; no long-term adverse effects to osprey, bald eagles, swallows, and other bird species would result from the dewatering of the Kilarc forebay. Similarly, other wildlife species that forage within or along the shoreline of the forebay or use the waters of the forebay would not be adversely affected by the dewatering of the forebay; other sources of open water habitat would be available including the restored Old Cow Creek.

Our Analysis

No significant impacts are expected from the implementation of AA2 at the Kilarc Development. Environmental effects to wildlife resources resulting from implementing AA2 at the Kilarc Development would result in general short-term, minor disturbance to species and habitat as previously discussed.

Cow Creek Development

As discussed for the Kilarc Development, the loss of 1-acre open water habitat for aerial foraging birds, waterfowl, and piscivorous species such as osprey and bald eagle would also occur with the dewatering and backfilling of the Cow Creek forebay. Similarly, other wildlife species that forage within or along the shoreline of the forebay or use the waters of the forebay as a source of water would no long have access to the Cow Creek forebay. However, no long-term adverse affects would result from the dewatering of the forebay, because other sources of open water habitat would be available, including South Cow Creek.

Over the long-term, foothill yellow-legged frogs and northwestern pond turtles would benefit by continuation of flows to Hooten Gulch.

Our Analysis

No significant impacts are expected from the implementation of AA2 at the Cow Creek Development. Environmental effects to wildlife resources resulting from implementing AA2 at the Cow Creek Development would result in general short-term, minor disturbance to wildlife species and habitat as previously discussed. Over the long-term, foothill yellow-legged frogs and northwestern pond turtles would benefit by continuation of flows to Hooten Gulch.

3.3.5.6 Environmental Effects of No Action

Kilarc Development

Under the No-Action Alternative the wildlife resources including special status species within the Kilarc Development would continue under the existing conditions with continued operation of the project. Wildlife habitats would continue to exist and wildlife species would continue their existence with appropriate habitats subject only to natural disturbances and natural mortality. Wildlife within the Kilarc Development would be expected to maintain their populations unaffected by project operations as they are adapted to the habitats currently existing within the project area and are not affected by daily operations of the project.

Our Analysis

Continued operation of the Kilarc-Cow Creek Project under existing conditions (No-Action Alternative) and operational requirements would have no impact on existing wildlife resources within the project boundary. The existence and operation of the Kilarc Development for more than 100 years has resulted in a series of wildlife habitats and wildlife species within those habitats that are adapted to project operations and the resulting current conditions. Natural phenomena, disease and fires would continue to affect wildlife and wildlife habitat independent of continued project operations.

Cow Creek Development

Under the No-Action Alternative, the wildlife resources within the Cow Creek Development would continue under the existing conditions of project operations. Hooten Gulch riparian and wetland plant communities would continue to exist as a result of continued augmented flow, and yellow-legged frog and northern pond turtle would benefit by continuation of flows to Hooten Gulch.

Our Analysis

Continued operation of the Cow Creek Development would not adversely affect the existing wildlife resources, including special status species within the Old Cow Creek and South Cow Creek watersheds. Wildlife species would persist into the future under the existing conditions and would be affected only by natural processes and cycles of disease, predation, and other external forces.

3.3.6 Rare, Threatened, and Endangered Species

3.3.6.1 Affected Environment

Fisheries and Aquatic RTE

Three runs of anadromous salmonids that could occur within the project area are either listed or have been considered for listing under the ESA: (1) the threatened Central Valley steelhead distinct population segment (DPS); (2) the threatened Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU); and (3) Central Valley fall- and late fall-run Chinook salmon ESU, a federal species of concern.

The Central Valley steelhead DPS includes all naturally spawned populations of steelhead within the Sacramento and San Joaquin River Basins (71 *Federal Register* [FR] 834). Critical habitat for Central Valley steelhead was designated September 2, 2005, and includes portions of Cow Creek and its tributaries (70 FR 52488).

Central Valley steelhead is a winter-run species, returning to freshwater in autumn or winter, migrating upstream, and spawning in late winter or spring (Meehan and Bjornn, 1991 as cited in PG&E, 2009a). Central Valley steelhead mature in the ocean, entering freshwater with well-developed gonads, and spawn shortly after reaching their natal stream. They typically enter freshwater from October through mid-April, although most fish return between November and January. Most spawning occurs from late January into April (McEwan and Jackson, 1996 as cited in PG&E, 2009a). Unlike other Pacific salmon, steelhead are capable of spawning in multiple years before they die. Depending on water temperature, eggs incubate for one and one-half to four weeks before hatching. Optimal temperatures for growth and survival of steelhead fry range from 59 to 64°F, although steelhead have been observed to grow at warmer temperatures in some parts of their range. Central Valley steelhead typically migrate to the ocean after spending their first two years in freshwater. They typically reside in the ocean for one or two years prior to returning to their natal stream to spawn as four or five year-olds (Moyle, 2002, as cited in PG&E, 2009a).

The Central Valley fall-run and late fall-run Chinook salmon ESU is designated as a species of concern and includes all naturally spawned populations of fall-run and late fall-run Chinook salmon in the Sacramento and San Joaquin Rivers and their tributaries. Fall-run and late fall-run Chinook salmon have been reported primarily within the South Cow Creek (SHN, 2001, as cited in PG&E, 2009a) portion of the Cow Creek watershed. These runs are considered jointly under the listing, but the project area is believed to support only fall-run Chinook salmon populations.

Central Valley fall-run Chinook salmon historically spawned within the Central Valley floor and foothill reaches of the Sacramento-San Joaquin (Rutter, 1904 as cited in PG&E, 2009a). They currently spawn in low-gradient portions of most Central Valley streams (typically, to an upper limit of 1,000-ft elevation). Fall-run Chinook salmon do not appear to use Old Cow Creek particularly in the Kilarc Development-affected portion of the Old Cow Creek watershed. This is related to the timing of their run during the end

of the dry season, which does not coincide with periods of high winter flows that would enable them to negotiate Whitmore Falls downstream of the Kilarc tailrace. Limited opportunities may be presented by earlier than usual storm events. Fall-run Chinook salmon occur in South Cow Creek through Wagoner Canyon (Yoshiyama et al., 2001 as cited in PG&E, 2009a) and have occasionally been observed above the Wagoner Canyon. The absence of Chinook salmon redds above the Canyon in Cal Fish and Game surveys indicates that only a few individual Chinook salmon make it past the canyon, thus spawning upstream of the canyon is probably minimal at this time. It is not known whether they utilize areas upstream of the South Cow Creek diversion dam; they have not been observed using the fish ladder at the diversion dam. This existing fish ladder does not meet current standards for anadromous salmonids.

Central Valley fall-run Chinook salmon migrate to their spawning grounds in the low-gradient sections of the river after the first series of rains increase stream flow and reduce water temperatures (Vogel and Marine, 1991 as cited in PG&E, 2009a). Central Valley fall-run Chinook salmon spawn soon after they enter their natal streams (Yoshiyama et al., 2001 as cited in PG&E, 2009a) from early October through late December (Vogel and Marine, 1991 as cited in PG&E, 2009a). The preferred stream temperature for Chinook salmon spawning is generally 52°F, with a range from 42 to 56°F (Vogel and Marine, 1991 as cited in PG&E, 2009a). The eggs hatch following a three- to four-month incubation period, and the alevins (sac-fry) remain in the gravel for another two to three weeks (Cal Fish and Game, 1995 as cited in PG&E, 2009a). Once the yolk sac is absorbed, the fry emerge and begin feeding on a variety of terrestrial and aquatic insects (Moyle, 2002, as cited in PG&E, 2009a). All fall-run Chinook salmon fry emerge by early June (Cal Fish and Game, 1995 as cited in PG&E, 2009a) and begin to disperse downstream (Moyle, 2002, as cited in PG&E, 2009a). Suitable temperatures for fry growth and survival range from 55 to 64°F (Moyle, 2002, as cited in PG&E, 2009a). Fry prefer shallow, silty substrate along the stream edge, moving to deeper, swifter water as they mature (Moyle, 2002, as cited in PG&E, 2009a). Juveniles migrate downstream in the spring when flows begin to decline and water temperatures begin to increase. Fall-run Chinook salmon juveniles seldom spend more than three to four weeks in freshwater before migrating downstream toward the Sacramento-San Joaquin Delta (Moyle, 2002, as cited in PG&E, 2009a). In the ocean, these salmon typically remain off the California coast, feed mainly on fish, and grow rapidly (Myers et al., 1998, as cited in PG&E, 2009a).

The Central Valley spring-run Chinook salmon ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries (70 FR 37160). Critical habitat for Central Valley spring-run Chinook salmon was designated on September 2, 2005 (70 FR 52488), but does not include Cow Creek or its tributaries. The few individual potential spring-run Chinook salmon that have been observed in the project vicinity are believed to be strays from other tributary systems.

Terrestrial RTE

Federally-listed species that may potentially occur or do occur in appropriate habitats within the Kilarc and Cow Creek Developments include one invertebrate, one amphibian, one bird, and one mammal species. There are no known occurrences of federally listed plant species in the vicinity of the project. Unless otherwise noted, the information in this section originates in the Kilarc-Cow Creek Project botanical, and terrestrial and aquatic wildlife resources report (ENTRIX, Inc., 2007) contained within the LSA (PG&E, 2009a).

Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus) (VELB) – Federally Threatened (FT)

The VELB is associated with various species of elderberry throughout the California Central Valley and foothills (below 3,000 ft in elevation). Shasta County is - within the VELB's range, though no critical habitat designated for this species exists in the county. The VELB occurs within riparian vegetation communities where it feeds exclusively on elderberry in both adult and larval stages. Larvae feed internally on the pith of the trunk and larger branches and it appears that they require stems that are greater than 1-in. diameter at ground level. Prior to becoming adults, the VELB larvae chew an exit hole in the elderberry trunk as an exit for the emerging adult. Adult VELB appear to feed externally on the flowers and foliage of the elderberry.

In 2003, surveys in the Kilarc and Cow Creek Developments were conducted to locate elderberry shrubs considered to be habitat for VELB (with stems greater than 1 in.). The surveys found elderberry shrubs in two locations in the Cow Creek Development: (1) the south side of the South Cow Creek main canal, opposite the canal trail, and (2) near the trail on the steep, inaccessible slope between South Cow Creek main canal and South Cow Creek. At the first location, one elderberry bush was found that had three stems: one less than 1-in. diameter, one about 1-in. diameter, and a third that was about 1.5-in. diameter. One elderberry at the second location had one stem that was less than 1-in. diameter. Though no VELB or holes were observed on either plant, both elderberry bushes are considered appropriate habitat for VELB. No documented occurrences of VELB were found within a 5-mile radius of the Kilarc and Cow Creek Developments.

California Red-Legged Frog (Rana aurora draytonii) − FT

The California red-legged frog occurs primarily below 3,500 ft in elevation, although historical records document occurrences up to 5,200 ft in elevation. Critical habitat has been designated for the species about 30 miles southwest of the Kilarc and Cow Creek Developments where the nearest documented occurrence has been reported (Tehama County).

As an amphibian, the California red-legged frog spends most of its time near water where breeding occurs. The California red-legged frog uses coastal lagoons, marshes, springs, permanent and semi-permanent ponds, ponded and backwater portions of

streams, and artificial impoundments. Spawning sites are typically 2.3 to 3.3 ft deep for at least 6.6 ft from the wetted edge, with dense bordering wetland vegetation (cattails, tules, sedges, willows). This species may use ephemeral habitat for spawning. Springs and seeps may provide foraging habitat or refuge. Floating vegetation is used as basking habitat for adults and as foraging habitat for tadpoles. Tadpoles transform in three and one-half to seven months and juveniles are found in slow moving, shallow riffles.

In summer, larger adult individuals are found close to spawning habitat or along deep, quiet pools and creeks with vegetative cover, emergent vegetation, undercut banks, root masses, or burrows in or above banks as secure shelters.

In the Kilarc and Cow Creek Developments, there is no habitat capable of supporting California red-legged frogs, though potential summer habitat exists along Hooten Gulch within 38 ft of its confluence with South Cow Creek. This summer habitat would only be considered as appropriate habitat when or if confirmed spawning habitat was documented within 1 mile of the site on Hooten Gulch.

Northern Spotted Owl (Strix occidentalis caurina) – FT, CSC

The northern spotted owl occurs in dense, old growth, mixed conifer, redwood, Douglas fir, and oak woodland habitat with vegetation and tree layers of varying heights and a dense canopy cover of greater than 70 percent. Large trees with cavities or broken tops are preferred nesting sites. Nesting generally occurs from early March through June with a peak in April and May. One brood per year is raised out of a clutch size of one to four eggs (average two). Critical habitat for northern spotted owls has been designated but there is none in the project area.

Spotted owls in the vicinity of the Kilarc and Cow Creek Developments would be considered the California spotted owl, not the northern spotted owl, as the Cow Creek watershed is located south of the Pit River watershed. The Pit River is considered the boundary between the two sub-species. Mixed coniferous forest in the Kilarc and Cow Creek Developments is considered appropriate foraging and nesting habitat, though no spotted owls were observed in the Kilarc and Cow Creek Developments during surveys and there are no documented occurrences within a 5-mile radius of the Kilarc and Cow Creek Developments.

Pacific Fisher (Martes pennant pacifica) – Federal Candidate (FC), CSC

The Pacific fisher is an uncommon permanent resident of the Sierra Nevada, Cascade, and Klamath Mountains in California. The Pacific fisher requires large areas of mature, dense forest with snags, and a canopy closure of greater than 50 percent. One to four young develop in the womb over the winter and these mammals are born from February through May. No observations of Pacific fisher were documented during surveys in 2003, though individuals are potentially present in mature, dense forest habitat. It is likely that if present, the Pacific fisher would avoid project facilities and other areas where human activity occurs. There are no reported occurrences of Pacific fisher within a 5-mile radius of the Kilarc and Cow Creek Developments.

3.3.6.2 Environmental Effects of Proposed Action

Fisheries and Aquatic RTE

Kilarc Development

The Proposed Action will restore full natural flows and a seasonal hydrograph to Old Cow Creek between the Kilarc diversion dam and the Kilarc tailrace. The higher flows restored to the Kilarc Development's bypassed reach under the Proposed Action could result in slightly cooler summer water temperatures and a potential enhancement of the extent and quality of spawning substrate. Water temperatures in the bypassed reach meet criteria for coldwater fisheries under the existing license and would continue to do so. Removal of the Kilarc diversion dam would allow for the release of native gravels stored behind the dam, thereby enhancing downstream spawning habitat.

Our Analysis

The Kilarc Development does not affect flows downstream of the tailrace through the area of Whitmore Falls, therefore, the Proposed Action would have no effect on the ability of steelhead or Chinook salmon to pass upstream of this feature. Several barriers to fish migration located in the bypassed reach could be passable by migratory fish at extremely high flows; however, the frequency, magnitude, and duration of these high flows are not significantly affected by project operations. Thus, the Proposed Action is not likely to have a significant effect on the amount of available habitat for either steelhead or fall-run Chinook salmon in the Old Cow Creek watershed upstream of these barriers in the bypass. However, short and long-term benefits would be associated with the release of native material stored behind the dam, which would enhance downstream spawning habitat.

Cow Creek Development

The Proposed Action will restore full natural flows and a seasonal hydrograph to South Cow Creek between the Cow Creek diversion dam and where flows return to South Cow Creek at Hooten Gulch. Currently, water temperatures above the diversion dam and in the bypassed reach frequently fail to meet criteria for coldwater fisheries under the existing license. The higher flows restored to the Cow Creek Development's bypassed reach under the Proposed Action could result in slightly cooler summer water temperatures and a potential enhancement of the extent and quality of spawning substrate.

Our Analysis

Under the Proposed Action, water temperatures are likely to be slightly cooler through the bypassed reach; however water temperature may continue to exceed 68°F during low flow summer periods. Several barriers to migration have been identified in the Wagoner Canyon portion of the South Cow Creek bypassed reach. It was estimated that these features are passable at minimum flows of 20-25 cfs. Significant long-term benefits would be associated with the restoration of full natural flows, allowing steelhead

and fall-run Chinook salmon to migrate upstream through the bypass during their respective spawning run. Under existing license conditions, steelhead use the fish ladder at the Cow Creek diversion dam to access aquatic habitat upstream of the Cow Creek Development. Removal of the diversion structures would enhance opportunities for both steelhead and Chinook salmon to access habitat in these upstream areas. Short and long-term benefits would be associated with the release of native material stored behind the dam, which would enhance downstream spawning habitat.

Terrestrial RTE

The licensee has been involved in informal consultation with DOI since 2002 and was granted non-federal representative status for informal consultation under the ESA by the Commission in a letter dated June 16, 2008. On September 10, 2009, DOI sent a letter to PG&E concurring that the proposed activities were not likely to adversely affect California red-legged frog and the VELB. The letter concluded that no further consultation was necessary unless new information became available.

Whitmore Community Stakeholders submitted comments questioning disturbance to a 100-year old stable habitat that contains 31 special wildlife species, including the bald eagle. Although there are not likely to be direct adverse effects on any terrestrial RTE species under the Proposed Action, PM&E measures WILD-1 and WILD-2 would be used by PG&E to minimize the potential for adverse effects on RTE species and general wildlife species found within the Kilarc and Cow Creek Developments. Pre-construction surveys would provide current information on the possible presence or location of RTE species within the developments. If identified, appropriate measures to reduce potential effects would be implemented for specific species as discussed below. WILD-2 would provide an increased awareness of trained construction personnel, include the presence of a biological monitor who can assist with identification of RTE species, implement stop work orders, and notify appropriate agency personnel as necessary. WILD-1 and WILD-2 are consistent with recommendations by Cal Fish and Game and DOI, and are consistent with the California Wildlife Action Plan (Cal Fish and Game, 2007 as cited in PG&E, 2009a).

Valley Elderberry Longhorn Beetle

Potential effects of proposed construction activities to the elderberry shrubs that are the host plant for VELB would be minimized by the implementation of PM&E WILD-4. WILD-4 provides pre-construction surveys for VELB host plants (elderberry shrubs). Protection through avoidance of any elderberry shrubs would protect potential habitat for VELB.

California Red-Legged Frog

Although the California red-legged frog has not been found to occur within the Kilarc and Cow Creek Developments, the licensee has proposed PM&E WILD-1 to minimize potential construction activity effects on the California red-legged frog from construction activities. Pre-construction surveys for California red-legged frogs would

provide current information on the presence of the frogs and minimize effects by implementing protection measures that may include relocation of individuals as necessary. In addition, PM&E WILD-2 would provide a biological monitor who would provide training to construction personnel on environmental awareness including identification of special status species including the red-legged frog, avoidance or minimization measures to be implemented including notification of the biological monitor and stop work orders.

Northern Spotted Owl

Although the northern spotted owl is not known to occur in the project area, PM&E WILD-3 proposed by the licensee would provide for pre-construction surveys in appropriate habitat to determine possible presence of northern spotted owl within the Kilarc and Cow Creek Developments prior to initiation of any proposed activities. PM&E WILD-2 would be in place and would provide a biological monitor who would provide training to construction personnel on environmental awareness including identification of special status species, avoidance or minimization measures to be implemented including notification of the biological monitor and stop work orders. WILD-3 and WILD-2 are consistent with recommendations by Cal Fish and Game and DOI.

Pacific Fisher

Licensee proposed PM&E WILD-2 implements a biological monitor to provide training and guidance to construction personnel to ensure that all personnel are educated and aware of the potential for special status species to occur within the project area, their descriptions, and the actions to take upon identification of special status species (notification of the biological monitor, stop work, relocation, etc.). In addition, PM&E WILD-7 would implement a posted 15 mile-per-hour speed limit on access and construction roads within the Kilarc and Cow Creek Developments that would reduce the potential for Pacific fisher mortality from fast-moving construction traffic, and is consistent with the recommendations from DOI.

Our Analysis

No direct adverse effects to terrestrial RTE species are expected under the Proposed Action, though short-term adverse effects could occur to potential habitat. Potential summer habitat is available for the California red-legged frog in Hooten Gulch, and VELB habitat (elderberry shrubs) exist near the South Cow Creek main canal at the Cow Creek Development. However, no California red-legged frogs or VELB have been documented within the project area. If the Proposed Action is implemented in associated with proposed PM&Es WILD-1 through WILD-4 and WILD-7, any impacts to the potential habitat or occurrence for RTE species in the project area would be minimized.

3.3.6.3 Environmental Effects of Action Alternative 1

Fisheries and Aquatic RTE

Kilarc Development

Under AA1, the Kilarc diversion dam, canal, and forebay would remain in place. Flows at the diversion dam would be split between the canal and the bypassed reach to support aquatic and recreational resources in the Kilarc forebay and aquatic habitat in the bypassed reach. This alternative would also require installation of a fish ladder and screen at the diversion dam and canal.

Our Analysis

The flow increase under AA1 would enhance nursery habitat available to resident and migratory salmonid fry and juveniles, although less so than the Proposed Action. The barriers to fish passage in the bypass would remain impassable during low summer flows. AA1 would have a negligible effect on natural high flows from late fall through spring, similar to the Proposed Action and the No-Action Alternative. The unnamed fish passage barrier (OC-11) is passable only at extremely high flows during the winter. The frequency and duration of such flows would not be affected by AA1; therefore, this alternative would not affect access of steelhead and Chinook salmon to upstream spawning habitat, compared to existing conditions. Fish able to pass above OC-11 would benefit from a new fish ladder, but this is expected to have a minor impact on the population.

Cow Creek Development

Under AA1, the Cow Creek Development would be decommissioned as described in the Proposed Action. The environmental effects on aquatic resources at the Cow Creek Development (particularly within the South Cow Creek bypassed reach) and proposed PM&E measures under AA1 would be the same as described for the Proposed Action (see sections 3.3.3.2, and 3.3.6.2, *Environmental Effects of Proposed Action*).

Terrestrial RTE

No direct adverse effects to RTE species are expected as a result of the implementation of AA1 as at the time of this analysis, there are no documented occurrences of any RTE species within the Kilarc or Cow Creek Developments.

Kilarc Development

Short-term minor adverse effects to potential habitat for northern (California) spotted owl and Pacific fisher may occur as potential habitat is present within the Kilarc Development. Implementation of PM&E measures as described for the Proposed Action would be consistent for the proposed activities in AA1.

Cow Creek Development

VELB habitat occurs with the presence of several elderberry shrubs along the South Cow Creek main canal. Loss of VELB habitat could result from activity associated with implementation of AA1 and result in unavoidable adverse impacts.

Degradation of or loss of potential summer habitat for the California red-legged frog could occur from the loss of augmented flow to Hooten Gulch due to the removal of the Cow Creek Development resulting in long-term minor adverse impacts to the potential habitat for the California red-legged frog.

Short-term minor adverse effects to potential habitat for northern (California) spotted owl and Pacific fisher may occur as potential habitat is present within the development. Implementation of PM&E measures WILD-1 through WILD-4 and WILD-7 would minimize the potential for impacts to RTE species or their habitat under AA1.

Our Analysis

No direct effects to terrestrial RTE species are expected as a result of implementation of AA1, as there are no known occurrences of RTE species within the developments. Short-term minor adverse effects may occur to potential habitat for Pacific fisher and northern (California) spotted owl as a result of vegetation disturbance or removal necessary for implementing AA1 at both developments. Removal of the Cow Creek Development facilities has the potential to cause the loss of VELB habitat and direct loss or degradation of potential summer habitat for the California red-legged frog as a result of AA1.

3.3.6.4 Environmental Effects of Action Alternative 2

Fisheries and Aquatic RTE

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described in the Proposed Action. The environmental effects on aquatic resources, including steelhead and Chinook salmon, at the Kilarc Development and proposed PM&E measures under AA2 would be the same as described for the Proposed Action (see sections 3.3.3.2 and 3.3.6.2, *Environmental Effects of Proposed Action*).

Cow Creek Development

Under AA2, the Cow Creek diversion dam, canal, and forebay would remain in place and operational. Flows at the diversion dam would be split between the canal and the bypassed reach to support the water rights for ADU and the conduit exempt Tetrick Hydroelectric Project which draw their water rights from Hooten Gulch. Flows adequate to supply about 13 cfs to the Abbott Ditch would be diverted at the Cow Creek diversion dam and the remainder of flow would remain in the South Cow Creek bypassed reach.

During summer, flows in the bypassed reach would be slightly higher than under the No-Action Alternative.

Our Analysis

The relatively low flows under AA2 generally would not support passage of migratory salmonids past several natural barriers in the Wagoner Canyon portion of the bypassed reach; however, this period does not coincide with the spawning migration periods for steelhead or fall-run Chinook salmon. Natural high flows would be relatively unaffected by AA2 during late fall through early spring when steelhead and late fall-run Chinook salmon are present.

Adult steelhead have been observed in Hooten Gulch under existing license conditions. Under the Proposed Action, the artificial permanent flows through Hooten Gulch downstream of the Cow Creek powerhouse would be terminated. Action Alternative 2 would continue to provide permanent flows of at least 13 cfs through this reach of Hooten Gulch. The extent to which steelhead utilize aquatic habitat in Hooten Gulch under the existing license is unknown and the effect of reducing those flows to about 13 cfs on steelhead utilizing Hooten Gulch is also unknown.

Terrestrial RTE

No direct effects to RTE species are expected as a result of implementing AA2 as there are no known occurrences of RTE species within the developments. Short-term minor adverse effects may occur to potential habitat for Pacific fisher and northern (California) spotted owl as a result of vegetation disturbance or removal necessary for implementing AA2 at both developments.

Kilarc Development

Limited, short-term minor adverse effects to potential habitat for northern (California) spotted owl and Pacific fisher may occur as potential habitat is present within the development. Implementation of PM&E measures as described for the Proposed Action would be consistent for the proposed activities undertaken in AA2.

Cow Creek Development

Summer habitat for the California red-legged frog occurs in Hooten Gulch, and VELB habitat occurs with the presence of several elderberry shrubs along South Cow Creek.

Action Alternative 2 would provide augmented flow to Hooten Gulch from the penstock and tailrace at the Cow Creek Development. As a result, the potential summer habitat for California red-legged frog would be maintained. Maintenance of the potential summer habitat for the California red-legged frog would provide long-term potential benefit to the frog should the species colonize the area in the future.

No effects to VELB habitat along the South Cow Creek main canal are expected. Activity resulting from the construction of a new fish screen would be limited in area to

the entrance of the canal and should not affect existing VELB habitat. Implementation of PM&E WILD-4 would require the initiation of pre-construction surveys for VELB habitat. Surveys would determine the location of any elderberry shrubs within 100 ft of the proposed construction activity at the canal entrance. Avoidance of any elderberry shrubs would be incorporated into construction plans to the extent practicable. The licensee would implement measures provided in the biological opinion[27] for VELB if elderberry shrubs were determined to be affected by activity associated with implementation of AA2.

Our Analysis

No direct adverse effects to terrestrial RTE species are expected from AA2, though short-term adverse effects could occur to potential habitat for the northern spotted owl, VELB, or Pacific fisher if the Proposed Action is implemented with the proposed PM&Es WILD-1 through WILD-4, and WILD-7.

3.3.6.5 Environmental Effects of No Action

Fisheries and Aquatic RTE

Kilarc Development

The No-Action alternative would leave all Kilarc Development structures in place and would not alter the distribution of flows through the project-affected reach. Water temperatures would continue to be supportive of both steelhead and Chinook salmon. Significant quantities of good quality salmonid spawning substrate were identified in the bypassed reach below the impassable unnamed falls (OC-11), which would not be changed from existing license conditions.

Cow Creek Development

The No-Action Alternative would leave all Cow Creek Development structures in place and would not alter the distribution of flows through the project-affected reach. Due to natural conditions in the watershed, water temperatures would continue to regularly exceed criteria for coldwater fisheries during the summer in the bypass, upstream of the diversion dam, and in Hooten Gulch. Potential barriers to fish passage in Wagoner Canyon typically would be impassable during low flow conditions from July through October; however, higher flows which exist under license conditions from November through late spring would support migration of steelhead and late-fall Chinook salmon through this reach to upstream habitat under the No-Action Alternative. Significant quantities of good quality spawning substrate were identified for both species in the bypassed reach which would continue to be available, particularly at the higher natural late fall and winter flows that would continue to exist under the No-Action Alternative.

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[27] On May 6, 2010, Commission staff issued the biological assessment to FWS and NMFS. The resource agencies have until September 23, 2010, (135 days) to respond to the Commission with their biological opinion.

Terrestrial RTE

No terrestrial RTE species are known to occur within either development; however, potential habitat exists for RTE species within the Old Cow Creek and South Cow Creek watersheds as previously discussed. Excepting external influences on habitat extent, diversity, and quality, potential habitat for RTE species would persist into the future under the No-Action Alternative. RTE species may colonize habitat within the project area over the long-term as long as habitat continues to exist. The continuation of the Kilarc-Cow Creek Project operations will have no adverse effect on RTE species.

Our Analysis

No direct or indirect adverse effects to fisheries and aquatic or terrestrial RTE species are expected as the result of the implementation of the No-Action Alternative. RTE species may benefit in the long-term from the continuation and protection of potential habitat within the project area.

3.3.7 Recreational Resources

3.3.7.1 Affected Environment

The Kilarc-Cow Creek Project is located in eastern Shasta County in northern California at the southern end of the Cascade Mountain Range about 30 miles east of Redding, California. Millions of acres of public lands in the vicinity of the project offer both developed and dispersed recreation opportunities. Regional recreational use is extremely high due to the large number of recreation resources, unique natural setting, and proximity to urban areas. However, recreational opportunities within the immediate project boundary are limited due to limited access through privately owned lands. Most lands within the project boundary are private lands not open to the general public and PG&E lands that are not easily accessible (e.g., no road access, heavily forested, steep hillsides) which do not have recreation facilities or attributes that draw recreation users.

Kilarc Development

The Kilarc day use area at the Kilarc forebay is the only recreation area at the project where public recreational activity is formalized and facilities are provided. The Kilarc day use area is situated on a flat plateau at the western end of an unpaved access road. The Kilarc forebay has recreational facilities and attributes that recreational users seek. Access to the Kilarc day use area and Kilarc forebay is via access roads that cross private lands (see section 3.3.8, *Land Use*), and is allowed in conjunction with the existing project license.

Under the existing project license, PG&E developed the Kilarc day use area as a recreational facility to provide group picnic areas and fishing access to the Kilarc forebay. There are two picnic areas that can be used year-round on the northeastern side of the forebay. These areas include picnic tables, barbecue pedestals, garbage cans, and two parking areas. Two vault toilets adjacent to the picnic areas are accessed from the picnic areas and the forebay via a short trail. A footbridge is located across the entrance

of the Kilarc main canal to provide the public with access around the forebay shoreline. Although some informal hiking likely occurs along the Kilarc main canal diversion dam that extends to the east of Kilarc forebay, this activity is not a PG&E-sanctioned public recreational opportunity and is not part of the Kilarc day use area. Shasta County Ordinance (SCO) bans camping and open fires (SCO section 12.32.120) and motor boating and swimming (SCO section 12.24.160) at the Kilarc forebay to maintain water quality and personal safety.

Fishing at the Kilarc forebay is from the shoreline. Cal Fish and Game stocks the Kilarc forebay with hatchery rainbow trout every spring and summer (Cal Fish and Game, 2008 as cited in PG&E, 2009a and PG&E, 2009c). The forebay also supports a brown trout fishery, and large brown trout have been caught in the forebay even though brown trout have not been stocked since the 1980s (PG&E, 2002 and PG&E 2007a as cited in PG&E, 2009c).

Situated on a terrace above the streambed of Old Cow Creek and located about one mile northwest of the Kilarc forebay, the Kilarc powerhouse has a grassy lawn that is occasionally used by the public for informal picnicking and fishing access (PG&E, 2008 as cited in PG&E, 2009a). The Kilarc powerhouse is of some historical and architectural interest to visitors traveling along Fern Road East; however, no interpretive signs are located at the site. PG&E does not provide any formal recreational facilities (i.e., picnic tables or restroom facilities) at the Kilarc powerhouse, but catch-and-release fishing is allowed along the shore of Old Cow Creek. Catchable rainbow trout have been stocked by Cal Fish and Game near the Kilarc powerhouse, and fingerling Chinook salmon and steelhead have been stocked further downstream (PG&E, 2009c).

Recreational Use

During the 2003 relicensing effort, PG&E commissioned a Recreational Resources Report that included a questionnaire study component and an existing use study component to determine the existing recreational use of the Kilarc forebay and Kilarc powerhouse. The 2003 visitor use questionnaire and existing use survey was conducted from Memorial Day through Labor Day in 2003 (including July 4th) within the project boundary and included observations from the Kilarc forebay shoreline and the Kilarc powerhouse.

Out of 135 questionnaires distributed, 45 responses were received (33.3 percent response rate). Out of the 45 visitors who responded, 38 visitors (84 percent) were from Shasta County, California. One visitor originated from Lassen County, California, which is adjacent to Shasta County. Two visitors were from Colusa County, California, and one visitor was from each of the following counties in California: Fresno, Riverside, and Alameda. Shasta County and several commenters note that most of the users of the Kilarc forebay are residents of the local community of Whitmore, California; however, a local nursery/garden comments that many visitors traveling to Shasta County to the gardens also visit the Kilarc recreation area, but no data were provided to support these comments.

The existing use study determined that the most popular recreation activities at the Kilarc forebay are bank fishing (62 percent of visitors), general recreation (20 percent), picnicking (12 percent), and sunning (6 percent). Although no survey respondents indicated that they boated, two visitors (0.4 percent participation) were recorded for general boating; however, this activity is not permitted in the Kilarc forebay. Most of the observed recreation activity occurred in the morning. Table use in the Kilarc day use area was evenly split between morning and afternoon, but group use was predominantly in the afternoon. The questionnaire confirmed that the most common recreation activities at the Kilarc day use area and forebay included fishing, sightseeing, picnicking, wildlife viewing, hiking, and "other activities." Other activities included nature photography, all-terrain-vehicle riding, scouting, and hunting. The most common primary activities reported were fishing and sightseeing.

About 78 percent of the total visitors at the Kilarc day use area and forebay were observed at the Kilarc forebay shoreline, and about 13 percent of the total visitors were observed at the Kilarc day use area. For the study season, the highest number of vehicles in the study area (130) was observed at the Kilarc day use area, followed by the Kilarc inlet canal area (the pathway to the forebay shoreline leads from the parking area) with 35 vehicles.

Over the course of the existing use study, the highest peak number of people-at-one-time (PAOT) of 25 was observed at the Kilarc forebay shoreline with an average of 5.4 PAOT. The overall peak number of persons observed in the study area was 25 on May 25, 2003 (Memorial Day weekend), with an average of 2.8 observed PAOT. The overall peak number of vehicles observed in the study area was nine on September 1, 2003 (Labor Day weekend), with an average of 3.2 observed vehicles-at-one-time (VAOT).

The Kilarc powerhouse had a peak of six PAOT and an average of 2.8 PAOT. The VAOT peak at the Kilarc powerhouse was four with an average of two VAOT. No specific recreational activities at the powerhouse were recorded during the study.

The Commission Form 80 prepared by PG&E (PG&E, 2009b) for the Kilarc Development for the year 2008 estimates 11,000 annual daytime visits to the Kilarc forebay. The Commission Form 80 also reports the peak weekend average visits to the Kilarc forebay as 300 visits.

Disabled Access

Although the Kilarc recreation facilities are not compliant with ADA guidelines, disabled persons can use these facilities because there is fairly wide access across a level area to the forebay shoreline and the picnic areas and restrooms can be accessed from flat terrain and nearby parking (PG&E, 2009f). PG&E recreation facilities similar to those at the Kilarc forebay also exist at Lake Grace and Lake Nora (Project No. 1121), both of which are within 14 miles (direct radial measurement) of the Kilarc forebay, and at McCumber and North Battle Creek reservoirs (Project No. 1121), which are within

12 miles.[28] Although none of these reservoirs have facilities that comply with ADA guidelines, Lake Grace and Lake Nora have fairly wide access across level areas to their shorelines. Much of Lake Nora is surrounded by a road making the shoreline accessible to the disabled. Lake Grace and McCumber and North Battle Creek reservoirs have berms surrounding the reservoirs that can be accessed only cross-country. All of these reservoirs have picnic areas and restrooms that can be accessed from flat terrain and nearby parking (PG&E, 2009f), and Cal Fish and Game currently stocks these four reservoirs with catchable-size trout (Cal Fish and Game, 2009). In addition to PG&E facilities, Shasta-Trinity National Forest and Lassen National Forest both offer a wide range of accessible recreation facilities that comply with ADA guidelines, many of which are within 40 miles of the Kilarc forebay.[29]

Stewardship Council

On April 6, 2001, PG&E filed for chapter 11 bankruptcy protection that resulted in a Settlement Agreement that included a Land Conservation Commitment by which PG&E Watershed Lands would be subject to conservation easements or be donated in fee simple to public entities or non-profit organizations for the benefit of the public and the creation of the Pacific Forest and Watershed Land Stewardship Council (Stewardship Council) to develop and implement the Land Conservation Program (LCP) (Stewardship Council, 2007). The Stewardship Council's objective for the Kilarc forebay, as stated in the LCP, is to enhance the recreation experience there in coordination with any decommissioning activities. However, should the Proposed Action result in removal of the Kilarc day use area as proposed by PG&E, the Stewardship Council would re-evaluate its recommendations for this area. The Stewardship Council also administers a Youth Investment Program that serves to enhance urban parks and recreation areas and provide outdoor recreation opportunities for underserved youth. The Stewardship Council intends, where possible, to pursue opportunities to connect and integrate the land conservation and youth investment programs (Stewardship Council, 2007).

Cow Creek Development

There is no public recreation access at the Cow Creek Development and no public recreation facilities are currently provided at the development (PG&E, 2009a and 2009e). Access to the development is over existing private roads across private lands.

Regional Recreational Resources

Kilarc and Cow Creek Developments

The region surrounding the project provides a variety of recreation opportunities, many of which are located within 60 miles of the project, including fishing, sightseeing,

[28] Using the Kilarc forebay as a centerpoint, measurements were taken using a direct route overland to the recreation site.

[29] Using the Kilarc forebay as a centerpoint, a circle with a 40-mile radius was drawn around the area.

picnicking, wildlife viewing, hiking, swimming, boating, camping, and hunting (PG&E, 2002). In addition to the recreation opportunities provided at the project, PG&E provides public recreational opportunities at its Battle Creek Project (Project No. 1121) that includes McCumber Reservoir, North Battle Creek Reservoir, Lake Grace, and Lake Nora. The Battle Creek Project recreational facilities, located near Shingletown between 20 and 47 miles from the Kilarc-Cow Creek Project, offer a wide range of facilities that support picnicking, motorized and non-motorized boating, camping, scenic viewing, swimming, and fishing. The regional recreational facilities are summarized in Table 18 and shown in Figure 5. Located 20 miles from the Kilarc-Cow Creek Project, Lake Grace and Lake Nora provide recreation opportunities similar to those at the project (i.e., fishing, picnicking, and scenic viewing).

Recreation attractions in the region include Shasta Lake, Whiskeytown Lake, Mount Shasta, Whiskeytown-Shasta-Trinity National Recreation Area, Lassen National Forest, Castle Crags State Park, Pacific Crest Trail, McArthur-Burney Falls Memorial State Park, and streams and rivers (such as Hat Creek and the Sacramento River). Popular fishing lakes include Lake McCloud, Shasta Lake, Iron Canyon reservoir, Big Lake, Baum Lake, and Keswick Lake (PG&E, 2002). Nearby hiking areas include Trinity Divide Country, Pacific Crest Trail, Lassen Volcanic National Park, and the Thousand Lakes Wilderness Area. Shasta County operates several day use areas within driving distance of the project. Hat Creek Park, located about 75 miles east of Redding, California, on State Route 299, provides public access to catch-and-release fly-fishing and a day use facility. French Gulch Park is located about 12 miles west of Redding, California, on State Route 299 and provides a day use area (Shasta County, 2010).

Cal Fish and Game currently stocks several reservoirs in the vicinity of the project with catchable-size trout (Cal Fish and Game, 2009). Stocked reservoirs include Lake Grace, Lake Nora, Iron Canyon reservoir, McCumber reservoir, North Battle Creek Reservoir, Baum Lake, and Shasta Lake (Table 18).

An estimated two to three million visitors each year visit Shasta County to enjoy these recreation resources (USDA-FS, 2003, 2002, and 2000a as cited in PG&E, 2009a). It is estimated that about 6,766,000 visitor recreation days occurred in Shasta County in 1998 (SHN, 2001 as cited in PG&E, 2002). The recreational activities and facilities at these areas that are located within 60 miles of the Kilarc-Cow Creek Project are summarized in Table 18.

Regional recreational use is high due to the large number of recreational resources, unique natural setting, and proximity to urban areas. The demand on recreational resources throughout northern California and within the vicinity of the project is expected to increase over the next 10 to 20 years (PG&E, 2007c as cited in PG&E, 2009a). Northern California's growth is generally concentrated in the metropolitan areas, but many Californians are moving inland (California State Parks, 2002 as cited in PG&E, 2009a). Shasta County has exhibited this inland growth pattern with an 11 percent

growth rate from 1990 to 2000 (Economic Research Service, 2003 as cited in PG&E, 2009a).

Table 18. Recreational facilities within 60 miles of the Kilarc-Cow Creek Project (Source: PG&E, 2008 and 2009 and Stienstra, 2000 and 1999 as cited in PG&E, 2009a, as modified by Commission staff).

Name	Location	Facilities	Recreational Activities	Approximate Distance to Project
PG&E				
Lake Grace	East of Shingletown off Hwy 44	10 picnic sites	Fishing, picnicking, scenic viewing	20 miles
Lake Nora	East of Shingletown off Hwy 44	10 picnic sites	Fishing, picnicking, scenic viewing	20 miles
McCumber Reservoir	East of Redding off Hwy 44 (between Shingletown and Viola)	7 camping units, 5 walk-in campsites, nearby car-top boat launch	Boating, fishing, camping	31 miles
North Battle Creek	East of Redding, north of Viola	10 campsites, 5 walk-in camp units	Fishing, swimming, non-motorized boating	47 miles
Shasta -Trinity National Forest				
Pit River	Northeast of Redding in national forest	Campsites	Camping, fishing, hot springs, swimming	30 miles
Rock Creek	Near Lake Britton in national forest	Primitive campground	Fishing, camping	50 miles
Keswick Lake	Near Redding in national forest	Boat ramp, day use picnic area	Boating, fishing, jet skiing, swimming, water skiing, picnicking	50 miles

Name	Location	Facilities	Recreational Activities	Approximate Distance to Project
Shasta Lake	Near Redding in national forest	14 boat ramps, 12 marinas, 12 campgrounds, lakeshore lodging, 400 houseboat rentals	Boating, water skiing, camping, fishing, jet skiing, swimming, windsurfing	50 miles
Whiskeytown Lake	Near Redding in national forest	Three boat ramps, three campgrounds, picnic areas	Boating, water skiing, jet skiing, fishing, camping, swimming, windsurfing, picnicking	50 miles
Clear Creek	West of Redding in national forest	Primitive campsite	Primitive camping, fishing, swimming	54 miles
Bear Creek	Near McArthur in national forest	None	Fishing	60 miles
Lassen National Forest				
Digger Creek	East of Red Bluff in national forest	None	Fishing	40 miles
Manzanita Lake	In Lassen Volcanic National Park	Primitive boat ramp, campground, picnic area	Non-motorized boating, camping, fishing, swimming, picnicking	45 miles
Summit Lake	Near Manzanita Lake in Lassen Volcanic National Park	Campground	Non-motorized boating, camping, fishing, picnicking, swimming, windsurfing	50 miles

Name	Location	Facilities	Recreational Activities	Approximate Distance to Project
Thousand Lakes Wilderness	East of Redding in national forest	None	Fishing, hiking, backpacking	60 miles
Other Recreational Facilities				
Hawkins Landing	West of Burney at Iron Canyon reservoir spillway	10 camping units and a boat ramp	Camping, fishing, swimming, boating	41 miles
Baum Lake	Northeast of Burney near Cassel	Car top boat launch	Waterfowl hunting, fishing, scenic and wildlife viewing	50 miles
Cassel Campground	East of Burney	27 camping units	Camping, fishing	51 miles
Dusty Campground	North shore of Lake Britton	7 camp units	Swimming, fishing	52 miles
Jamo Point	Lake Britton	Boat launch, fishing access area	Fishing, boating, water skiing, swimming	52 miles
Pines Picnic Area	North shore of Lake Britton	10 tables for day-use	Picnicking, nearby fishing and swimming opportunities	52 miles

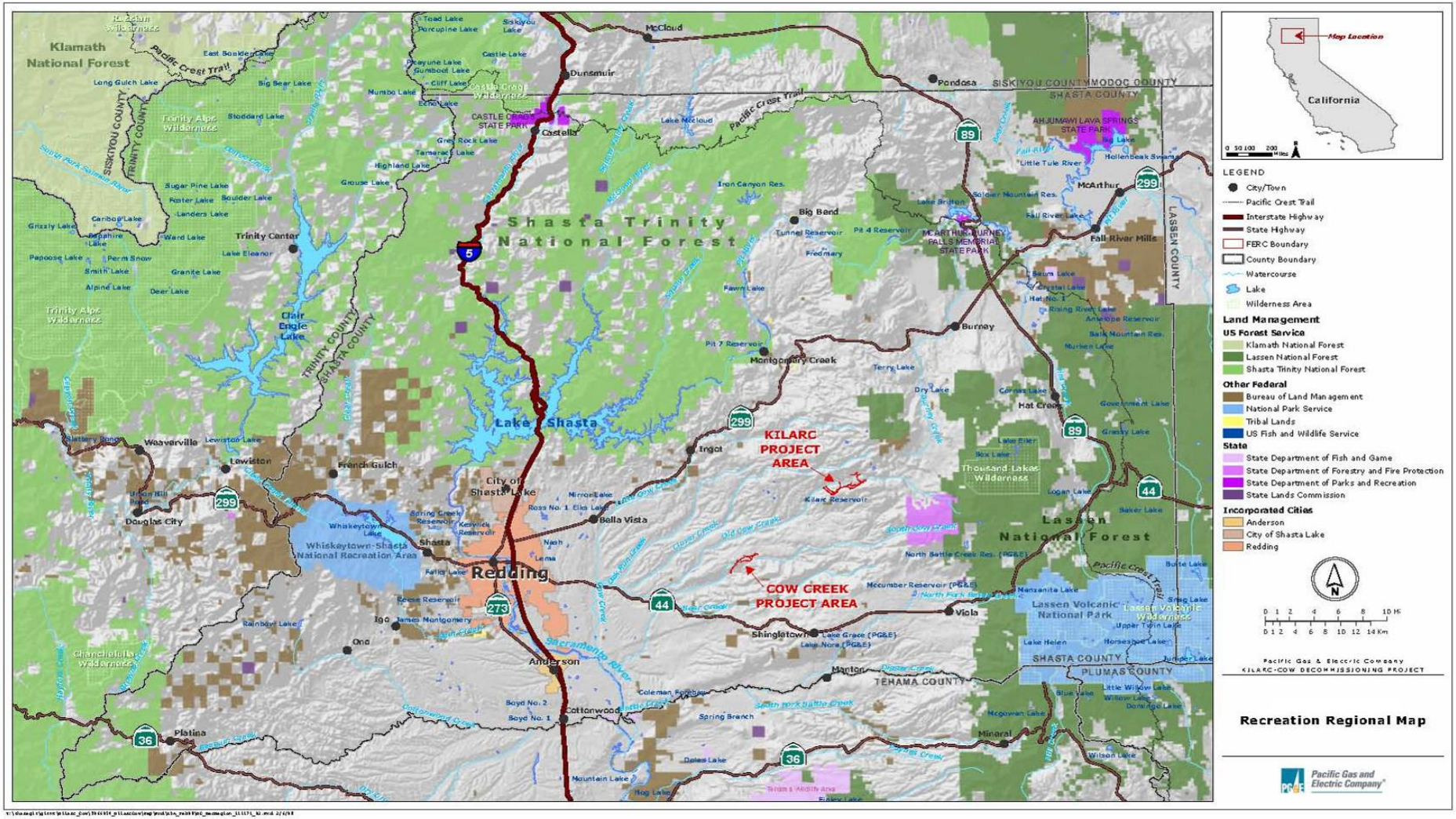

Figure 5. Map of regional recreation areas. (Source: PG&E, 2009a)

3.3.7.2 Environmental Effects of Proposed Action

Kilarc Development

Recreation Opportunities

At the Kilarc Development, PG&E proposes to fill the Kilarc forebay with excavated bank material and remove the picnic tables and site furnishings. The restroom building and slab would be demolished and removed. The toilet vaults would be pumped, backfilled, and abandoned in place. Under the Proposed Action, the Kilarc forebay would no longer exist. Prior to submitting the LSA, PG&E issued solicitations to interested parties to determine if there were parties potentially interested in operating the Kilarc forebay or Kilarc powerhouse for recreational or historical public use. No applications were received (PG&E, 2009d). PG&E also explored whether a local lake currently closed to public recreation could be made available for future public recreation use, but the private landowner indicated it would not be (PG&E, 2009d). Thus, PG&E has not proposed any PM&E measures for the loss of recreation access and facilities at the Kilarc forebay.

The principal effects of the Proposed Action on recreation would occur at the Kilarc forebay where the only developed formal recreation facilities exist at the project. Individuals who have traditionally used the forebay and day use area for recreational activities would be directly affected over the long-term as access to the forebay and the recreation facilities would no longer exist. Bank fishing, sightseeing, picnicking, and general recreation are the most popular activities at the Kilarc forebay which most likely would be affected by the Proposed Action. Since most of the visitors to the Kilarc forebay and day use area are from Shasta County, California, the loss of the recreational facilities would mainly affect local (Shasta County) residents. There are other comparable recreation areas within driving distance of the project that provide similar recreational opportunities (Table 18). PG&E's Lake Nora and Lake Grace are the closest to the project; however, several commenters note that the drive times to these lakes are about 45 minutes. Thus, the drive times to comparable recreation areas would be accessible, but likely would be inconvenient for the local community that regularly recreates at the Kilarc forebay.

Under the Proposed Action, the Kilarc powerhouse would be secured and left in place and potential reuse of the structure would be preserved. The informal public use of the Kilarc powerhouse for fishing and other activities would not be restricted as a result of the Proposed Action. No changes to public access are proposed at the Kilarc powerhouse since the public still would be allowed informal access to the grassy lawn area at the Kilarc powerhouse and fishing access below the powerhouse. However, as described in section 3.3.7.1, *Affected Environment,* there are no formal recreation facilities at the powerhouse. The Proposed Action resulting in the removal of the Kilarc forebay could affect the recreational use of the powerhouse area since some of the displaced recreationists who generally recreate at the forebay may use the powerhouse area for recreational purposes (i.e., picnicking or bank fishing). Since the powerhouse

does not have any developed recreation facilities or a forebay to attract anglers, the effects of the Proposed Action on the powerhouse area are expected to be minimal.

Many commenters express a desire to maintain the recreation access and facilities at the Kilarc forebay and note the importance and values of the recreation facilities to the community and beyond the local community. Additionally, a petition of 129 local residents was filed requesting the Commission allow someone to operate the project and save the recreational facilities. Although some commenters state that the Kilarc forebay area provides hiking opportunities, hiking is not a PG&E-sanctioned public recreational opportunity (except for the path around the forebay) and not part of the Kilarc day use area, but hiking likely informally occurs along the Kilarc main canal diversion dam that extends to the east of the Kilarc forebay.

Several commenters recommend that PG&E be required to have a recreation survey of the uses of the Kilarc recreation facility conducted by an independent company and designed with input from Shasta County staff, as well as Commission staff, and that an independent assessment be made as to whether there are adequate recreation facilities for existing and future use.

As a condition of the license surrender, several commenters recommend that PG&E provide the county with easements to be determined in coordination with the county, specifically to meet the recreation needs of local residents because of the loss of the Kilarc forebay, in addition to funding for other recreation facilities to assist the county in meeting these local recreation needs.

Our Analysis

The Proposed Action would result in long-term unavoidable adverse impacts to recreation resources at the Kilarc Development since public access and the recreation facilities would no longer exist as they would under the No-Action Alternative. The local community that regularly recreates at the Kilarc forebay would be adversely affected due to longer drive times to reach comparable recreation areas. Additionally, the Commission's jurisdiction over project lands, and responsibility to seek the ultimate development of recreation resources at the project, would end once the license was surrendered.

Since the powerhouse does not have any developed recreation facilities or a forebay to attract anglers, displaced recreationists who generally recreate at the forebay are not likely to use the powerhouse area for long-term recreational use. The Proposed Action could have minor, adverse short-term effects on the powerhouse area.

As discussed in section 3.3.7.1, *Affected Environment,* PG&E developed a recreational resources report in 2003 when it was beginning its relicensing process for the project and submitted its Commission Form 80 recreation report in 2009. We do not find that additional recreational use studies are necessary because the recreation uses are well documented at the project.

Regional Recreation Use

Under the Proposed Action, the removal of the Kilarc forebay could result in increased recreational use of other nearby recreation areas or streams since some of the displaced recreationists who generally recreate at the forebay may seek other nearby recreational opportunities. With many other recreation areas in the vicinity of the project, it is likely that displaced recreation users would seek various alternate locations. Since PG&E's Lake Nora and Lake Grace offer similar recreational opportunities and are relatively close to the project, the recreation use of those facilities may increase.

One commenter notes that if the Kilarc forebay were removed, there would be increased fishing pressure on downstream fish, possibly migrating populations that are being enhanced, and that the displaced fishing pressure may be substantial. Another commenter suggests that recreational users may choose to drive to another recreation area in the vicinity of the project, fish in nearby streams, or find other recreation activities.

Our Analysis

The Proposed Action would have negligible effects on other recreation areas or streams because displaced recreation users likely would seek various alternate recreation areas, of which there are many.

Disabled Access

The Kilarc recreation facilities are not compatible with ADA guidelines, but some disabled persons are able to use the recreation facilities due to flat terrain and nearby parking. Similar recreational facilities providing access to the disabled do exist within driving distance, and fully ADA-compatible recreation facilities are located within driving distance of the Kilarc forebay. The drive times to comparable recreation areas that are accessible to the disabled may be inconvenient.

Many commenters express concerns about the effects of the removal of the Kilarc forebay and the recreation facilities at the forebay on disabled access, and state that the day use area is compatible with ADA guidelines and the Architectural Barriers Act. Based on comments from the public, disabled persons use the Kilarc day use area and the forebay for bank fishing and picnicking, and several individuals comment that the Kilarc forebay is the only place in Shasta County that a disabled person could catch fish.

Our Analysis

The Proposed Action would result in minor, long-term adverse impacts to disabled access at the Kilarc Development. Although disabled access to the project's recreation facilities would be lost, other recreational facilities providing access to the disabled exist within driving distance of the Kilarc forebay.

Stewardship Council

The Stewardship Council's objective for enhancing the recreation experience at the Kilarc forebay, in accordance with the LCP, would be re-evaluated if the Kilarc day

use area were removed. The loss of the Kilarc forebay would affect underserved youth under the Stewardship Council's Youth Investment Program, which serves to provide outdoor recreation opportunities for underserved youth.

A number of commenters note that the Stewardship Council was charted to achieve, for all PG&E land released to the state, conditions that enable families to teach their children and inner-city youth a relationship to nature and to fish as has occurred at the Kilarc forebay. If Kilarc is decommissioned, the commenters argue that this prime location is lost for the support of inner-city youth.

Our Analysis

The Proposed Action at the Kilarc Development would result in a minor long-term unavoidable adverse impact to the Youth Investment Program administered by the Stewardship Council. There are a number of comparable recreation areas located within driving distance of the project that could be used by the Youth Investment Program in its programs for underserved youth, some of which may be more accessible to the public. Additionally, the extent to which this program has used the Kilarc facilities is unknown, and is not expected to be significant.

Cow Creek Development

The Cow Creek Development is not currently accessible to the public and no public recreation facilities are currently provided at the development. Under the Proposed Action, no public access or recreational opportunities would be provided at the Cow Creek Development.

Our Analysis

The Proposed Action would have no effect on recreation resources at the Cow Creek Development because the Proposed Action would not change public access or recreational opportunities at the Cow Creek Development.

3.3.7.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, the Cow Creek Development would be decommissioned as under the Proposed Action, and the Kilarc Development would be decommissioned with retention and operation of the Kilarc forebay with spillway modifications, Kilarc main canal diversion dam, and main canal. Under AA1, Cal Fish and Game would continue management and stocking of the forebay for a rainbow trout put-and-take recreational fishery. The access road and public facilities at the Kilarc forebay, including access for the disabled, would be maintained with installation of additional signage as necessary. Action Alternative 1 assumes that an interested entity with adequate financial resources would be identified to take over the operation and maintenance of the remaining facilities as well as any required monitoring.

Under AA1, there would be no changes from the current conditions for public access and recreational facilities and opportunities available to the public at Kilarc forebay. Additional miles of Old Cow Creek above the new fish passage facility proposed under AA1 would be open to anadromous fish, which may result in additional fishing opportunities and/or restrictions by Cal Fish and Game. As discussed in Section 3.3.3.3, *Environmental Effects of Action Alternative 1,* a fish screen blocking the entrance of the Kilarc main canal would ultimately keep any anadromous fish from entering the Kilarc forebay so no additional fishing restrictions by Cal Fish and Game would be likely for Kilarc forebay.

Our Analysis

The types of effects on recreation resources expected at the Kilarc forebay as a result of the implementation of AA1 would be better than those expected under the Proposed action (see section 3.3.7.2, *Environmental Effects of Proposed Action*) and be the same as those under the No-Action Alternative (see section 3.3.7.5, *Environmental Effects of No Action*) since the recreation facilities would still exist under AA1 and the public still would be able to access the Kilarc forebay. Action Alternative 1 would not result in any effects on public access at the Kilarc powerhouse for informal use; therefore, the effect on recreation resources at the Kilarc powerhouse from AA1 would not differ from those of the Proposed Action (see section 3.3.7.2, *Environmental Effects of Proposed Action*) or the No-Action Alternative (see section 3.3.7.5, *Environmental Effects of No Action).* Public access to Old Cow Creek is limited, so any effects related to additional fishing restrictions that may be implemented by Cal Fish and Game as a result of opening additional miles of Old Cow Creek to anadromous fish would be expected to be minimal.

Cow Creek Development

Under AA1, the Cow Creek Development would be decommissioned as proposed under the Proposed Action and the Kilarc Development would be decommissioned with retention and operation of the Kilarc main canal diversion dam, and forebay with spillway modifications. The Cow Creek Development is not currently accessible to the public and no public recreation facilities are currently provided at the development, and AA1 would not change the lack of access or facilities at the Cow Creek Development.

Our Analysis

Action Alternative 1 would have no effect on recreation resources at the Cow Creek Development, as is the case with the Proposed Action (see section 3.3.7.2, *Environmental Effects of Proposed Action*) and the No-Action Alternative (see section 3.3.7.5, *Environmental Effects of No Action*).

3.3.7.4 Environmental Effects of Action Alternative 2

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as proposed under the Proposed Action, and the Cow Creek Development would be decommissioned with retention and operation of the South Cow Creek diversion dam and the main canal with an extension through the former forebay area to the penstock intake. The recreation facilities and public access at the Kilarc forebay would cease to exist under AA2. No changes would occur at the Kilarc powerhouse where informal access would continue to be allowed.

Our Analysis

The effects of AA2 on recreation resources at the Kilarc Development would be identical to those described for the Proposed Action (see section 3.3.7.2, *Environmental Effects of Proposed Action*) and adverse as compared to the No-Action Alternative. Under AA2, the recreation facilities and public access at the Kilarc forebay would cease to exist as they do under the current license.

Cow Creek Development

Under AA2, the Kilarc Development would be decommissioned as proposed under the Proposed Action, and the Cow Creek Development would be decommissioned with retention and operation of the South Cow Creek diversion dam and the main canal with an extension through the former forebay area to the penstock intake. The Cow Creek Development is not currently accessible to the public and no public recreation facilities are currently provided at the development, and AA2 would not change the lack of access or facilities at the Cow Creek Development. Additional miles of South Cow Creek above the new fish passage facility proposed under AA2 would be open to anadromous fish, which may result in additional fishing restrictions by Cal Fish and Game.

Our Analysis

Implementing AA2 would have no effect on recreation resources at the Cow Creek Development. The Proposed Action (see section 3.3.7.2, *Environmental Effects of Proposed Action*) and the No-Action Alternative (see section 3.3.7.5, *Environmental Effects of No Action*) also would result in no effect on recreation resources at the Cow Creek Development. Public access to South Cow Creek is limited, so any effects related to additional fishing restrictions that may be implemented by Cal Fish and Game as a result of opening additional miles of South Cow Creek to anadromous fish would be expected to be minimal.

3.3.7.5 Environmental Effects of No Action

Kilarc Development

Under the No-Action Alternative, the Kilarc Development would continue to operate under the same conditions as the existing license. The Kilarc Development would continue to provide public access and recreation facilities at the Kilarc forebay. The project's recreation resources would not change from those described in section 3.3.7.1, *Affected Environment*.

Our Analysis

The No-Action Alternative would create no adverse effects on recreation resources at the Kilarc Development. Continued operation of the Kilarc Development and the Kilarc forebay recreation facilities under the No-Action Alternative would continue to provide long-term beneficial effects on recreation resources at the Kilarc Development as compared to the Proposed Action.

Cow Creek Development

The No-Action Alternative would result in no change compared to the existing license in public access or recreation facilities at the Cow Creek Development (see section 3.3.7.1, *Affected Environment*).

Our Analysis

The No-Action Alternative would have no effect on recreation resources at the Cow Creek Development. The No-Action Alternative would result in no change in public access or recreation facilities at the Cow Creek Development from the existing license conditions or the Proposed Action.

3.3.8 Land Use

3.3.8.1 Affected Environment

The Kilarc-Cow Creek Project is located in eastern Shasta County in northern California at the southern end of the Cascade Mountain Range, about 30 miles east of the city of Redding, near the rural communities of Whitmore and Millville. The project consists of two hydroelectric developments: the Kilarc Development and the Cow Creek Development. The two developments encompass the Old Cow Creek and South Cow Creek watersheds, respectively. The project occupies property owned by PG&E, or where PG&E has acquired the necessary land rights. Total land within the project boundary is about 184.33 acres, of which 109.70 acres are owned primarily by PG&E (Figure 6 and Figure 7).[30] The total patented area, for the project is approximately 72.76 acres, for which PG&E has written easement deeds for 62.76 acres and prescriptive

[30] Acreage within the project boundary is derived from exhibit G-2 to G-10 general maps contained in the LSA (PG&E, 2009a).

rights for about the remaining 10 acres.[31] An additional 1.87 acres are held in trust by DOI under the jurisdiction of BIA. The primary land-use activities in the project area consist of cattle grazing on privately owned lands, and commercial timber production on private and state-owned lands. Several small ranches are located in the vicinity of the project (PG&E, 2009c).

Kilarc Development

The Kilarc Development is located in the Old Cow Creek watershed. It is supplied with water diverted from North and South Canyon Creeks, and Old Cow Creek. The Kilarc Development encompasses about 125.02 acres of project lands. PG&E directly owns 95.50 acres beginning at the Kilarc powerhouse and extending to the Kilarc main canal diversion dam to include the Kilarc penstock, Kilarc forebay (reservoir), and Kilarc main canal (Figure 6). The remaining 29.52 acres are privately-owned lands associated with the spillways, North Canyon Creek canal and diversion dam, South Canyon Creek canal and diversion dam, and some access roads.

Land uses primarily include cattle grazing on private lands. Additionally, wildlife habitat and recreation resources management occurs on state lands, and commercial timber production occurs on private and state lands. Lands in the immediate vicinity of the Kilarc powerhouse and associated facilities are primarily managed for commercial timber harvesting, with some smaller portions used for cattle grazing (PG&E, 2009c). Sierra Pacific Industries (SPI) owns about 45,000 acres of timber lands adjoining the project in the Whitmore area, and would be impacted through the use of access roads to be used for surrender activities that cross its property. Existing access roads inside and outside of the project boundary connect project features (Figure 6).

[31] The patented area is land not owned by the federal government or PG&E, but is held in trust by DOI and under the jurisdiction of BIA.

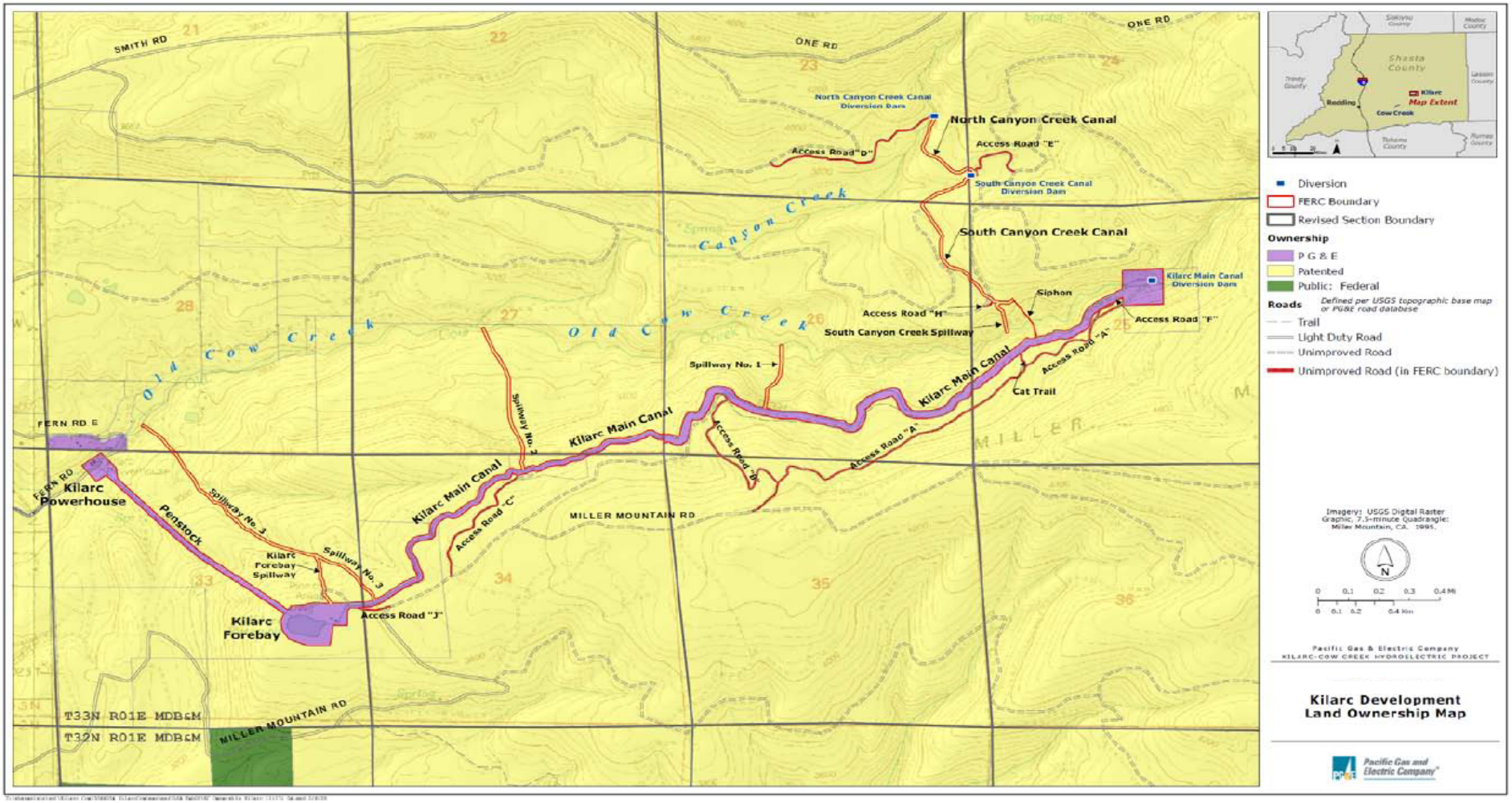

Figure 6. Map showing Kilarc Development land ownership. (Source: PG&E, 2009a)

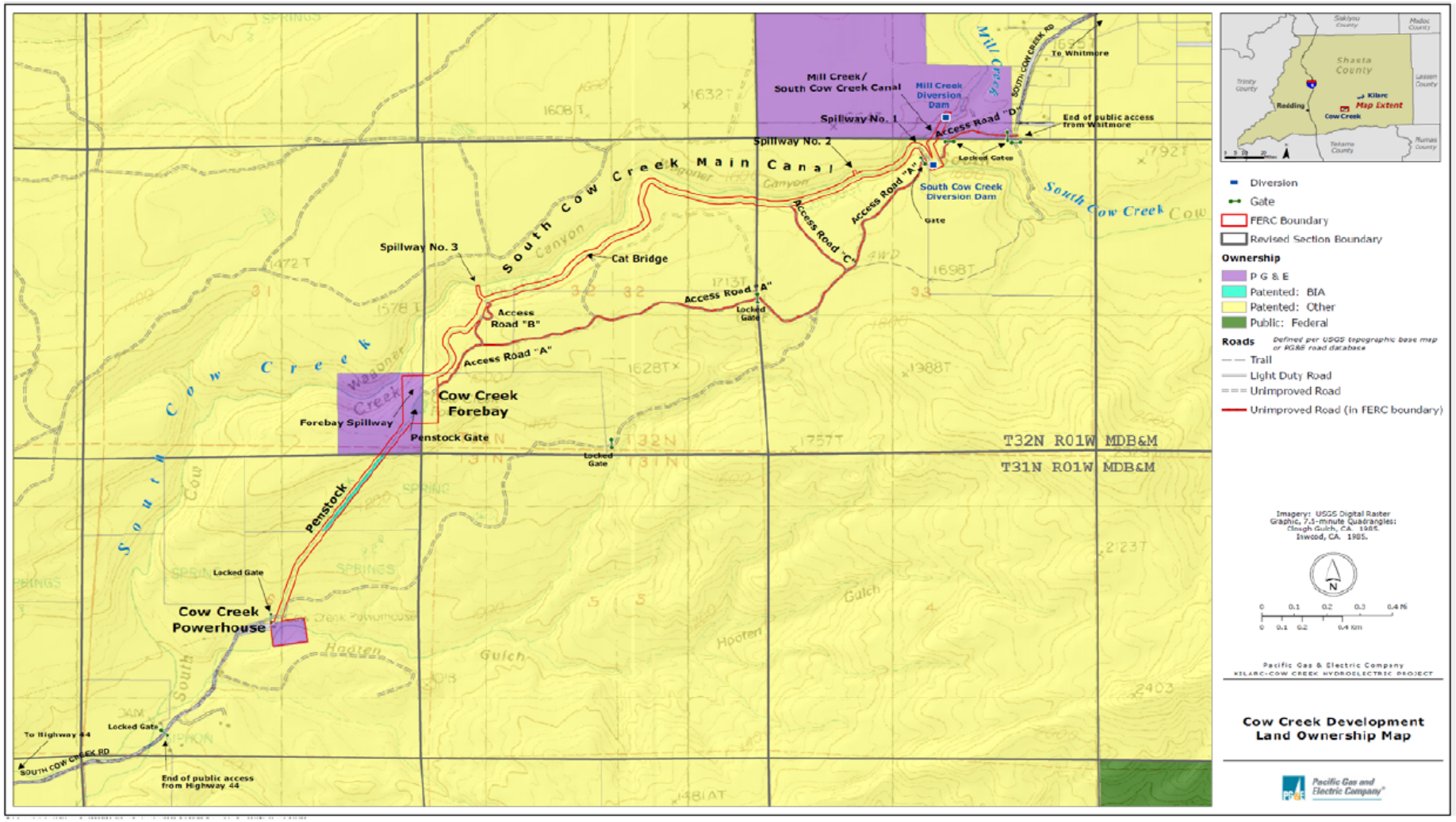

Figure 7. Map showing Cow Creek Development land ownership. (Source: PG&E, 2009a)

Cow Creek Development

The Cow Creek Development, located in the South Cow Creek watershed, is supplied by water diverted from Mill Creek and South Cow Creek. The Cow Creek Development encompasses about 59.31 acres of project lands. PG&E directly owns a total of 14.20 acres at the following locations: the Cow Creek powerhouse, Cow Creek forebay, uppermost end of Mill Creek/South Cow Creek canal, Mill Creek diversion dam, and access road D (Figure 7). The remaining 45.11 acres of project lands include: 43.24 acres of privately owned lands associated with the Cow Creek penstock, Cow Creek forebay, South Cow Creek main canal, South Cow Creek diversion dam, several spillways and access roads. Also, there are 1.87 acres at the Cow Creek penstock owned by DOI under the jurisdiction of BIA. Land uses within the lower watershed primarily include cattle grazing and rural residential uses, with some private commercial-timber harvesting. Land in the upper watershed is primarily state-owned forest that is managed for commercial-timber harvesting. Rural residential development occurs along South Cow Creek Road, a paved county road used for project access. Lands in the immediate vicinity of the Cow Creek powerhouse and associated facilities are primarily used for cattle grazing, with some private timber production, rural residential development, and an agricultural water diversion.

Below the Cow Creek powerhouse tailrace, waters are diverted from Hooten Gulch for two non-project related uses. The 110 kilowatt-capacity Tetrick Hydroelectric Project (conduit exempt FERC Project No. 6594), diverts water from Hooten Gulch for power generation. The Abbott Diversion (Abbott Ditch) redirects flows pursuant to an adjudication of the watershed throughout the year from Hooten Gulch , and is located a short distance upstream of the Hooten Gulch and South Cow Creek confluence.[32] The water diverted is used by the Abbott Ditch Users (ADU) for domestic, livestock, crops, and flood irrigation on 312 acres of pasture and hay lands (Figure 8) (PG&E, 2009c and 2009f).

Existing access roads inside and outside of the project boundary connect project features (Figure 7). These access roads are single-lane, gated, unpaved, and are located mostly on private land.

[32] The ADU state that they are entitled by a state adjudication of the watershed to divert 13.13 cfs from the natural flow of the east channel of South Cow Creek below the confluence with Hooten Gulch.

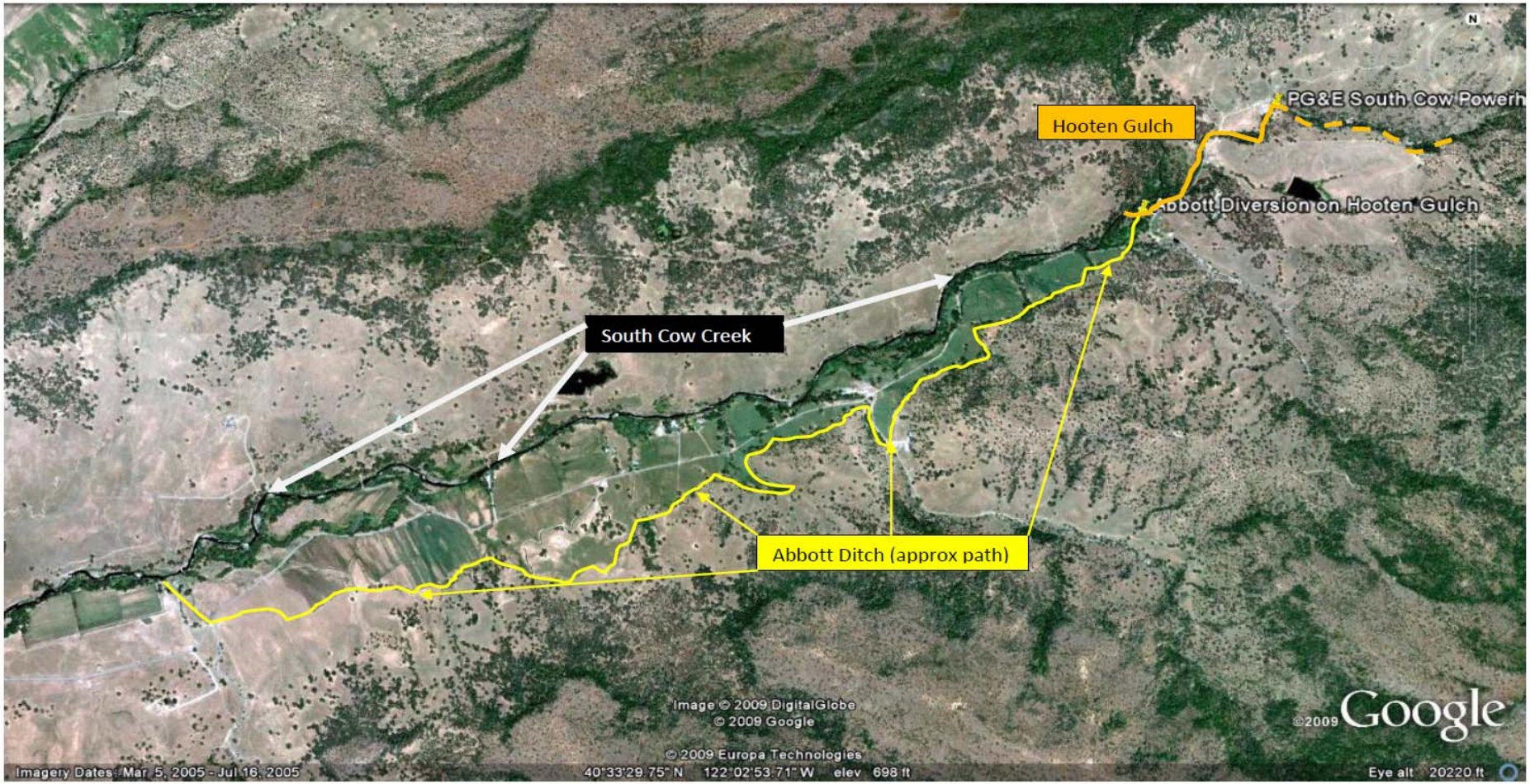

Figure 8 Location of Abbott Diversion on Hooten Gulch and Abbott Ditch. (Source: Tetrick Ranch and ADU, 2009)

Land Use or Land Management Plans, Policies, or Regulations

Shasta County General Plan and Zoning Plan

Relevant local land use plans for the project vicinity are described in the Shasta County General Plan (2004) and Shasta County Zoning Plan (2003). The project is located within the Sierra-North Regional Plan Area of the General Plan. The General Plan includes objectives for preserving agricultural lands and timberlands, and protection and provision of open space and recreational resources. The Zoning Plan designates the Kilarc Development as Unclassified[33] and Timber Production lands.[34] The Cow Creek Development is designated as Timber Production, Exclusive Agricultural, and Unclassified lands.[35]

PG&E's Land Conservation Commitment

PG&E states that it has, in consistency with the Land Conservation Commitment promised to preserve and enhance 140,000 acres of licensee-owned lands in perpetuity, as well as the 655-acre Carrizo Plain in San Luis Obispo County, California[36] (Stewardship Council, 2007).[37] In order to achieve the goals set out in the LCC, the Stewardship

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[33] The Unclassified designation is intended to be applied as a holding district until a precise principal zone district has been adopted for the property. Permitted uses within the unclassified district include agricultural and timber management uses, open space, and limited residential and mixed uses.

[34] The Timber Production designation is intended to preserve lands devoted to and used for the growing and harvesting of timber. Permitted uses within the Timber Production district include forest management, grazing, beekeeping, watershed management, and fish and wildlife habitat; hunting, fishing, camping, and similar recreational uses not involving any permanent improvement of the land or interfering materially with the primary use; and Christmas tree farms.

[35] The Exclusive Agricultural designation is intended to preserve lands with agricultural value that have the combination of size and quality to make their use for agriculture economically feasible, and within which agricultural preserves may be created. Permitted uses within the Exclusive Agricultural district include agricultural uses, sale of products grown on the premises, wholesale nursery or greenhouse, forest management, and low-intensity recreational uses that require only minor improvements.

[36] PG&E included the Stipulation as a supplementary document to its 2003 Proposed Settlement Agreement to clarify outstanding issues stakeholders had with the original LCC, also included as part of the Proposed Settlement Agreement.

[37] The properties are located in 22 counties and 11 watersheds, primarily in the Sierra Nevada and Cascade Mountain Range watersheds, from the far northern reaches of the State of California to the southern end of the Central Valley, and contain some of the most stunning and resource-rich landscapes found in the State of California. About half of the lands are generally associated with PG&E hydroelectric facilities and operations under licenses granted by the Commission.

Council was created in 2004 as an independent nonprofit organization as an advisory body to oversee development and implementation of a Land Conservation Program (LCP). The Stewardship Council Board adopted the LCP in 2007 to provide a framework for how the two sets of land are to be beneficially managed for the community as well as the environment, and to be consistent with the following six values: protection of natural habitat for wildlife, fish, and plants; preservation of open space; sustainable forestry; agricultural uses; outdoor recreation by the public; and historical values. PG&E has stated that it intends to donate conservation easements or fee title for at least 11,000 acres of land, which includes land inside the project boundary, to public agencies or qualified non-profit conservation organizations for permanent preservation and enhancement (Stewardship Council, 2007).

Cal FIRE Fire and Resource Assessment Program

The California Department of Forestry and Fire Protection (Cal FIRE) has designated portions of Shasta County, including the project area, a State Responsibility Area, which designates Cal FIRE as fiscally responsible for fire response in the area. As required by California Public Resources Code 4201-4204, Cal FIRE has identified and mapped Fire Hazard Severity Zones. The hazard level for the project area is categorized as "Very High" (Cal FIRE, 2007). PG&E's proposed surrender activities related to clearing and piling of vegetative materials on site, and the use of equipment with internal combustion engines, gasoline powered tools, and equipment or tools that produce a spark, fire, or flame in an area of Very High fire hazard could pose a wildland fire risk in the project area.

During wildfire emergencies in the project area, the Kilarc forebay is accessed by helicopter as a water supply for fire suppression by Cal FIRE. There are several other water bodies within 15 miles of the Kilarc forebay, including Buckhorn Lake, Silver Lake, Blue Lake, Woodbridge Lake, and Lake Shasta, that Cal FIRE can access via helicopter as a water resource for fire suppression. In addition, wide points along creeks in the area have been used successfully in the past for water collection via helicopter. The Kilarc forebay is also used by the equipment of the Whitmore Volunteer Community Fire Company (WVCFC) as a water resource for fire suppression in the immediate area.

3.3.8.2 Environmental Effects of Proposed Action

Kilarc Development

Effects of Proposed Action at Kilarc on Property Rights, Land Ownership, and Existing Land Use in the Project Boundary

PG&E would retain ownership of the 95.50 acres of project lands it owns at the Kilarc Development until the surrender becomes effective. For the remaining 29.52 acres where PG&E holds either deeded easements or prescriptive rights over private lands for project facilities and access roads, PG&E would execute one of the following options: (1) for deeded easements, PG&E would provide a quitclaim deed to the private landowner, and (2) where PG&E holds prescriptive rights, those rights would be

extinguished automatically by operation of law after PG&E abandons use of the property (PG&E, 2009d).[38] No additional changes to land ownership are expected as a result of the Proposed Action.

PG&E proposes to develop detailed engineering and management plans for implementing the Proposed Action on lands at the Kilarc Development. The proposed disposition of facilities associated with the Proposed Action would include the following mitigation activities to ensure safe use of the project lands, incorporate private landowner concerns, and be consistent with relevant existing land use plans administered by state and local entities:

- North Canyon Creek, South Canyon Creek, and the Kilarc main canal diversion dams would be removed to stop water diversions and to allow for free passage of fish and sediment.
- Some diversion dam abutments and foundations would be left in place to protect stream banks and provide grade control.
- In consultation with affected landowners, the canal segments would be left in place, breached, or filled depending on accessibility to the canal section. Structures would be left in place at or below grade level if graded and filled, where feasible. Metal and wood flume structures and overflow spillways would be removed.
- The Kilarc forebay intake would be removed to grade, and the outlet structure to the penstock removed.
- The Kilarc forebay would be drained, filled with excavated bank material, graded for drainage with appropriate erosion control measures, and reseeded with native plants.
- The picnic tables, site furnishings, restroom buildings, and slabs at the Kilarc day use area would be removed. The toilet vaults would be pumped out, backfilled, and abandoned in place.
- The buried siphon, the Kilarc main canal tunnel, and the underground Kilarc penstock would be sealed and left in place as removing the facilities would cause significant environmental disturbance due to the manner in which they were buried. The penstock surge tower would be removed and its opening to the penstock sealed.
- The Kilarc powerhouse would be secured and left in place to address safety issues, and to preserve the option for future reuse of the structure.

[38] A quitclaim deed is a term used to describe a document by which an entity disclaims any interest it may have in a piece of real property and passes that claim to another person.

- Electric generators, turbines, and other equipment would be removed for safety reasons and for reuse.

Short-term adverse effects resulting from localized stream bank erosion may occur as a result of the removal process for the diversion dams, the installation and removal of any temporary cofferdams or diversion structures required, and the removal of any canal segments. PG&E proposes PM&E measures in order to minimize any erosion that should occur as a result of the Proposed Action, and would include the development of detailed design plans with specific provisions to minimize the potential for on- or off-site landslides, to implement bank erosion measures, and to implement soil erosion and sedimentation control BMPs developed by the U.S. Department of Agriculture, Forest Service (Forest Service), and published in the *Water Quality Management for Forest System Lands in California, Best Management Practices* (Forest Service, 2000).[39]

Access roads at the Kilarc Development transverse lands inside and outside of the project boundary and are held in a combination of PG&E, public, and private ownerships. Equipment needed for disposition of project facilities associated with the Proposed Action may require improvement of the existing access roads. However, improvements would be limited to the existing road bed, and consist primarily of surface smoothing and pothole filling with a motor grader. Also, equipment proposed for surrender implementation is relatively small due to the small size of the project features, and therefore it would have limited effect on existing roads. Construction equipment would be offloaded from haulers at locations served by major project roads and travel under their own power to the work sites to minimize the need for extensive road improvements, and overall environmental impacts to the site. PG&E proposes PM&E measures for the Proposed Action that would minimize any potential erosion and sedimentation from road improvement activities, including the application of BMPs developed by the Forest Service (Forest Service, 2000). Further, PG&E proposes to implement a speed limit of 15 miles per hour on access roads located in the project boundary during the Proposed Action for safe vehicle operation and in consideration of other road users. PG&E would leave existing access roads located within the project boundary of the Kilarc Development, in place where requested by landowners, scarify and seed the surfaces of any roads to be rehabilitated, and erect barriers or obstacles to limit future access.

SPI requests that the removal of project facilities be conducted promptly and performed in a manner ensuring protection of its own valuable resources. SPI also requests that all its access roads located within and leading to the project be maintained during use by PG&E to SPI's minimum specifications such that SPI can meet its obligations to comply with state standards in its forest management activities. SPI's minimum specifications are as follows:

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[39] The *Water Quality Management for Forest Service System Lands in California, Best Management Practices* (Forest Service, 2000) provides a set of standardized BMPs to protect water quality during the planning and construction of projects, and the decommissioning of roads.

"Roads, landings, and associated drainage structures used by the project proponent need to be maintained in a manner which minimizes concentration of runoff, soil erosion, and slope instability and which prevents degradation of the quality and beneficial uses of water during operations and throughout the access permit maintenance period. Waterbreaks, rolling dips, and drainage culverts need to be structured such that the outlets are kept open to the unrestricted passage of water. Road running surfaces on the permitted access roads need to be treated and maintained as necessary to prevent excessive loss of road surface materials by, but not limited to, rocking, watering, chemically treating, asphalting or oiling. Drainage ditches, drainage structures, and any appurtenant trash racks must be maintained to allow free flow of water while minimizing soil erosion, and action must be taken to prevent failures of cut, fill, or sidecast slopes from discharging materials into watercourses in quantities deleterious to the quality of beneficial uses of water. Where not present, new trash racks should be installed if there is evidence that woody debris is likely to significantly reduce flow through a drainage structure."

NMFS recommends land-use conditions for surrender of the project consistent with PG&E's proposed PM&E measures and concurs with PG&E's proposed plan for decommissioning of the project works, including disposition of existing and any surrender-related new access roads.

DOI recommends requiring PG&E to prepare and implement a mitigation and monitoring plan (MMP). The MMP would include restoration of abandoned or temporary roadbeds, address compaction issues, and require seeding, mulching, and planting. The MMP would be developed in consultation with private landowners where appropriate. PG&E would include the MMP as a PM&E measure to prepare a MMP as recommended by DOI to mitigate effects associated with the Proposed Action. The MMP measures would work in conjunction with similar and additional measures in the erosion and sedimentation control BMPs proposed by the licensee as PM&E measures, as described above, to address erosion of access roads and staging areas as well as the removal of temporary access roads both during and after the Proposed Action PG&E further proposes two years of monitoring for potential erosion following removal of the Kilarc main canal diversion dam. Subsequently, it would consult with the resource agencies on the need for any additional monitoring.

In the Proposed Action, 95.50 acres of project lands at the Kilarc Development would remain in fee ownership by PG&E, and it would have the right to use or sell off this property should it choose to do so. PG&E would relinquish its easement rights to use the remaining 29.52 acres of lands for project purposes, returning it solely to private ownership. Implementing the proposed BMPs for erosion and sedimentation control, a speed limit on access roads, and an MMP; as well as conducting two years of post-construction monitoring of long-term BMPs within the stream channel, and one year in all other upland construction areas; removing project features that may have been a barrier to access; as well as restoring project lands to a more naturally appearing

landscape would mitigate effects associated with the Proposed Action on lands within the project boundary.

Our Analysis

The Proposed Action at the Kilarc Development would have a moderate long-term adverse effect on local access and recreation land uses by removing the Kilarc forebay and day use area (see section 3.3.7, *Recreational Resources*). All other effects of the Proposed Action at the Kilarc Development on land use within the project would be minor and short-term in nature and limited to the disposition of facilities associated with the Proposed Action, including equipment operation and building of new access roads as previously described. Commission staff agree that the effects would be minimized by implementing BMPs for erosion and sedimentation control, conducting two years of post-construction monitoring of long-term BMPs within the stream channel and for one year in all other upland construction areas, together with the disposition of any new access roads and staging areas as proposed by PG&E and described above.

PG&E's commitment to develop an MMP for the Proposed Action to include provisions for access roads, staging areas, and other disturbed areas located on property within the project boundary, in consultation with relevant affected property owners, would minimize to the extent possible any adverse effects on lands impacted by the Proposed Action.

Commission staff recommends inclusion of SPI's recommendation to maintain their access roads to minimum specifications when used during the Proposed Action within project boundary.

Effects of Proposed Action at Kilarc Facilities on Land Use and Properties Adjacent to the Project

For the Proposed Action at Kilarc, PG&E proposes to build about 0.5 mile of new, temporary access road in 13 segments to gain access to eight canal locations that are otherwise rendered inaccessible by elevated flume structures. Typically, these proposed new road segments would be very short, begin at an existing road near the canal, and be built only in areas that already have been disturbed by logging. Without these new road segments there are a number of canal segments that would have to be either abandoned in place or hand cut. PG&E would work with relevant landowners to mutually agree on any decisions regarding proposed access across private property. (PG&E, 2009a and 2009c).

The disposition of new access roads and staging areas that are created for the Proposed Action at the Kilarc Development would be included in the MMP. PG&E would leave access roads in place where requested by landowners, scarify and seed the surfaces of all staging areas and any roads to be rehabilitated, and erect barriers or obstacles to limit future access.

SPI requested on November 4, 2009, that all its access roads leading to the project be maintained during use by PG&E to SPI's minimum specifications, stated above, such

that SPI can meet its obligations to comply with state standards in its forest management activities.

Our Analysis

Effects of the Proposed Action at the Kilarc Development on land use adjacent to the project would be minor and short-term in nature, and limited to the disposition of facilities associated with the Proposed Action, including equipment operation and building of new access roads as previously described. Commission staff agree that the effects would be minimized by implementing BMPs for erosion and sedimentation control, conducting two years of post-construction monitoring of long-term BMPs within the stream channel and for one year in all other upland construction areas, together with the disposition of any new access roads and staging areas, as proposed by PG&E and described above.

PG&E's commitment to develop an MMP for the Proposed Action to include provisions for access roads, staging areas, and other disturbed areas located on property adjacent to the project in consultation with relevant affected property owners would minimize any adverse effects on lands impacted by the Proposed Action.

Consistency of the Proposed Action at Kilarc With Land Use or Land Management Plans, Policies, or Regulations

The Kilarc Development facilities represent an established land use in the project area and do not conflict with any other federal, state, or local use. The Proposed Action at the Kilarc Development would not conflict with the Shasta County General Plan or the Shasta County Zoning Plan. As discussed below, the Proposed Action at Kilarc would be in conflict with PG&E's Land Conservation Commitment (LCC) as it relates to the Stewardship Council's recommendations for the Kilarc Reservoir Planning Unit and could conflict with Cal FIRE's Fire and Resource Assessment Program.

Pacific Gas and Electric Company's Land Conservation Commitment

The Land Conservation Plan (LCP) requires the Stewardship Council, along with PG&E and other interested stakeholders, to develop land conservation and conveyance plans (LCCPs) for PG&E's watershed lands associated with the Kilarc-Cow Creek Project that would contain recommendations for future fee domes or conservation-easement holders (PG&E, 2009d).

Several commenters expressed concern that the LCP and the Stewardship Council were chartered to assist PG&E in their 2001 chapter 11 bankruptcy filing. While the formation of the Stewardship Council and the LCP occurred at a similar time as PG&E's scoping for the surrender of the project, the LCP is management tool that can contribute to the preservation of certain lands in the area. On December 2003, California Public Utilities Commission (CPUC) issued its bankruptcy decision in a final order as a Settlement Agreement that required PG&E commit to preserving or enhancing the 140,000 acres of lands associated with its hydroelectric system, and 655-acre Carrizo Plain, as discussed above, in the LCC and specified in both the Settlement Agreement

and Stipulation. The Stewardship Council is a private non-profit foundation and was established as a result of the California CPUC's Settlement Agreement to oversee PG&E's LCC and to develop and implement the LCP (Stewardship Council, 2007).

PG&E's proposal to remove the Kilarc day use area, and drain and regrade the Kilarc forebay is in conflict with the LCP's Recommended Concept that project lands located inside the Kilarc Reservoir Planning Unit be preserved and enhanced by focusing on the importance of recreation resources to the local community.[40] The Stewardship Council developed the LCP to enhance the recreation experience at Kilarc reservoir in coordination with any surrender activities, enhancing biological resources, and ensuring protection of cultural resources. However, implementation of the LCC would not interfere with the Proposed Action because the Stewardship Council would re-evaluate the Kilarc Reservoir Planning Units and make recommendations for the LCCP that reflect the status and outcome of the Proposed Action, and terms of any Commission order, in coordination with stakeholders and all interested parties (Stewardship Council, 2007).

Section 3.3.7, *Recreational Resources*, addresses several comments regarding the Stewardship Council's charter for all PG&E land released to the state to achieve conditions where opportunities for children and inner-city youth would include fishing and nature education, and similar to current conditions at the Kilarc forebay. Loss of that recreation and land use are also mentioned.

Our Analysis

The Proposed Action would conflict with the Stewardship Council's recommendation regarding land uses at the Kilarc Reservoir Planning Unit as discussed above. However, the Stewardship Council would re-evaluate the Kilarc Reservoir Planning Unit to make recommendations for the LCCP that would reflect any surrender terms. The re-evaluation would provide sufficient mitigation of any moderate adverse long-term impacts to recreation and education opportunities at the Kilarc forebay and day use area.

Fire and Resource Assessment Program (Cal FIRE)

PG&E acknowledges that the proposed use of construction equipment and temporary onsite storage of diesel fuel could pose a wildland fire risk and conflict with the Fire and Resource Management Program. The greatest fire risk is during the clearing phase, when people and machines are working among vegetative fuels that can be highly flammable. If piled onsite, the cleared vegetative materials also could be ignited by

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[40] The Recommended Concept consists of specific objectives for each planning unit. The Stewardship Council has identified a set of potential measures to preserve or enhance the beneficial public values for each objective that are intended to be illustrative in nature, not prescriptive, and that would be amended, deleted, or augmented over time in coordination with future landowners and managers to best meet the objective for the planning unit.

equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a spark, fire, or flame. Because these potential effects could conflict with the Fire and Resource Assessment Program, PG&E proposes the following PM&E measures to reduce the risk of loss, injury, or death involving fires to people or structures as a result of the Proposed Action:

- Earthmoving and portable equipment with internal combustion engines would be equipped with a spark arrestor to reduce the potential for igniting a wildland fire.
- Appropriate fire suppression equipment would be maintained during the highest fire danger period from April 1 to December 1.
- On days when a burning permit is required, flammable materials would be removed to a safe distance of 10 ft from any equipment that could produce a spark, fire, or flame, and the appropriate fire suppression equipment would be maintained and readily available.
- On days when a burning permit is required, portable tools powered by gasoline-fueled internal combustion engines would not be used within 25 ft of any flammable materials.

As described above in section 3.3.8.1, *Affected Environment*, Cal FIRE has identified the hazard level for the project area as Very High (Cal FIRE, 2007). Shasta County, community stakeholders, landowners, and members of the public commented that the Kilarc forebay is a valuable body of water for fire suppression, primarily by helicopter, that is readily accessible to Cal FIRE and to WVCFC. Because decommissioning of the Kilarc forebay would result in the loss of the forebay as a water source for fire protection for the surrounding community, Shasta County requests that PG&E's surrender be conditioned to provide the County with funds to acquire necessary land and water rights to provide an equivalent source of fire protection for its citizens and property within the County. Cal FIRE does not maintain any records of how often the forebay has been used for fire suppression activities (PG&E, 2009f). WVCFC did not provide any information as to how often it has used the forebay for fire suppression. The loss of the forebay for fire suppression would have no effect on Cal FIRE'S ability to fight fires in the area because there are several lakes of similar size or larger within 15 miles of the Kilarc forebay that may serve as alternatives water sources. In addition, certain wider points along Old Cow Creek have been successfully used in the past for water collection via helicopter. Old Cow Creek as well as several other creeks in the area would continue to be available for WVCFC to use as substitute water resources for fire suppression.

Our Analysis

Surrender activities could conflict with Cal FIRE's Fire and Resource Assessment Program by piling cleared vegetative material onsite or using equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a

spark, fire, or flame in an area of Very High fire hazard. PG&E's proposed PM&E measures including equipping equipment with internal combustion engines with a spark arrestor; maintaining appropriate fire suppression equipment during the period of highest fire danger and on days when a burning permit is required; moving flammable material to a safe distance of 10 ft from any equipment that could produce a spark, fire, or flame; and avoiding the use of portable tools powered by gasoline-fueled internal combustion engines within 25 ft of any flammable materials would provide sufficient mitigation of the adverse impacts to fire dangers in the project area.

Commission staff concludes that the short distance between the Kilarc forebay and the nearby water resources would not add substantial amounts of time to Cal FIRE's fire response, and, with other local substitute water sources available, the removal of the Kilarc forebay would not substantially hinder Cal FIRE's firefighting efforts in the area, or WVCFC's ability to obtain fire suppression water. The availability of alternation water sources for fire suppression mitigates for any minor adverse long-term effects associated with the removal of the Kilarc forebay.

Cow Creek Development

Effects of Proposed Action at Cow Creek on Property Rights, Land Ownership, and Existing Land Use of Properties in the Project Boundary

PG&E would retain ownership of the 14.20 acres of project land it owns at the Cow Creek Development throughout surrender implementation. For the 43.24 acres where PG&E holds deeded easements or prescriptive rights over private lands for project purposes, PG&E would execute one of the following options: (1) where PG&E holds deeded easements, PG&E would provide a quitclaim deed to the private landowner, or (2) where PG&E holds prescriptive rights, those rights would be extinguished automatically by operation of law after PG&E abandons use of the property (PG&E, 2009d).

By letters dated March 21, 2008, and July 10, 2009, DOI suggested PG&E with two options for disposition of the 1.87 acres held in trust by DOI under jurisdiction of the BIA that PG&E holds in easement at a portion of the Cow Creek penstock: (1) PG&E would purchase the land in the easement, or (2) PG&E would remove the penstock and restore the land to pre-permit conditions. By letter dated September 4, 2009, PG&E responded that it is exploring the option of acquiring the land rights associated with these 1.87 acres in order to facilitate the disposition of a portion of the Cow Creek penstock as in the proposed surrender plan (PG&E, 2009f). No additional changes to land ownership are expected as a result of the Proposed Action at the Cow Creek Development.

PG&E proposes to develop and implement detailed engineering and management plans for the Proposed Action on lands in use at the Cow Creek Development project facilities. The proposed disposition of facilities associated with the Proposed Action would include the following mitigation measures to promote safety, accommodate private

landowner concerns, and to be consistent with adjacent land uses and relevant existing land use plans administered by state and local entities:

- Where feasible and acceptable to the private landowner, structures would be left in place at or below grade level with sediment fill or fill from elsewhere.
- Mill Creek and South Cow Creek diversion dams and appurtenant structures would be removed to stop water diversions and to allow for free passage of fish and sediment.
- Some diversion dam abutments and foundations would be left in place to protect stream banks and provide grade control.
- In consultation with affected landowners, the canal segments would be left in place, breached, or filled (or include a combination of these treatments) depending on accessibility to the canal section (see South Cow Creek canal below). Canal metal and wood flume structures and overflow spillways would be removed.
- The South Cow Creek canal would be abandoned in place, with strategic breaching, at the preference of the private landowner on whose property the canal is located. The cross-over flume over this canal would be removed. The cat bridge tied into the walls of the South Cow Creek canal would be abandoned in place to allow access across the dry canal.
- Spillways No. 2 and 3 would be modified such that spill height is the same as the canal bottom.
- The Cow Creek forebay would be removed to grade and the outlet structure to the penstock removed.
- The Cow Creek forebay would be dewatered, backfilled with adjacent berm material, graded, and reseeded.
- The South Cow Creek tunnel and the underground Cow Creek penstock would be sealed and left in place because removing these buried facilities would cause a significant environmental disturbance at a significant cost.
- The Cow Creek powerhouse would be secured and left in place to address safety issues, and to preserve the option for future reuse of the structure.
- Electric generators, turbines, and other equipment would be removed for safety reasons and for reuse.
- Hooten Gulch would have the shotcrete armor removed for burial in the tailrace to allow a more natural stream bed for fish passage. Replacement bank stabilization measures would be installed.

Short-term adverse effects of the Proposed Action resulting from localized stream bank erosion may be associated with the removal process for the diversion dams due to

the installation and removal of any temporary cofferdams, or diversion structures required, and the removal of any canal segments. To minimize any erosion that should occur as a result of the Proposed Action, PG&E proposes PM&E measures that would include development of detailed design plans and specifications with provisions to minimize the potential for on- or off-site landslides, the implementation of bank erosion measures, and soil erosion and sedimentation control BMPs developed by the Forest Service (Forest Service, 2000).

No new access roads are anticipated to be needed for the Cow Creek Development. Current access roads at the Cow Creek Development transverse lands inside and outside of the project boundary that are in a combination of PG&E, public, and private ownerships. Equipment required for the disposition of project facilities associated with the Proposed Action may require improvement to existing roads. However, equipment proposed for surrender implementation is relatively small due to the small size of the project features, and therefore it would have limited effect on existing roads. Improvements would be limited to the existing road bed and consist primarily of surface smoothing and pothole filling with a motor grader. Construction equipment would be offloaded from haulers at locations served by major project roads and travel under their own power to work sites to minimize the need for extensive road improvements. PG&E proposes PM&E measures to minimize potential erosion and sedimentation from road improvement activities through the application of BMPs as described above. Further, PG&E proposes to implement a 15 mile-per-hour speed limit on access roads located within the project boundary during the Proposed Action for safe vehicle operation and in consideration of other road users. PG&E would leave existing access roads located within the project boundary at the Cow Creek Development, in place where requested by landowners, scarify and seed the surfaces of any roads to be rehabilitated, and erect barriers or obstacles to limit future access.

SPI requests, in comments dated November 4, 2009, that the removal of project facilities be conducted promptly and performed in a manner ensuring protection of its resources. SPI also requests that all its access roads located within and leading to the project be maintained during use by PG&E to SPI's minimum specifications, which are stated above for the Kilarc Development, so SPI can meet its obligations to comply with state standards in its forest management activities.

One individual expressed concern, in comments dated October 14, 2009, with regard to the responsible treatment of private lands during the disposition of project facilities associated with the Proposed Action. The individual commented that reasonable preventive or relatively simple proactive measures need to be invoked on his property at the South Cow Creek diversion dam when it is removed, specifically in relation to the re-establishment of a natural bank in front of the north-side retaining wall due to safety concerns.

PG&E proposes to consult with each private landowner where structures would be removed to determine the extent of their removal (at or below grade level), and to prepare

detailed design plans and specifications for soil erosion and sedimentation control. As part of the implementation of the Proposed Action, PG&E would prepare detailed plans in consultation with landowners to address any preventive or proactive physical measures required for South Cow Creek diversion dam decommissioning, including treatment of the bank in front of the north side retaining wall and the wall itself.

NMFS recommends land-use conditions for surrender of the project's license consistent with PG&E's proposed PM&E measures and expressed support for the Proposed Action. DOI recommends requiring PG&E to prepare and implement mitigation and monitoring plan (MMP), which includes measures identical to those stated for the Kilarc Development. The MMP would be developed in consultation with private landowners, where appropriate. PG&E proposes as a PM&E measure to prepare and implement the MMP as recommended by DOI to mitigate effects associated with the Proposed Action.

For the Proposed Action at Cow Creek, 14.2 acres of project land would remain in fee ownership by PG&E. PG&E would relinquish its easement rights to use the remaining 43.24 acres of lands for project purposes, returning it solely to private ownership. Implementing the proposed BMPs for erosion and sedimentation control, a speed limit on access roads, and the MMP; conducting post-construction monitoring for long-term BMPs for two years within the stream channel and one year in all other upland construction areas; removing project features that may have been a barrier to access in some instances; as well as restoring project lands to a more natural landscape would sufficiently mitigate effects on lands within the project boundary associated with the Proposed Action.

One individual stated, in comments dated October 8, 2009 and October 13, 2009, that the proposed post-monitoring period of two years is too short and has no practical value, either to his lands at the South Cow Creek diversion dam or to the stream bed with respect to the objectives of the resource agencies. PG&E indicates that following two years of monitoring for potential erosion following removal of the South Cow Creek diversion dam, they would consult with the resource agencies on the need for any additional monitoring that may need to be conducted, in conjunction with other federal, state, and local permits. Commission staff concludes that the two years of post monitoring, spanning two growing seasons as proposed by PG&E, with the commitment to consult with resource agencies after two years, is a reasonable and sufficient length of time to establish vegetation at the site and to evaluate erosion and sedimentation control measures.

Our Analysis

The minor adverse effects of the Proposed Action at Cow Creek on land use within the project boundary would be short-term in nature and limited to the disposition of facilities associated with the Proposed Action, including equipment operation and building of new access roads as previously described. Commission staff agrees that the effects would be minimized by implementing BMPs for erosion and sedimentation

control, conducting two years of post-construction monitoring of long-term BMPs within the stream channel and for one year in all other upland construction areas, and preparing detailed plans in consultation with landowners to address any preventive or proactive physical measures required for South Cow Creek diversion dam decommissioning. Additionally, Commission staff recommends inclusion of SPI's requirement to maintain their access roads within the project boundary to minimum specifications when used during the Proposed Action.

PG&E's commitment to develop the MMP for surrender activities associated with the Proposed Action at the Cow Creek Development that would apply to access roads, staging areas, and other disturbed areas located within the project boundary, in consultation with all relevant affected property owners, would provide sufficient mitigation to minimize adverse effects on lands impacted by of the Proposed Action.

Effects of Proposed Action at Cow Creek Facilities on Land Use and Properties Adjacent to the Project

No new access roads would be needed for the Proposed Action at the Cow Creek Development on properties adjacent to the project. PG&E proposes to locate one staging area at the main intersection of several access roads on the ridge above the South Cow Creek diversion dam and South Cow Creek main canal. This location is not near the stream and would help minimize potential water quality effects to stream habitat in South Cow Creek. This area is the central point proposed for off-loading and staging construction equipment to avoid heavy truck traffic on the small, less-improved connecting road segments (PG&E, 2009c). PG&E proposes PM&E measures for the Proposed Action identical to those for property located within the project boundary, including BMPs for soil erosion and sedimentation control, and the development of the MMP.

SPI requests that all its access roads leading to the project be maintained during use by PG&E to SPI's minimum specifications, as stated above for the Kilarc Development, such that SPI can meet its obligations to comply with state standards in its forest management activities.

Tetrick Ranch and ADU stated in several comments that the Proposed Action impedes their ability to exercise their water rights to maintain their agricultural land uses and home water supply by the Proposed Action. The Proposed Action would end the augmentation of flows to Hooten Gulch downstream of the Cow Creek powerhouse. Removal of these artificial and perennial water flows from Cow Creek powerhouse would potentially interrupt irrigation water from Hooten Gulch at the Abbott Diversion, as described by Tetrick Ranch and the ADU, during periods in the summer and fall as a result of seasonal and cyclic hydrological conditions that occur under natural stream flows in Hooten Gulch (see section 3.3.2.1, *Water Quantity*). Artificial flows from the Abbot Diversion are used by Tetrick Ranch and ADU farming and ranching operations for flood irrigation on 312 acres of crop and pasture lands. The loss of the diversion

could have a long-term adverse effect on agricultural uses for crop, pasture, and livestock production if an alternative water source is not created.

The concerns expressed by Tetrick Ranch, ADU, Shasta County, and other stakeholders that removal of the present Abbott Ditch water conveyance, absent mitigation, would result in adverse economic effects to the farming and ranching community in the project area is described in section 3.3.10, *Socioeconomics* for the Cow Creek Development.

Should the natural flows in Hooten Gulch be augmented by the construction of a new water diversion as a means to provide a perennial source of water to Abbott Diversion, or Abbott Diversion is replaced by a new diversion, as stakeholders suggest, Tetrick Ranch and ADU's ability to maintain their agricultural farming and ranching operations on the 312 acres irrigated by Abbott Ditch would continue throughout the year uninterrupted by seasonal and cyclic hydrological conditions that prevail under natural stream flows in Hooten Gulch.

Our Analysis

Adverse effects of the Proposed Action at Cow Creek on land use and properties located adjacent to the project, as discussed above, would be minor and short-term in nature, limited to the surrender process for the project, and the result of equipment operation and new staging area locations. Effects would be minimized by implementing BMPs proposed by PG&E including erosion and sedimentation control, conducting post-construction monitoring for one year in all upland construction areas and for two years within the stream channel, and the disposition of the new staging area.

PG&E's commitment to develop the MMP for the Proposed Action at the Cow Creek Development would apply to access roads, staging areas, and other disturbed areas located on property adjacent to the project, in consultation with all relevant affected property owners, and would minimize effects on lands impacted by the Proposed Action.

The Proposed Action at Cow Creek, including the permanent removal of the augmented water source provided to Hooten Gulch by the Cow Creek powerhouse through the Abbott Diversion would have a major long-term adverse effect on the agricultural uses of farm and ranch lands irrigated by Abbott Diversion. Replacement of these augmented flows, outside the scope of this proceeding, would allow Abbott Ditch to continue to receive irrigation water under natural stream flow conditions following the Proposed Action, and would allow agricultural uses to continue and avoid conflict with the Shasta County General Plan and PG&E's Land Conservation Commitment.

Consistency of the Proposed Action at Cow Creek with Land Use or Land Management Plans, Policies, or Regulations

The current use of project lands at the Cow Creek Development do not conflict with any other federal, state, or local use. The Proposed Action at the Cow Creek Development would not conflict with the Shasta County Zoning Plan. As discussed below, the Proposed Action at Cow Creek could conflict with the Shasta County General

Plan, with PG&E's Land Conservation Commitment as it relates to the Stewardship's Council's recommendations for the Cow Creek Planning Unit, and with Cal FIRE's Fire and Resource Assessment Program.

Shasta County General Plan

The Shasta County General Plan (2004) has no specific policies or guidelines regarding the project facilities and would not result in environmental or land use changes that would conflict with the General Plan. However, the Proposed Action at Cow Creek could conflict with the General Plan's objectives and policies for preserving agricultural land, indirectly, by removing the perennial water supply to the Abbott Diversion.[41]

Our Analysis.

The permanent loss of irrigation water associated with the Proposed Action would have a long-term adverse impact on the Shasta County General Plan's objectives and policies for preserving agricultural land by having a major long-term adverse effect on the agricultural uses of farm and ranch lands irrigated by the Abbott Diversion. Replacement of the augmented flows, outside the scope of this proceeding, would allow Abbott Ditch to continue to receive irrigation water under natural stream flow conditions following the Proposed Action, and would avoid conflict with the Shasta County General Plan.

Pacific Gas and Electric Company's Land Conservation Commitment

The Proposed Action for the Cow Creek Development could conflict with the LCP's Recommended Concept objective to preserve and enhance agricultural uses at the Cow Creek Planning Unit by removing the perennial water supply to the Abbott Diversion following the termination of augmented flows to Hooten Gulch from the Cow Creek powerhouse.[42] However, implementation of PG&E's Land Conservation Commitment would not interfere with the Proposed Action. The Stewardship Council would re-evaluate the Cow Creek Planning Unit to make recommendations for the LCCP to reflect the status and outcome of the Proposed Action and surrender terms, in coordination with stakeholders and all interested parties (Stewardship Council, 2007).

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[41] The objective in the Shasta County General Plan for Agricultural Lands is AG-6, "Protection of water resources and supply systems vital for continuation of agriculture."

[42] The Recommended Concept consists of specific objectives for each planning unit. The Stewardship Council has identified a set of potential measures to preserve or enhance the beneficial public values for each objective that are intended to be illustrative in nature, not prescriptive, and that would be amended, deleted, or augmented over time in coordination with future landowners and managers to best meet the objective for the planning unit.

Our Analysis

The permanent loss of this irrigation water would result in the Proposed Action presenting a conflict with the Stewardship Council's recommendation to preserve and enhance agricultural uses at the Cow Creek Planning Unit by having a major long-term adverse effect on the agricultural uses of farm and ranch lands irrigated by Abbott Diversion. Replacement of these augmented flows, outside the scope of this proceeding, would allow Abbott Ditch to continue to receive irrigation water under natural stream flow conditions following the Proposed Action, and would allow agricultural uses to continue and avoid conflict with PG&E's Land Conservation Commitment.

The Stewardship Council's re-evaluation of the Cow Creek Planning Unit once the surrender process is complete would make specific determinations to identify and manage grazing practices in balance with other uses and values of the property to minimize any impacts.

Fire and Resource Assessment Program (Cal FIRE)

The Proposed Action at Cow Creek could conflict with Cal FIRE's Fire and Resource Assessment Program in the same manner as described above for the Kilarc Development. PG&E's proposed PM&E measures as described for Kilarc also would be employed at Cow Creek to address these conflicts for the Fire and Resource Assessment Program.

Our Analysis

The Proposed Action could conflict with Cal FIRE's Fire and Resource Assessment Program by piling cleared vegetative material onsite or using equipment with internal combustion engines, gasoline-powered tools, and equipment or tools that produce a spark, fire, or flame in an area of Very High fire hazard. This would cause a minor short-term adverse effect on the fire hazard in the area. PG&E's proposed PM&E measures, stated above for the Kilarc Development, would sufficiently mitigate for these conflicts.

3.3.8.3 Environmental Effects of Action Alternative 1

The purpose of AA1 is to ensure continued recreation access at the Kilarc forebay as well as associated facilities of the Kilarc Development required to maintain the forebay for public land use of the forebay area. Project facilities not associated with forebay maintenance would be decommissioned as proposed under the Proposed Action.

Kilarc Development

Under AA1, there would be beneficial impacts on land use at the Kilarc forebay area, including the retention of the Kilarc forebay for public access, recreation, and as a water source for fire suppression. A new owner would upgrade and maintain the main canal structures and overflow spillways at the Kilarc Development. This likely would result in the construction of temporary access roads to reach some of the elevated flume structures, with minor short-term adverse effects on land use due to land clearing and

equipment operation. The implementation of PG&E's proposed erosion and sedimentation control measures would be appropriate to mitigate for impacts caused by the remaining surrender activities. Otherwise, the effects of this Action Alternative would be identical to those effects described under licensed conditions, or the No-Action Alternative.

AA1 would not adversely impact land uses in comparison to current licensed condition, or conflict with land management plans, policies, or regulations within the Old Cow Creek watershed and the Kilarc forebay area, including the Stewardship Council's objective for enhancing the recreation experience at the Kilarc Development in relation to PG&E's Land Conservation Commitment.

Our Analysis

In comparison to the Proposed Action, AA1 would maintain the moderate long-term beneficial impact on land use of public access and recreation at the Kilarc forebay and day use area, and would retain the existing source of water for fire suppression for Cal FIRE and WVCFC. Retention of the Kilarc forebay would be in agreement with the Stewardship Council's LCP for land and land uses at the Kilarc reservoir.

Cow Creek Development

Under AA1 the Cow Creek Development would be decommissioned as described in the Proposed Action. The effects of AA1 on land use at the Cow Creek Development, in comparison to the No-Action Alternative, include adverse effects on agricultural irrigation, consistency with current land use and land management plans, policies and regulations within the South Cow Creek watershed identical to those described for the Proposed Action. AA1 would not provide any measures in addition to those discussed as part of the Proposed Action.

Our Analysis

Under AA1, the effects on Cow-Creek-area land use, in comparison to the No-Action Alternative, would be the same as those described for the Proposed Action.

3.3.8.4 Environmental Effects of Action Alternative 2

Action Alternative 2 would provide for continued augmentation of flows to Hooten Gulch from the Cow Creek powerhouse, and retention of associated facilities at the Cow Creek Development needed to maintain flows. Project facilities not associated with flows would be decommissioned as proposed under the Proposed Action.

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described in the Proposed Action. The effects on current land use at the Kilarc Development as a result of implementing AA2, in comparison to the No-Action Alternative, include an adverse effect on consistency with land use and land management plans, policies and regulations within the Old Cow Creek watershed that are identical to those described for

the Proposed Action. The Kilarc forebay would no longer be available as a source of water for fire suppression. AA2 would not provide any measures in addition to those discussed as part of the Proposed Action.

Our Analysis

Under AA2, the effects on Kilarc-area land use would be the same as those described for the Proposed Action.

Cow Creek Development

Under AA2, there would be beneficial impacts to land use at the Cow Creek Development, in comparison to the Proposed Action, by continuing augmentation of water flows to Hooten Gulch from the Cow Creek powerhouse to provide artificial perennial flows to the Abbott Diversion. A new owner would upgrade and maintain the main canal structures and overflow spillways. Otherwise, the effects of this Action Alternative would be identical to licensed conditions and the No-Action Alternative.

AA2 would remain consistent with agricultural use, land use and land management plans, policies and regulations within the South Cow Creek watershed for the Cow Creek Development, as discussed for the Proposed Action. The retention of augmented flows to Hooten Gulch from the Cow Creek powerhouse would be in agreement with the goals of the Shasta County General Plan for preserving agricultural lands, and its objective for protection of agricultural water resources and supply systems. In addition, AA2 would not conflict with the Stewardship Council's recommendation to preserve and enhance agricultural uses at the Cow Creek Planning Unit.

Our Analysis

AA2 would result in major long-term beneficial impacts to land use at the Cow Creek Development, in comparison to the Proposed Action, by continuing current land uses consistent with Shasta County General Plan objectives and policies for preserving agricultural lands, and the Stewardship Council's recommendation to preserve and enhance agricultural uses at the Cow Creek Planning Unit. The disposition of facilities not associated with flows would have a minor short-term adverse impact, in comparison to the No-Action Alternative.

3.3.8.5 Environmental Effects of No Action

Kilarc and Cow Creek Developments

Under the No-Action Alternative, the project facilities would continue to operate under the terms and conditions of the existing license. The existing land use resources within the Old Cow Creek and South Cow watersheds described in section 3.3.8.1, *Affected Environment*, for the Kilarc and Cow Creek Developments, respectively, would be identical to conditions under the project license, with no effect on current land management activities or land uses. The No-Action Alternative would remain consistent with land use or land management plans, policies, and regulations within the project boundary.

Our Analysis

The No-Action Alternative would maintain land use conditions identical to licensed conditions. There would be no disturbance of existing environmental conditions, and there would be no new environmental protection, mitigation, or enhancement measures. Existing project structures would remain in place and operational.

3.3.9 Aesthetics

3.3.9.1 Affected Environment

The project is located in the foothills at the southern end of the Cascade Mountain Range, and encompasses a range of scenery. The Shasta County General Plan (as amended in September 2004), in section 6.8 (*Scenic Highways*) and section 6.9 (*Open Space Inventory*), states that the project facilities are not located within the viewshed of officially designated or planned scenic highways, and the project area does not appear in Shasta County's Open Space Inventory.

Kilarc Development

Steep, narrow river canyons, and densely vegetated river banks with conifer forests are characteristic of the upper Old Cow Creek watershed of the Kilarc Development. The Kilarc powerhouse is located at an elevation of 2,580 feet msl and sits below Miller Mountain on the western slope below Fern Road East. The area surrounding the Kilarc powerhouse and its facilities is heavily forested on all sides with a steeply-rising landscape toward Miller Mountain. Vegetation density, landforms, and a curvilinear highway limit extended views in the area. The aesthetic of the area, including topography and vegetation, shows evidence of human activity with evidence of timber harvesting particularly apparent. However, existing views are not currently interrupted by the presence of project facilities.

The Old Cow Creek channel is lined with light-colored granite and moderately vegetated slopes. The Kilarc powerhouse, constructed of locally quarried stone, is most visible from Fern Road East, which crosses directly over the penstock and passes within 50 ft of the powerhouse structure, thus placing the building in the immediate visual foreground. Viewer quality and visual sensitivity of the Kilarc powerhouse has been determined to be moderate as viewed from Fern Road East (Figure 9). Although the Kilarc powerhouse is a visible element in the landscape, it does not represent a substantial contrast with its surroundings because the naturally-occurring stone materials it is made from blend in with the surrounding environment.

The Kilarc penstock is visible as a cleared, 50-ft path as it rises steeply in a southeasterly direction above Fern Road East to the ridge 1,200 feet above the Kilarc powerhouse on Miller Mountain. The penstock terminates at the Kilarc forebay dam. The Kilarc-forebay vicinity is characterized by steeply undulating landscapes covered by a green canopy of Jeffrey pine, white fir, and lodgepole pine forests that are broken by

outcrops of light-colored granite. From the access road, views of the Kilarc forebay and related facilities are partially blocked due the higher elevation of the forebay compared to the roadway surface, and the presence of trees along the roadway. Public access is allowed at the Kilarc forebay by the project's license for use of the Kilarc day use area for picnicking, fishing, and sightseeing.

Viewer quality and visual sensitivity of the Kilarc forebay has been determined to be moderate from the Kilarc day use area (Figure 10). The forebay, dam, and day use area do not detract from the distinctive landscapes in the background. The Kilarc forebay, main canal, and main canal diversion dam are relatively small in scale and blend in with their surroundings. High-country views of Lassen Peak and Lassen National Forest are possible to the south and east of the forebay area. To the north and west, distant views of the peaks in Shasta National Forest are possible, though partially obscured by vegetation in some places.

PG&E identified key observation points (KOPs) for the Kilarc Development project area from visually-sensitive locations, defined as views of project facilities from public travel routes and project-related recreation areas. Since all project facility operations occur on existing creeks and canals, most of which are located away from major roadways and are not visible from the surrounding area due to steep terrain and dense vegetation, only two KOPs were selected for further visual impact analysis. KOP 1 is a point directly north of the Kilarc powerhouse on Fern Road East, a travel corridor to the project area (Figure 9). KOP 2 overlooks the Kilarc forebay to the northwest from the Kilarc day use area (Figure 10).

The visual impact analysis of each KOP is based on field observations conducted in April 2008. A review of ground level photographs of the project area from the KOP, and from information contained in PG&E's proposed surrender implementation plan was qualitative, and used the Federal Highway Administration methodology for assessing visual impacts (1988). Each viewpoint was analyzed for its visual quality, a measure of the overall impression or appeal, and viewer sensitivity defined as the viewer's concern for scenic quality in response to change in the visual resources. PG&E's analysis included a value of high, moderate, or low where:

- "High" defines a landscape with great scenic value; for example, a "picture postcard" scene such as Mount Shasta. People typically go out of their way to visit areas of high visual quality that have high levels of vividness, unity, and intactness, and viewers have substantial concern for the scenic quality of these areas.
- "Moderate" defines landscapes that are common or typical and have average scenic value. They usually lack significant man-made or natural features. Levels of vividness, intactness, and unity are average, and viewers have some concern for scenic quality in response to changes in views.

- "Low" defines landscapes that are below average in scenic value. They often contain visually discordant man-made alterations and provide little of interest in terms of landscape attributes. Views are typically classified as indistinct, unharmonious, and disjunctive. Levels of vividness, intactness, and unity are low, and viewers have little to no concern for views in these areas.

Additionally, viewer exposure was assessed for each viewpoint by measuring the number of viewers exposed to the resource change, type of viewer activity, duration of their view, speed at which the viewer moves, and position of the viewer. The results of the visual impact analysis for KOP 1 and KOP 2 are described in section 3.3.9.2, *Environmental Effects of Proposed Action*.

Figure 9. KOP 1 is a point directly north of Kilarc powerhouse on Fern Road East, a travel corridor to the project area. (Source: PG&E, 2009a)

Figure 10. KOP 2 overlooks Kilarc forebay to the northwest from the Kilarc day use area. (Source: PG&E, 2009a)

Cow Creek Development

Gently rolling foothills consisting of grasses, oak, and pine trees, with a sparse and scattered overstory are typical of the Cow Creek Development in the lower South Cow Creek watershed. The Cow Creek powerhouse is located at an elevation of 856 feet msl on South Cow Creek Road. The area surrounding the Cow Creek powerhouse is dominated by rangeland and forested areas adjacent to South Cow Creek. Landscape visibility is limited from the roadway due to the presence of trees and a nonlinear road pattern. There is only a limited view of the Cow Creek powerhouse from the private South Cow Creek Road, and the powerhouse structure does not substantially contrast with its surroundings. The Cow Creek powerhouse and forebay are inaccessible to the public due to gated access at the end of South Cow Creek Road, and at the upper-end of South Cow Creek Road on the Whitmore side. The visibility of the Cow Creek forebay is obscured from South Cow Creek Road due to the elevation difference. There is no view of the penstock from the paved terminus of South Cow Creek Road.

PG&E did not identify any KOPs for the Cow Creek Development portion of the project due to topography, vegetation, and the lack of public viewpoints to project features, since public access to the project is restricted.

3.3.9.2 Environmental Effects of Proposed Action

Kilarc Development

PG&E states that several existing project features at the Kilarc Development are visible in the immediate foreground from two visually sensitive locations, KOP 1 (Fern Road East travel corridor) and KOP 2 (Kilarc day use area). It states that no other existing project features are visible from any major vantage points within the project area, and concludes that views of surrounding areas would not be altered by the Proposed Action. The results of the visual impact analysis for KOP 1 and KOP 2 are described below.

Visual Impact Analysis Results for KOP 1

The powerhouse and switchyard are clearly visible from KOP 1 (Figure 9). KOP 1 has moderate visual quality sensitivity because the landscape surrounding the Kilarc powerhouse is fairly typical in the area. This KOP has average scenic value because it contains significant man-made features such as the powerhouse, electric transmission poles, and accessory structures, and a paved two-way road. This KOP contains some natural features, mostly consisting of dense forest to the southeast. The level of vividness, intactness, and unity at this location is average. From the survey information contained within the 2007 PG&E recreational resources report, viewers expressed some concern for scenic quality in response to changes in views.

The current view from KOP 1 (Figure 9) would not change as a result of the Proposed Action. The powerhouse would be left in place to preserve the option for future reuse of the structure and, in accordance with PG&E's proposed PM&E measures to offset project effects on architectural and historical resources, secured from unwanted entry. The switchyard would be left in place as part of the PG&E inter-connected transmission system.

Visual Impact Analysis Results for KOP 2

The Kilarc forebay dam is visible from KOP 2 (Figure 2). KOP 2 has moderate visual quality and viewer sensitivity because there is only sparse vegetation surrounding the Kilarc forebay, which is a man-made feature in the foreground. This KOP has average scenic value because it lacks high-quality landscape and topography that would define a higher quality scenic value. In addition, the level of vividness, intactness, and unity at this location is average. From the survey information contained within the 2007 recreational resources report, viewers expressed some concern for scenic quality in response to changes in views.

The existing visual character of the Kilarc forebay site and its surroundings would be adversely affected in the short-term during implementation of the Proposed Action

(Figure 10). The Kilarc forebay would be drained and re-vegetated, the canals and diversions dewatered, and the picnic area and restroom facilities removed. These changes would adversely affect the existing aesthetic views from KOP 2. However, the disposition of the man-made forebay would return the Kilarc forebay area to a more natural setting, with revegetation consisting of native plants to create visual compatibility with surrounding forest and vegetation cover types. Further, following implementation of the Proposed Action, the Kilarc forebay would no longer be accessible to the public as required by the project license. Since the right of public access would cease with PG&E's surrender of the project, the forebay would no longer be a visual resource.

Several commenters stated that scenic views for vistas are exceptional at the Kilarc day use area, and that the ease of access for youth, seniors, and the handicapped are rare at other reservoirs in California. Termination of the project license would mean that public access to the site would no longer be available. However, sightseeing and scenic views are possible from other recreational areas within close proximity to the project area. Some of these areas and their distances from the project include:

- McMullin Mountain and LaTour Butte in LaTour Demonstration State Forest, located 6 miles east of the Kilarc forebay, offer 360 degree views of the surrounding area, including Mount Shasta.
- PG&E's Lake Grace day use area is 20 miles.
- PG&E's Lake Nora day use area is 20 miles.
- Baum Lake is 50 miles.
- Big Lake is 67 miles.

Our Analysis

The removal of the Kilarc forebay area under the Proposed Action as a visual resource at KOP 2, and termination of the public's access right to the forebay and day use area would be a minor long-term adverse effect on Kilarc project area aesthetics, in consideration of the site's relatively low rates of visitation, moderate visual quality, and moderate viewer sensitivity. This KOP has average scenic value because it lacks high-quality landscape and topography that would define a higher quality scenic value. Alternative sightseeing and scenic views are possible from other recreational areas within close proximity to the Kilarc project area.

Cow Creek Development

The results of PG&E's aesthetic analysis of the Cow Creek Development indicated that there were no project features visible from visually-sensitive locations or key observation points, due to topography, vegetation, and lack of lack of public access to the development. Further, the Cow Creek powerhouse is not accessible or easily viewed by the public. While not considered a visual resource, the Cow Creek powerhouse would be left in place and secured to preserve the option for future reuse of

the structure, in accordance with PM&E measures to offset adverse effects on historic properties as a result of the Proposed Action.

ADU stated in several comments that individual members of this group of landowners at the Cow Creek Development requested that the effects of the Proposed Action on aesthetic aspects of the riparian habitat supported by the Abbott Ditch irrigation practices be addressed. Under current conditions, water discharges into Hooten Gulch from the Cow Creek powerhouse, and the Abbott Diversion allow for limited aesthetic features such as riparian habitat associated with the artificial flows. The Proposed Action would end these artificial water flows, and limit views to periods of natural stream flow. The loss of these views would constitute a minor long-term adverse effect due to the seasonal nature of this loss and to the private nature of the views.

The long-term adverse effect to views of the limited aesthetic features of Abbott Ditch and its riparian habitat as a result of the Proposed Action would not occur in the event an alternative water source is provided for the Abbott Diversion.

Our Analysis

Under the Proposed Action, there would be a minor long-term adverse affect on views, by ADU, of the aesthetic aspects associated with riparian habitat associated with Abbott Ditch irrigation. The views would be possible, but would be limited to seasonal periods when natural stream flows in Hooten Gulch are sufficient to supply water to Abbott Ditch. Replacement of the augmented flows, outside the scope of this proceeding, would allow Abbott Ditch to continue to receive irrigation water following the Proposed Action.

3.3.9.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, the Kilarc forebay would be retained along with public access to the area. The existing visual and aesthetic resources would remain unchanged with views of the Kilarc forebay in the foreground and distant vistas to Lassen Peak and Lassen National Forest. Otherwise, the effects of this Action Alternative would be identical to licensed conditions and the No-Action Alternative.

Our Analysis

Action Alternative 1 would result in minor long-term beneficial impacts at the Kilarc Development on aesthetics, in comparison to the Proposed Action, by retention of existing views of the Kilarc forebay and existing distant vistas.

Cow Creek Development

Under AA1, the Cow Creek Development would be decommissioned as described in the Proposed Action. There are currently no known observation points identified as part of the Cow Creek Development. Most facilities associated with the Cow Creek

Development are not accessible to the public, and any alteration of aesthetic resources would only adversely affect private lands.

Our Analysis

Under AA1, the effects on the aesthetics of the Cow Creek Development area, in comparison to the No-Action Alternative, would be the same as those described for the Proposed Action. This would include the adverse impact to the riparian aesthetic associated with the Abbot Diversion, in comparison to the No-Action Alternative.

3.3.9.4 Environmental Effects of Action Alternative 2

AA2 provides augmentation of flows to Hooten Gulch from the Cow Creek powerhouse to continue to provide 14 cfs of downstream flows. Those project facilities at the Cow Creek Development needed to provide the flows would be maintained. Project facilities not associated with the flows would be decommissioned as stated for the Proposed Action.

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described in the Proposed Action. The effects of implementing AA2 at the Kilarc Development on aesthetics would result in termination of the public's right to access the Kilarc forebay and day use area. The Kilarc forebay would be removed and existing vistas would not be accessible to the public and public access to this area would be terminated.

Our Analysis

Under AA2, the effects on Kilarc area aesthetics, in comparison to the No-Action Alternative, would be the same as those described for the Proposed Action.

Cow Creek Development

Under AA2, augmented flows would continue and the riparian aesthetic associated with flows in Abbott Ditch would be maintained at the Cow Creek Development. Otherwise, the effects of this Action Alternative would be identical to licensed conditions.

Our Analysis

AA2 would have a minor long-term beneficial impact on the year-round aesthetic views associated with the flows in Abbott Ditch and its riparian habitat and available in the area occupied by ADU. The continued operation of the Cow Creek Development would be identical to current conditions and the No-Action Alternative under the project license.

3.3.9.5 Environmental Effects of No Action

Kilarc and Cow Creek Developments

Under the No-Action Alternative, the Kilarc-Cow Creek Project and project facilities would not be surrendered, but would continue to operate under the terms and

conditions of the existing license. The existing aesthetic resources within the Old Cow Creek and South Cow Creek watersheds described in section 3.3.9.1, *Affected Environment*, for the Kilarc and Cow Creek Developments, respectively, would persist into the future. The existing physical features of Kilarc and Cow Creek facilities on the landscape would be maintained in their current licensed condition and project operations would have no effect on the aesthetic resources located within the Kilarc-Cow Creek Project boundary.

Our Analysis

The No-Action Alternative would create no adverse effects on aesthetic resources at the Kilarc-Cow Creek Project different from licensed conditions. There would be no disturbance of existing environmental conditions, and there would be no new environmental protection, mitigation, or enhancement measures. Existing project structures would remain in place and operational.

3.3.10 Socioeconomics

3.3.10.1 Affected Environment

Kilarc and Cow Creek Developments

Power Generation

In 2007, California's electrical energy generation, excluding net energy imports of about 92,217 million kWh, was 210,330 million kWh. Of this total, hydroelectric generation accounted for 26,955 million kWh or about 12.8 percent of all generation. The remaining 87.2 percent of electrical energy generated in 2007 was derived from gas (56.3 percent), nuclear (17.0 percent), geothermal (6.2 percent), wind (2.7 percent), biomass (2.6 percent), coal (2.0 percent), solar (0.32 percent), and oil (0.05 percent) (California Department of Finance [DOF], 2009a).

Governmental and utility-owned in-state hydroelectric generation facilities produced 26,523 million kWh or about 98.4 percent of all hydroelectric generation, and the remaining 432 million kWh or 1.6 percent was produced by commercial in-state hydroelectric facilities (California DOF, 2009a).

The Kilarc-Cow Creek Project had an estimated average annual energy production of 31.1 million kWh (19.1 million kWh by the Kilarc powerhouse and 12.0 million kWh by the Cow Creek powerhouse) over a 25-year period from 1977 to 2001.

Population and Housing

The Kilarc-Cow Creek Project is located in Shasta County, California, near the community of Whitmore and about 30 miles east of Redding. The Shasta County population in January 2009 was 183,023, and is projected to expand to 331,724 by the year 2050 (California DOF, 2009b). About 60 percent of Shasta County's population resides in the cities of Redding, Anderson, or Shasta Lake, with nearly 50 percent residing in Redding (population 90,898).

Redding, bisected by the Sacramento River and a growing center of commerce and industry, is a nationally recognized metropolitan marketplace of northern California. The population in Redding has increased about 11.5 percent since 2000 (U.S. Census Bureau, 2008a). No U.S. Census data exist for the nearest community of Whitmore, but it is estimated that about 800 families live there.[43]

According to the American Community Survey conducted by the Census Bureau from 2006 to 2008, Shasta County has 76,381 housing units (U.S. Census Bureau, 2008c). About 91 percent of housing units (69,185) are occupied, with 64.6 percent owner occupied.

Employment and Income

The largest employment sectors in Shasta County are retail trade, state and local government, and health care and social assistance (U.S. Census Bureau, 2009). Employment is primarily comprised of wage and salary employment (75 percent in 2007), followed by nonfarm proprietors (24 percent) and farm proprietors (1 percent).

At the project, PG&E employees are onsite daily at the powerhouses during the work week and once a week (or more often if problems exist) at the waterways. About 15 PG&E employees operate and maintain the project, but between two and 50 PG&E employees are at the project on any given day. PG&E employees who work at the project are not based locally, but rather reside in the town of Manton in Tehama County, and farther away.

In addition to employment at the project, project area lands support other economic activity and employment related to timber production, agriculture, cattle ranching and grazing, recreation, conservation, transportation, and hydroelectric power generation.

The sectors with the largest contributions to income in 2007 for Shasta County are similar to those with the largest employment contributions, and include state and local government, health care and social assistance, retail trade, and construction (U.S. Bureau of Economic Analysis, 2009a and 2009b). Total personal income (TPI) increased 4.3 percent in Shasta County between 2006 and 2007, the latest year the data are available. Over the same period, California's TPI increased 5.2 percent, while across the United States the increase was six percent. Per capita personal income of $32,543 in Shasta County was much lower in 2007 than in both California ($41,405) and the United States ($38,615). Shasta County's share of TPI from net earnings of economic activity in 2007 was 57 percent compared to 68 percent for both California and the United States. Most of the difference is due to a higher share of personal current transfer receipts in Shasta County compared to California that include such payments as unemployment

[43] Resident L. Carnley, employed by Children and Family Services, in Scoping Comments.

compensation, social security, and retirement payments, as well as other similar types of income (U.S. Bureau of Economic Analysis, 2009c).

Agriculture, Forest Products, and Recreation Industries

Agriculture—Even though agriculture accounts for one percent of employment in Shasta County, agriculture continues to serve as a critical segment of the county economy (Shasta County General Plan, 2004). Agriculture in Shasta County was valued at $74.0 million in 2008. Field crop acreage is primarily in hay (including grass, alfalfa, Timothy, and other) and pasture (irrigated, improved, and rangeland). Wild rice and mint are also cultivated in the county (Shasta County, 2008). The Shasta County General Plan notes that the South Cow Creek valley contains lands classified as prime agricultural lands and may be suitable as irrigation cropland or pasture.

ADU, an informal association of seven property owners, operates an agricultural diversion in Hooten Gulch known as the Abbott Diversion, providing water for domestic, livestock, and irrigation use on the South Cow Creek bottomlands. The diversion is located a short distance upstream of the confluence of Hooten Gulch with South Cow Creek. Water is conveyed about 1 mile down valley from the Abbott Diversion by gravity flow in an unlined ditch. The main canal laterals and turnouts irrigate about 312 acres by flood irrigation. ADU is entitled, pursuant to a state court adjudication of the watershed, to divert 13.13 cfs from the natural flow of the east channel of South Cow Creek below the confluence with Hooten Gulch (and not from Hooten Gulch itself).

Forest Products—Maintaining timber operations and preservation of valuable timberlands are important to the economic base and the natural resource values of Shasta County. Private timberland owners range from large corporations to operators of small woodlots and Christmas tree farms. (Shasta County General Plan, 2004.) Timber and other forest products contribute about the same to the Shasta County economy as field crops and livestock, with production in 2008 valued at $56.85 million. This value is down from $67.4 million in 2007, due to the fall in the price of timber (production actually increased in 2008) (Shasta County, 2008).

Recreation —Although recreation is not typically classified as a separate industry sector in economic statistics, recreation-related spending also contributes to the economy of Shasta County. There are extensive recreation opportunities in Shasta County at federal and state recreation areas such as Lassen National Park, Whiskeytown National Recreation Area, Shasta Lake, McArthur-Burney Falls Memorial State Park, and Shasta-Trinity National Forest. These sites as well as locally and privately managed sites include reservoir recreation areas that offer boating, fishing, swimming, camping, and picnicking, among other activities. Recreation opportunities contribute to the local economy by attracting visitors to Shasta County who spend money at local businesses such as hotels, restaurants, and retail stores.

Tax Base

Land uses in the project area are classified as Timber Production, Exclusive Agriculture, and Unclassified (Shasta County, 2003).

Shasta County expects to collect $61.3 million in tax revenue in the 2008–2009 fiscal year (Shasta County Assessor's Office, 2009). This figure is lower than the tax revenues collected in the previous two years ($62.2 million and $63.5 million).

Property taxes on the project area utility assets have averaged $76,492 between 2000 and 2009 (in nominal dollars, not adjusted for inflation between years). PG&E paid the greatest property taxes in 2009 with $86,267. The assessed value of project facilities and their property taxes are presented in Table 19.

Table 19. Project area utility facility property taxes, 2000 to 2009. (Source: PG&E, 2010a)

Year	Assessed Value	Property Taxes
2000	$7,326,812	$79,313
2001	$5,941,154	$64,545
2002	$6,563,133	$71,459
2003	$6,407,882	$71,948
2004	$6,747,310	$76,096
2005	$6,897,550	$78,060
2006	$6,426,074	$73,193
2007	$7,199,790	$80,638
2008	$7,420,233	$83,396
2009	$7,556,633	$86,267
Average		**$76,492**

For the 2009-2010 tax year, PG&E paid $43,543 in property tax revenue to Shasta County for the Kilarc Development and $42,724 for the Cow Creek Development (PG&E, 2010b).

Property Values

The project boundary encompasses 184.33 acres of land owned by PG&E, BIA, and private landowners. Property around the Kilarc-Cow Creek Project includes forestland, irrigated fields and pastures (rangeland), and residences. The primary land use activities in the two watersheds that encompass the project are privately owned

grazing lands (in the lowlands) and private and state owned timberlands (in the higher elevations). There is minimal cultivated crop production, based on 2006 aerial photographs (U.S. Department of Agriculture, 2006). Selected agricultural (North American Industry Classification System) statistics for farms in Shasta County are provided in Table 20.

Table 20. Farm statistics for Shasta County and California. (Source: California State Board of Education [SBOE], 2010 and U.S. Census Bureau, 2008b).

	Shasta County	**California**
No. of farms (2007)	1,473	81,033
No. of individual or family farms (2007)	1,380	64,001
Land in farms (2007)	390,812 acres	25,364,695 acres
Average size of farm (2007)	265 acres	313 acres
Total irrigated land (2007)	48,690 acres	8,016,159 acres
Assessed value of agricultural land for cattle grazing (varies depending on carrying capacity and length of growing season) (2009-2010)	–	$500 - $700/acre

According to the 1997 Federal Census of Agriculture, as reported in the Shasta County General Plan, in 1997 there were 1,108 farms in Shasta County, 348,074 acres in farms, and the average size farm was 314 acres. Comparing these data with the U.S. Census Bureau data for 2007 provided in Table 20, since 1997 the number of farms has increased 32.9 percent; the total acres in farms has increased 12.3 percent, but the average size of farms has declined 15.6 percent in Shasta County.

For the period 2006-2008 the median value for owner-occupied homes was $275,300 for Shasta County. By comparison, the median value of owner-occupied homes in California was $510,200 while that of the U.S. was $192,400 (U.S. Census Bureau, 2008c). As of October 2009, the median price was $191,500 in Shasta County (California Employment Development Department, 2009). Home values peaked in March 2006 when the median sales price in Shasta County reached $300,000. As a result of the current economic recession and home foreclosure crisis, home values may have bottomed out in March 2009 when the median sales price plunged to $177,000 (Benda, 2009).

3.3.10.2 Environmental Effects of Proposed Action

Kilarc Development

Power Generation

The Proposed Action would result in the loss of a 4.67 MW operating project that produces an average annual generation of about 31.1 million kWh per year. The gross amount of electric energy generated at the Kilarc-Cow Creek Project from October 2008 through September 2009 represents 0.2 percent of the total gross amount of generation from all PG&E's major projects with more than 1,500 kilowatts of capacity.[44] This loss of the project's hydroelectric generation would represent about 0.12 percent of all the hydroelectric energy generated by governmental and utility-owned in-state hydroelectric generators in 2007 (California DOF, 2009a). PG&E historically used project power to meet the needs of its electric customers.

Several commenters state the need to determine the cost of replacing the 4.67 MW of lost renewable, carbon-free generation from PG&E's and the state's energy portfolio. Another interested party states that the direct consequence of removing this renewable resource would be its replacement by fossil energy. The alternative sources of power currently available to PG&E include increased purchases of replacement power and new generation developments. Since the project powerhouses are considered "renewable" small hydroelectric facilities under California law, any reduced power production of the project would need to be replaced by another source of renewable electrical energy.[45] Sources of energy that count toward the California RPS include biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, and tidal current (Pew Center, 2009). In fall 2009, California raised its goal for renewable energy as a percentage of overall generation from 20 percent by December 31, 2010, to 33 percent by 2020, with a near-term goal of 13 percent renewables by the end of 2010 (Pew Center, 2009 and Wagman, 2009).

CPUC periodically publishes "Market Price Referents" (MPRs), which are estimates of the long-term market price of electricity for baseload and peaking power products that will be used in evaluating bid products received during California RPS power solicitations. The MPRs represent "the levelized price at which the proxy power plant revenues exactly equal the expected proxy power plant costs on a net-present value basis."[46] The 2009 20-year MPR is $0.11126 per kilowatt-hour.[47]

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[44] PG&E statement of generation for fiscal year 2009 in correspondence to the Commission, dated October 28, 2009.

[45] California Public Utilities Code section 399.12(b)(1)(A).

[46] D.04-06-015, p.6.

[47] CPUC Resolution E-412 (December 18, 2008).

PG&E states that, although the project is an emissions-free, California RPS-eligible renewable energy resource, it is no longer needed to meet the electricity needs of PG&E's electricity consumers. Lower-cost, emissions-free, California RPS-eligible renewable energy is forecast to be available to replace it.

Our Analysis

Even though the Proposed Action results in loss of renewable hydroelectric generation in the long-term, this loss is relatively minor in terms of the overall total hydroelectric generation produced in California by governmental and utility-owned hydro-power generators. The purchase of California RPS-eligible renewable energy for replacement power at lower cost represents a moderate long-term benefit to PG&E's customers.

Population and Housing

PG&E anticipates that the estimated 12 contract workers hired to decommission the project would be Shasta County residents, although there may be a few individuals from outside Shasta County who would relocate temporarily to Redding (PG&E, 2009f).

Our Analysis

Since the surrender work would result in an insignificant increase of about 12 people, who could easily be accommodated in the nearly 7,200 vacant housing units (U.S. Census Bureau, 2008c) in Shasta County, there would be no effect on housing during the Proposed Action. Once the Proposed Action is complete, it is anticipated that there would be no long-term local effects on county population or housing.

Employment and Income

PG&E's preliminary plans for conducting the decommissioning work indicate that the process would require hiring up to 12 contract workers at the project site rather than using PG&E employees (PG&E, 2009f).[48] The Proposed Action would not directly affect the number of workers employed in the energy industry within the affected environment. The number of employees necessary to maintain the powerhouses following the Proposed Action has not been determined by PG&E. PG&E does not expect to reduce its workforce due to the Proposed Action; therefore, employees currently working in the project area would be absorbed into other groups or transferred to other projects within PG&E following the Proposed Action.

Our Analysis

Some temporary, short-term employment benefits would occur during the Proposed Action but these are expected to be insubstantial. With no foreseen layoffs in the project area, no direct effects to income or employment would occur.

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[48] These estimates may change as more detailed decommissioning plans are developed.

Agriculture, Forest Products, and Recreation Industries

Agriculture—There are no agricultural uses that would be affected by the Proposed Action at the Kilarc Development.

Forest Products—As described in section 3.3.8, *Land Use*, the lands in the immediate vicinity of the Kilarc powerhouse and associated facilities are primarily managed for commercial timber harvesting by state and private landowners. To minimize adverse affects on this commercial forest land due to the Proposed Action, PG&E proposes PM&E measures to reduce the risk of wildland fire during decommissioning, in accordance with Cal FIRE's Fire and Resource Assessment Program, and the preparation of an MMP for restoration of access roads and staging area on project and non-project lands in consultation with landowners (see section 3.3.8, *Land Use*).

Our Analysis

In consideration of the PMEs and MMP proposed by PG&E, the Proposed Action would not have an adverse effect on forest products in the Kilarc project area.

Recreation

Shasta County states that, as economically challenged communities, Oak Run and Whitmore have few alternative amenities to draw people to their area. Anglers and families on day trips to Kilarc often stop off for food, gas, and bait, supporting a rather weak existing economy. Shasta County indicates the loss of Kilarc reservoir would have a disproportionate economic effect on these communities. In addition, one local business establishment (organic nursery and gift shop) in Whitmore expresses concern that the removal of the Kilarc forebay most likely would cause them serious financial losses and possibly force the closure of their establishment (see section 3.3.7, *Recreational Resources*).

As described in section 3.3.7, *Recreational Resources*, removal of the Kilarc forebay and day use area would result in the loss of recreation opportunities provided at the site and the displacement of visitors to other recreation areas. The Proposed Action is expected to result in only minor changes in recreation enjoyment to local residents and little change in the number of visitors to Shasta County.

Our Analysis

The removal of visitations to the Kilarc forebay would have some minor, adverse effects to socioeconomics, including potential reductions in business at establishments in Whitmore for food, gas, bait, and, as stated above, at a local organic nursery and gift shop. However, Commission staff expects that many of the potentially affected visitors and anglers in the project area may continue to patronize local business regardless of where they visit, fish, or picnic. In terms of visitor spending at local businesses, only 16 percent of the estimated 1,250 recreationists using the Kilarc forebay and day use area and the Kilarc powerhouse during the summer peak period are visitors from outside

Shasta County. Thus, there are about 200 non-resident visitors using the recreation area during the summer, which represents the minority of annual visitors. These visitors could use one of the many substitute recreation sites available to them in Shasta County following the decommissioning of the project. Even if these visitors ceased coming to Shasta County because of the project closure, the change in visitor spending and associated effect on employment and income to local business establishments would be minor due to the relatively small number of non-resident visitors and recreationists.

Tax Base

Shasta County states that residents have seen a dramatic reduction in local services in the last several years as tax revenue for these services declines, and that the Proposed Action would exacerbate this problem with the loss of tax payments associated with project properties. As presented in Table 19, PG&E has paid about $76,492 annually in property tax on project facilities, with the highest annual payment of $86,267 in 2009. This accounts for about 0.14 percent of the $61.4 million in expected 2009 Shasta County tax revenues.

If the Proposed Action were implemented, the estimated amount of property taxes PG&E would pay Shasta County for PG&E's facilities remaining at Kilarc is about $1,996 annually compared to $43,543 paid for the 2009-2010 tax year (California SBOE, 2010).

Our Analysis

The Proposed Action would result in removal of some project facilities, which has the potential to reduce the property tax currently paid by PG&E by about $41,547 annually. This change in property tax revenue would represent a long-term minor adverse effect to the county given the relatively low property tax currently being paid.

Property Values

The Save Kilarc Committee and other local residents state the removal of the Kilarc Development would affect property values and the quality of life. The Proposed Action is not expected to affect property values related to demand or supply for lands in the project area.

Our Analysis

Although activities during the decommissioning period may temporarily inconvenience local landowners (for example, through increased traffic on local roads or increased dust), these effects would be short-term and limited to the Proposed Action period, and would therefore not cause any long-term adverse effects on property value. Commission staff does not expect that the Proposed Action at the Kilarc Development would result in any long-term changes in property values in the project area.

Cow Creek Development

Power Generation

The effects of the Proposed Action at Cow Creek on power generation would be the same as those described above for Kilarc.

Population and Housing

The effects of the Proposed Action at Cow Creek on population and housing would be the same as those described above for Kilarc.

Employment and Income

The effects of the Proposed Action at Cow Creek on employment and income would be the same as those described above for Kilarc. In addition, the Proposed Action would affect the potential income to be derived from the Tetrick Hydroelectric Project by its owner, as discussed below.

Tetrick Ranch, ADU, and Shasta County state that the Proposed Action would dry up Hooten Gulch and force the shutdown of the Tetrick Hydroelectric Project, a source of income for its current owner.[49] Tetrick Ranch states that it holds a consumptive water right of 1.1 cfs, part of which it withdraws from Hooten Gulch, which is watered by the tailrace of Cow Creek powerhouse.

Although the loss of the Tetrick Hydroelectric Project generation would only represent about 0.13 percent of all the hydroelectric energy generated by commercial in-state hydroelectric generators in 2007, it is a source of revenue for its current owner. The effects of the Proposed Action on the continued operation of the Tetrick Hydroelectric Project, and its ability to continue to provide income to Tetrick Ranch, are considered below.

The Proposed Action would end the augmentation of flows to Hooten Gulch downstream of the Cow Creek powerhouse. Removal of these artificial and perennial water flows from the Cow Creek powerhouse would likely force the Tetrick Hydroelectric Project to shut down during some periods in the summer and fall months of the year due to insufficient water from the natural stream flows in Hooten Gulch to operate the mini-hydro project's unit (see section 3.3.2.1, *Water Quantity*). Terminating Tetrick Hydroelectric Project operation during such periods would represent a major long-term adverse effect on the income to Tetrick Ranch due to the corresponding loss in the production and sale of energy. The amount of energy production lost during such shutdowns and the amount of corresponding income lost is not known as this information was not provided by Tetrick Ranch.

[49] Tetrick Ranch in Motions to Intervene, July 13, 2009.

Our Analysis

Permanent removal of the augmented water source provided to Hooten Gulch by the Cow Creek Development would have a major long-term adverse effect on Tetrick Ranch's potential to derive income from the production and sale of energy due to the shutdowns of the Tetrick Hydroelectric Project.

Agriculture, Forest Products, and Recreation Industries

Agriculture—Tetrick Ranch, ADU, and Shasta County comment that the removal of the present water conveyance system, absent mitigation (i.e., the replacement of the current water conveyance system), would leave ADU and Tetrick Ranch without their long-established water supply. This would result in adverse economic circumstances for property owners, including loss of income, loss of livestock and crops, and personal distress from loss of water sources for domestic and business purposes.[50] These stakeholders state that construction of a new diversion is a foreseeable effect of the proposed decommissioning, and that the NEPA documentation must evaluate the costs of relocating a new diversion point at a suitable location, as well as its environmental effects. In consideration of these stakeholders' comments, the effects of the Proposed Action on the continued operation of Abbott Diversion, and its ability to provide irrigation flows to Tetrick Ranch and ADU, are considered below.

As discussed in section 3.3.2.1, *Water Quantity,* and section 3.3.8, *Land Use*, the Proposed Action would remove the artificial and perennial water flows from the Cow Creek powerhouse to Hooten Gulch and most likely would deprive Tetrick Ranch and ADU of their source of irrigation water obtained from Hooten Gulch at the Abbott Diversion during some parts of the year. Loss of this long-established water source during such periods would adversely affect the 312 acres of agricultural crop and pasture lands flood irrigated by the Abbott Diversion. The expected consequences of losing this irrigation water would be incremental adverse effects on associated crop and livestock production, farm and ranch income, and the availability of water for domestic and business uses. The actual anticipated economic loss of agricultural revenues to stakeholders from the Proposed Action is not known and was not provided by Tetrick Ranch, ADU, or the county. Based on farm statistics for Shasta County in Table 20, the loss of 312 acres of irrigated farm and ranch land to the county's irrigated land base and total number of family farms would represent a relatively minor effect in the context of a total of 48,690 acres of irrigated land and 1,380 family farms, respectively.

A number of stakeholders comment that approval of PG&E's decommissioning proposal would result in the expenditure of perhaps two million dollars or more by local ranching and farm families to design, site, acquire easements and rights of way, obtain permit approvals, and construct an alternative water diversion feature to exercise their

[50] One ADU directly uses water delivered by Abbott Ditch from the augmented flows to Hooten Gulch by the Cow Creek powerhouse; another uses the Abbott Ditch water to charge a very shallow well.

present water rights and make a living for themselves, if it is in fact possible to construct a new diversion at all.

Cal Fish and Game expresses support for a new Abbott Ditch diversion, at the historic location as documented in the 1969 Cow Creek Adjudication (Adjudication) (California SWRCB, 1969). The Adjudication identifies the Abbott Ditch diversion to be located at sec. 6, T31N, R1W from lower South Cow Creek about 3.5 miles downstream of PG&E's current diversion. Having visited the approximate location, Cal Fish and Game indicates that it believes this is an appropriate and feasible site for a new diversion. Cal Fish and Game encourages evaluation of the Abbott Ditch diversion, at the historical point of diversion. Tetrick Ranch requests the Commission obtain from Cal Fish and Game the criteria for a new water diversion that would be sited, designed, permitted, and constructed to protect existing water rights.

Since PG&E assumed that ADU's diversion would be relocated to South Cow Creek consistent with the adjudication of the watershed, PG&E also assumed that ADU's livelihoods, and associated agricultural land uses supported by the flood irrigation from Abbott Ditch, would not be affected by the cessation of artificial flows in Hooten Gulch upon decommissioning (PG&E, 2009f).[51]

Should the natural flows in Hooten Gulch be augmented by the construction of a new water diversion as a means to provide a perennial source of water to Abbott Ditch, or the Abbott Diversion is replaced by a new diversion, as stakeholders suggest, Tetrick Ranch and ADU's agricultural farming and ranching operations on the 312 acres irrigated by Abbott Ditch and use of domestic water would continue throughout the year uninterrupted by seasonal and cyclic hydrological conditions that prevail under natural stream flows in Hooten Gulch.

Because the FPA reserves to the state's jurisdiction over matters pertaining to water rights, the selection and ultimate construction of an alternative diversion location, wherever it is, would be subject to a separate state authorization and permitting process with associated environmental review.[52]

Our Analysis

Permanent removal of the augmented water source provided to Hooten Gulch by the Cow Creek Development and its loss to the Abbott Diversion would have a major long-term adverse effect on Tetrick Ranch and ADU's long-established farming and ranching operations and affect their quality of life. The loss of this irrigated agricultural land to Shasta County would be minor in terms of the total irrigated farm land in the

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[51] The ADU are entitled, pursuant to a state court adjudication of the watershed, to divert 13.13 cfs from the natural flow of the east channel of South Cow Creek below the confluence with Hooten Gulch (and not in Hooten Gulch itself). See LSA section E.2.2.6.

[52] 16 U.S.C. section 821.

county, but this loss could be in conflict with the Shasta County General Plan as it relates to agricultural lands as discussed in section 3.3.8.2, *Environmental Effects of Proposed Action* under section 3.3.8, *Land Use*. Replacement of these augmented flows to Hooten Gulch accessible to the Abbott Diversion or the construction of an alternative, new diversion, outside the scope of this proceeding, would allow Abbott Ditch to continue to receive irrigation water under natural stream flow conditions following the Proposed Action. Commission staff acknowledges that the costs to develop a new diversion feature could run into the millions of dollars, but depending on the type of diversion, the costs could be much less. For instance, screened pipe intakes could cost from $2,200 to $6,400 per each cfs the intake diverts, and consolidating diversions could also help reduce costs (Brink, McClain, and Rothert, 2004). If an alternative means for water diversion were accomplished, outside the scope of this proceeding, the Proposed Action would have minimal adverse impacts to agriculture.

Forest Products—Although there is limited commercial forest land in the Cow Creek area, the effects of the Proposed Action at Cow Creek on forest products would be the same as those described above for Kilarc.

Recreation—There are no recreation industries that would be affected by the Proposed Action at the Cow Creek Development.

Tax Base

Shasta County's concern for the loss of tax payments associated with the Proposed Action is stated above in the *Tax Base* section for the Kilarc Development along with a discussion of the annual tax payment information for the project as a whole provided in Table 19 by PG&E as it applies to Shasta County's expected 2009 tax revenues.

If the Proposed Action were implemented, the estimated amount of property taxes PG&E would pay Shasta County for PG&E's facilities remaining at Cow Creek is about $5,187 annually compared to $42,724 paid for the 2009-2010 tax year (California SBOE, 2010).

Our Analysis

The Proposed Action would result in removal of some project facilities, which has the potential to reduce the property tax currently paid by PG&E by about $37,537 annually. This change in property tax revenue would represent a long-term minor adverse effect to the county given the relatively low property tax currently being paid.

Property Values

The effects of the Proposed Action at Cow Creek on property values resulting from activities during the Proposed Action period that may temporarily inconvenience local landowners would be the same as those described above for Kilarc.

Tetrick Ranch, ADU, and Shasta County request the Commission evaluate the value of the loss of farmland property or all lands irrigated by Abbott Ditch. In consideration of these stakeholder's comments, and the potential that the Proposed

Action could affect the property values of agricultural lands irrigated by Abbott Diversion, the affects of the Proposed Action are considered below.

As described above for *Agriculture*, the Proposed Action likely would adversely affect the productivity on the 312 acres of agricultural crop and pasture lands flood irrigated by Abbott Ditch. This would adversely affect the quality of life for Tetrick Ranch and ADU who are dependent on this irrigated land for their livelihoods.

Based on farm statistics for Shasta County in Table 20, with an estimated assessed value of agricultural lands used for cattle grazing between $500 and $700 per acre, the total estimated value of the 312 acres of irrigated farm land that would be affected by the loss of Abbott Ditch irrigation water is estimated to be between $156,000 and $218,400 (California SBOE, 2010). This current estimate of property value indicates that the agricultural land irrigated by the Abbott Diversion and potentially affected by the Proposed Action has considerable worth as grazing land. These estimates of value are not intended to represent actual market value.

Augmenting the natural flows in Hooten Gulch by the construction of a new water diversion as a means to provide a perennial source of water to Abbott Ditch, or replacing Abbott Diversion with a new diversion, as stakeholders suggest, would allow Abbott Ditch irrigation to continue throughout the year uninterrupted by the seasonal and cyclic hydrological conditions that prevail under natural stream flows in Hooten Gulch. If a new diversion were constructed, property values would not be adversely affected as a result of the Proposed Action.

Our Analysis

The Proposed Action would adversely affect the productivity on the 312 acres of agricultural crop and pasture lands irrigated by Abbott Ditch which could decrease the property values of this farm and irrigated land, which, at the present time, has an assessed value of about $218,400 as grazing land. However, if an alternative means for water diversion were accomplished outside the scope of this proceeding, the Proposed Action would have minimal adverse impacts to property values.

3.3.10.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, Kilarc area socioeconomics would benefit as follows:

(1) *Recreation*—The Kilarc forebay would remain accessible to the public for recreation enabling visitors and recreationists to use the facility, and retaining visitor and recreation user spending at local business.

(2) *Tax Base*—Property tax revenues paid to Shasta County would be about $37,862 annually with retention of some facilities and associated power equipment removed compared with $1,996 annually for the Proposed Action (California SBOE, 2010).

The effects of AA1 on other area socioeconomic issues would be the same as those for the No-Action Alternative.

Our Analysis

Action Alternative 1 would result in long-term beneficial effects on Kilarc Development socioeconomics including retention of local recreation revenues and a significant increase (1,796.9 percent) in property tax revenues paid to Shasta County versus the Proposed Action.

Cow Creek Development

Under AA1, the Cow Creek Development would be decommissioned as described in the Proposed Action.

Our Analysis

Under AA1, the effects on Cow Creek area socioeconomic conditions would be the same as those described for the Proposed Action.

3.3.10.4 Environmental Effects of Action Alternative 2

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described in the Proposed Action.

Our Analysis

Under AA2, effects on Kilarc area socioeconomic conditions would be the same as those described above for the Proposed Action.

Cow Creek Development

Under AA2, Cow Creek area socioeconomics would benefit as follows:

(1) *Income*—The natural flows in Hooten Gulch would continue to be augmented by artificial flows from the Cow Creek powerhouse. The Tetrick Hydroelectric Project would continue to operate utilizing these augmented flows from Hooten Gulch, with no loss in income to its owner.

(2) *Agriculture*—The natural flows in Hooten Gulch would continue to be augmented by artificial flows from the Cow Creek powerhouse. Abbott Diversion would continue to obtain these artificial flows from Hooten Gulch and provide flood irrigation flows on 312 acres of agricultural farm and ranch land, retaining income, livestock, crops, and water for domestic and business uses for Tetrick Ranch and ADU.

(3) *Tax Base*—Property tax revenues paid to Shasta County would be about $27,822 annually with retention of some facilities and associated power equipment removed compared with $5,187 annually for the Proposed Action (California SBOE, 2010).

(4) *Property Values*—The natural flows in Hooten Gulch would continue to be augmented by artificial flows from the Cow Creek powerhouse. Retention of Abbott Diversion and its use of these artificial flows from Hooten Gulch would not diminish property values on the 312 acres of crop and pasture land irrigated by Abbott Ditch for Tetrick Ranch and ADU's farming and ranching operations.

The effects of AA2 on other area socioeconomic issues would be the same as those for the No-Action Alternative.

Our Analysis

Action Alternative 2 would result in long-term beneficial effects on Cow Creek Development socioeconomics including uninterrupted income for a private hydroelectric plant operator, retention of agriculture and farm income, a significant increase (436.4 percent) in property tax revenues paid to Shasta County versus the Proposed Action, and preservation of agricultural land property values.

3.3.10.5 Environmental Effects of No Action

Kilarc Development

The Kilarc Development, as currently operated, benefits local area socioeconomic conditions as follows:

(1) *Recreation*—The Kilarc forebay and day use area provides for local public recreation, enabling visitors and recreationists to use the facility and retaining visitor and recreation user spending at local businesses.

(2) *Tax Base—Property t*ax revenues are paid to Shasta County for operating facilities.

Our Analysis

Under the No-Action Alternative, the socioeconomic benefits associated with Kilarc described above in section 3.3.10.1, *Affected Environment*, would persist into the future and include minor recreation revenues paid to local businesses in the community of Whitmore and property tax revenues paid to Shasta County.

Cow Creek Development

The Cow Creek Development as currently operated benefits local area socioeconomic conditions as follows:

(1) *Income*—The augmentation of flows in Hooten Gulch from the Cow Creek powerhouse allows the Tetrick Hydroelectric Project to operate year-round providing income to its owner.

(2) *Agriculture*—The augmentation of flows in Hooten Gulch from the Cow Creek powerhouse allows the Abbott Diversion to provide

flood irrigation flows on 312 acres of agricultural farm and ranch land that provides benefits to Tetrick Ranch and ADU in terms of crop and livestock production, water for domestic and business uses, and income.

(3) *Tax Base*—Property tax revenues are paid to Shasta County for operating facilities.

(4) *Property Values*—The augmentation of flows in Hooten Gulch from the Cow Creek powerhouse allows Abbott Ditch to maintain agricultural uses on 312 acres of crop and pasture by flood irrigation, thereby preserving the agricultural property value of this farm and irrigated land in Shasta County.

Our Analysis

Under the No-Action Alternative, the socioeconomic benefits associated with Cow Creek described above in section 3.3.10.1, *Affected Environment,* would persist into the future and include income to a private hydroelectric plant operator on Hooten Gulch, agricultural subsistence to Tetrick Ranch and ADU farm and ranching operations on 312 acres of irrigated crop and pasture land, property tax revenues paid to Shasta County, and preservation of agricultural property values on the crop and pasture lands irrigated by Abbott Ditch.

3.3.11 Cultural Resources

3.3.11.1 Affected Environment

In this document, we use the term "cultural resources" to refer to archaeological sites, historic structures, Indian tribe properties, cultural landscapes, and other resources of the human past. As discussed in section 1.3.6, the term "historic properties" is used to refer to cultural resources that are listed on, or have been determined eligible for listing on, the National Register. Where the National Register eligibility of cultural resources is unknown, those resources may be treated as historic properties until a determination of eligibility can be made.

Area of Potential Effect

Pursuant to section 106 of the National Historic Preservation Act (NHPA), the Commission must take into account whether any historic property could be affected by an undertaking within a project's area of potential effects (APE). The APE is defined as the geographic area or areas where an undertaking may directly or indirectly cause alterations in the character or use of any existing historic properties. The APE for the Kilarc-Cow Creek Project includes lands within the project boundary, as delineated in the current Commission license, plus lands outside the project boundary where project operations may affect the character or use of historic properties or TCPs.

The APE, as defined by PG&E in their submitted plan for surrender implementation, consists of the area where ground-disturbing activities are expected to occur, and corresponds directly to the Commission boundary for the project. Further, the APE for cultural resources includes the entire built environment, as well as a 100-foot radius along the boundary outside edge to include any sites that may extend past the project boundary. No vertically defined APE is established, as various existing facilities would be removed or left in place (Siskin et. al., 2009).

Cultural Context

Based on archaeological evidence, the prehistory of northeastern California dates as far back as 12,000 to 13,000 years ago. There are six patterns of cultural adaptation generally recognized in the northeastern California prehistoric chronology (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009). The archaeological resources identified within the project APE consist of pre-historic, historic, and multi-component sites containing both pre-historic and historic elements.[53] The following pre-historic chronology is presented as an overview of the types of pre-historic resources located within the APE.

- Early Holocene (5000+ B.C.)─Artifact assemblages from this pattern are characterized by numerous projectile points, including large lanceolate points, a range of stemmed points, and Clovis points. The use of varying obsidian sources among artifact assemblages suggests a highly mobile population (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).
- Post-Mazama (5000−3000 B.C.)─Early artifacts from this pattern include side-notched projectile points, antler wedges, mortars with V-shaped bowls and pointed pestles, T-shaped drills, tanged blades, and flaked stone pendants. Although side-notched points are common throughout the Modoc Plateau and Western Great Basin Provinces, they are rare south of the plateau areas, where variants including Gatecliff, Fish Slough, and Martis-like points are typical. The geographical shift in projectile point types may correlate to the Middle Holocene warming and the movement of populations from desert areas to spring-fed areas as other water sources slowly disappeared. Later assemblages from this pattern are characterized by an increase in the presence of milling tools indicative of an increased dependence on plant resources (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).
- Early Archaic (3000−150 B.C.)─Elko and Siskiyou side-notched projectile points, as well as Gatecliff and Martis-like series, are associated with the early Archaic in region. Artifacts, including milling stones, mortars and pestles, and basalt cores, along with village features such as clay-lined pit houses and what

[53] Due to the sensitive nature of archaeological sites, California state and federal mandates restrict the publication site-specific information in order to preserve the integrity of the resources.

appear to have been rock line roasting ovens, all indicate a shift toward continued occupation of sites (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).

- Middle Archaic (1500 B.C.–A.D. 700)─Archaeological components of this pattern resemble those of the Early Archaic, with a shift toward large settlement sites. Artifact assemblages are typical of increased house construction, obsidian production, ceremonial activities, trade and exchange, and big game hunting (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).
- Late Archaic (A.D. 700−1400)─The early part of the Late Archaic (A.D. 200 to 1000) closely resembles the Middle Archaic. The latter part, however, reflects substantial changes in settlement and site adaptation (hearths, caches, storage pits), assemblages (Rose Spring and Gunther projectile points, marking the advent of bow and arrow technology), and subsistence (the decline of large-game hunting, and a shift toward freshwater mussels, seeds and berries, and camas root processing) (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).
- Terminal Prehistoric (A.D. 1400–Contact)─Elaborate ceremonial and social organization, along with the development of social organization, are reflective of this pattern. Exchange became more developed, with acorns increasing in value as a resource, indicated by the presence of shaped mortar and pestles and numerous hopper pestles in the archaeological record. Artifact assemblages (associated with the Augustinian Pattern) include flanged tubular smoking pipes and clamshell disc beads, as well as small projectile points indicating the use of bow and arrow technology (Siskin et. al., 2009; McGuire, 2007 as cited by Siskin et. al., 2009).

Russian explorers may have been the first Europeans to contact Indian tribe in the region, while moving through the Sacramento River Canyon in 1815 (Siskin et. al., 2009; Smith, 1991 as cited by Siskin et. al., 2009). Additional contacts followed after Mexico declared independence from Spain in 1821 and California became a Mexican Territory in 1822. The same year, Governor Solo sent an exploration party north under the command of Captain Luis Arguello. Arguello's expedition traveled north across the Carquinez Straight and up the Central Valley along the east bank of the Sacramento River and into the project area (Siskin et. al., 2009; Lewis Publishing Company, 1891 as cited by Siskin et. al., 2009).

Despite Spanish rule, northern California and the project area were not significantly influenced by Spanish culture. Historic records indicate that the areas surrounding the Kilarc and Cow Creek Developments were explored by American and French explorers, and that fur trappers were present in the Sacramento River Valley as early as 1820 (Siskin et. al., 2009; Lewis Publishing Company, 1891 as cited by Siskin et. al., 2009). Alexander McLeod traveled along Cow Creek from 1829 to 1830. In 1833,

John Work's expedition traveled from the headwaters of Cow Creek, along the divide between Old and South Cow Creeks, and continued along Cow Creek (Siskin et. al., 2009; Miesse, 2008 as cited by Siskin et. al., 2009; Thielemann, 2000 as cited by Siskin et. al., 2009). This early American and European presence introduced foreign disease into the Indian tribe population, culminating in an epidemic that depleted the native population by 75 percent between 1831 and 1833. The Hudson Bay Company, along with other American and French trapping parties, continued operating in the region until the 1840s. By 1842 low fur yields and reduced profits caused the Hudson Bay Company to end its endeavors in California (Siskin et. al., 2009; Thompson, 1957 as cited by Siskin et. al., 2009).

After secularization of the Spanish missions in 1834, the Mexican government distributed individual land grants, and land use in the region expanded to include cattle ranching, primarily for the hide and tallow trade. In 1844, Major Pierson Reading was granted 26,000 acres of land, much of which comprised Shasta County. California was annexed to the United States in 1848. The same year, gold was discovered at Sutter's Mill in Coloma, and at Clear Creek, near Reading, in Shasta County. The Clear Creek strike eventually became known as Horsetown, and along with Shasta and Lower Springs, became a major mining area in Shasta County. The discovery of gold in the Sierra Nevada by European-American prospectors fueled a major population boom in northern California, specifically in the Sacramento River Valley, and mining camps were established throughout the area surrounding the Kilarc and Cow Creek Developments. Nearly half of the mining labor was made up of Native Americans, who were forced out of the mining industry by 1849. Chinese mine workers began arriving in California by the early 1850s, and were expelled from Shasta County after the Chinatown in Reading burning in 1886 (Siskin et. al., 2009; Shasta Historical Society, 2003 as cited by Siskin et. al., 2009).

In 1885, German settlers arrived in the Whitmore vicinity, near the project area, following the promise of established farmsteads. Upon arrival, the settlers found only virgin timberland. After surviving the winter, the settlers developed farms and ranches, along with irrigation ditches to provide water to their lands. German Ditch was constructed by the Cow Creek Irrigation Company, and was one of the largest irrigation ditches in the area. Later on, many of these irrigation ditches were adapted for hydroelectric use. Despite the proximity of both the Kilarc and the Cow Creek powerhouses, electricity was not available in much of the Whitmore area until 1937, and many farms did not connect until the 1950s (Siskin et. al., 2009; Thielemann, 2000 as cited by Siskin et. al., 2009).

Copper was discovered in Shasta County in the mid-1860s. Soon copper mining became the predominant industry in the area, as gold deposits were depleted. The first copper mines in Shasta County were built in Copper City in 1862. By 1906, a 30-mile-long, 1- to 4-mile-wide crescent-shaped copper belt within the Sacramento Valley was supplying at least five copper smelters in Shasta County (Siskin et. al., 2009; Aubury, 1908 as cited by Siskin et. al., 2009; Fowler, 1923 as cited by Siskin et. al., 2009; Hart,

1979 as cited by Siskin et. al., 2009). Located in the Cow Creek watershed were the Afterthought and Donkey mines, and the Ingot smelter. By 1920, all smelters in the area were forced to shut down in part due to litigation pushed by the Forest Service and area farmers to combat the environmental damage caused by the smelting process, and to the lack of commercially viable copper ore (Siskin et. al., 2009).

Steam plants were producing electricity for several municipalities in California by the 1870s, but as the population of the state grew and more industries became mechanized, power shortages became common by the 1890s (Siskin et. al., 2009; JRP Historical Consulting Services and the California Department of Transportation [JRP], 2000, as cited by Siskin et. al., 2009). Hydroelectric power was introduced to meet the demand for electricity, taking advantage of California's mountainous landscape and abundant watersheds, as well as existing irrigation and hydraulic mining canal systems (Siskin et. al., 2009; JRP, 2000 as cited by Siskin et. al., 2009). It is likely that the Cow Creek canal system, and perhaps the Kilarc canal system, were based on existing canals in the area.

The San Bernardino Electric Company constructed one of the first hydroelectric power facilities in California in 1887, using a riverside water irrigation canal to supply water for the generation of direct current (DC). DC, however, was limited in its application, leading to the development of alternating current (AC) by German engineers in the 1880s. AC replaced DC and was promoted by such companies as Westinghouse and General Electric. Eventually hydropower developed from single plants on single rivers into stepped systems incorporating several plants within a single watershed, utilizing high mountain reservoirs. By 1902, hydroelectric power was well established within California, requiring large-scale consolidation of resources as well as companies, mirroring the development of mining and agricultural industries in the state (Siskin et. al., 2009; JRP, 2000 as cited by Siskin et. al., 2009).

Hamden Holmes Noble of San Francisco and Lord Keswick of London established the Keswick Electric Power Company in the late 1890s to supply hydroelectric power to the copper mining industry in Shasta County. The Mountain Copper Company operated the Keswick copper mine and smelter (owned by Lord Keswick) and was the largest operation in Shasta County. It required more electrical power to operate than was available at the time (Siskin et. al., 2009; Aubury, 1908 as cited by Siskin et. al., 2009; Hart, 1979 as cited by Siskin et. al., 2009). Prior to the construction of the Kilarc powerhouse in 1903, Noble had negotiated contracts with Horsetown gold dredging operations as well as with the Balakalala Copper Company for a proposed smelter. Noble joined with Edward Coleman and Antoine Borrel in 1902, incorporating the Keswick electric company to form the Northern California Power Company (NCPC) (Siskin et. al., 2009).

Kilarc was NCPC's second power plant. The Volta plant, located about 25 miles southeast of the copper mining district, was the first, having begun operations in 1901. Located 20 miles north of the Volta plant, the Kilarc plant was named for the Kilarc high-

voltage switch oil used in the plant, and acted as a back-up plant (Siskin et. al., 2009; Gudde, 2004 as cited by Siskin et. al., 2009). Kilarc went online in 1904, and in 1905 NCPC contracted with PG&E to access local business through PG&E's grid. Once Kilarc was in operation, however, the power demands of the area dropped significantly due to fires at the Mountain Copper Company mines, resulting in a cut in electricity usage, the closing of mines at Horsetown, and the scrapping of plans to construct a new smelter by the Balakalala Copper Company. By the 1910s, NCPC was wavering. In 1919 PG&E purchased the company (Siskin et. al., 2009).

The Cow Creek hydroelectric facility was constructed by the Northern Light & Power Company of Redding, which went into operation in 1907 (Siskin et. al., 2009; PG&E, 1962 as cited by Siskin et. al., 2009). Shortly, the Cow Creek facilities were in direct competition with the Kilarc plant, and in 1912 NCPC purchased the Northern Light and Power Company, which had become part of the Sacramento Valley Power Company. When PG&E acquired NCPC in 1919, it also acquired the Cow Creek facility (Siskin et. al., 2009). During the Great Depression, hydroelectricity production was taken over by public agencies in order to continue service to an increasing population. Shasta dam, which was central to the New Deal Central Valley Project, was constructed in the 1930s, spawning several boomtowns that eventually incorporated into Shasta Lake City in 1993 (Siskin et. al., 2009; JRP, 2000 as cited by Siskin et. al., 2009).

Previous Investigations

As part of PG&E's application of license surrender, Garcia and Associates (GANDA), under subcontract to ENTRIX, Inc., conducted and prepared the *Cultural Resources Inventory and Evaluation for the Kilarc-Cow Creek Hydroelectric Decommissioning Project, FERC No. 606, Shasta County, California* (Siskin et. al., 2009). Along with providing an in depth pre-historic and historic cultural context, the GANDA report identifies 14 previous studies that have been conducted for cultural resources within a 0.05-mile radius of the APE. These studies include the following (Siskin et. al., 2009):

- Foster, Daniel

  1984 California Department of Forestry and Fire Protection Archaeological Field Inspection for the Atkins VMP/VMP# 24-010/011-83.

- Salzman, Sally

  1984 Archaeological Reconnaissance: Proposed Group Picnic Area, Kilarc Forebay (I.C. Report # 1343).

- Jensen and Associates

  1986 Report on Historical and Archaeological Resources, Tucker Power Project near Whitmore (I.C. Report # SH-L-358).

- Foster, Daniel

1989 Archaeological Field Inspection for THP# 2-89-97-Sha/Kilarc Reservoir Timber Sale.

- Hamusek, Blossom

  1989 Archaeological Reconnaissance for THP#2-89-97/ARP# 89-76 (I.C. Report # SH-L-356).

- Jenkins, Richard

  1990 California Department of Forestry and Fire Protection Archaeological Field Inspection for the Atkins VMP Project.

- Coyote & Fox Enterprises

  Vaughan, Trudy

  1995 Archaeological Survey Report for the Proposed Replacement of Old Cow Creek Bridge on Fern Road East (Bridge # 6C-3) (I.C. Report # SH-L-694).

- Chapman, Bruce

  1996 Archaeological and Historical Resource Survey and Impact Assessment for the Big Cow THP/THP # K95-330/THP# 2-96-199-Sha(4).

- Dethero, Charles

  2001 Archaeological Addendum for the Cow Chips THP/I.C. File #'s K00-105 and K0211/THP# 2-01-060-Sha(4).

Identified Cultural Resources within the APE

Eleven cultural resources were identified within the APE for the project. Five of these resources are located within the Kilarc Development (Table 21), while the other six are located within the Cow Creek Development (Table 22). Three of these resources, site CA-SHA-1764H, site P-45-003241, and site 482-12-11/H, were previously identified and recorded during earlier investigations. The remaining eight resources were identified in the GANDA study. Of the 11 resources identified within the APE, three are eligible for listing on the National Register, four are not eligible for listing, and four have not been evaluated for listing. The four resources that have not been evaluated for listing on the National Register would be treated as eligible resources until such time that a full evaluation is completed. In-depth descriptions and evaluations for each of these resources are available in the GANDA study (Siskin, et al., 2009).

PG&E states that it requested concurrence from the California SHPO on the evaluations and recommendations addressing historic properties and archeological resources associated with the Proposed Action, by letter dated September 17, 2008. Concurrence with the evaluations and recommendations was received November 4, 2008. Further, PG&E states that the California SHPO also concurred with PG&E's proposal to draft an MOA to mitigate the adverse effects on cultural resources created by surrender

activities, and specifically those impacts to the eligible powerhouses at both developments.

Kilarc Development

Within the APE for the Kilarc Development, five cultural resources were identified (Table 21). Two of these resources, the Kilarc powerhouse (482-12-07H) and a multi-component archaeological site (482-23-08/H) are eligible for listing on the National Register. Two are not eligible for listing, and one has not been evaluated for listing.

Archaeological Resources

Of the two archaeological resources identified within the APE for the Kilarc Development, one is eligible for listing on the National Register under criterion D, while the other has not been evaluated and therefore would be treated as eligible until such time that it is fully evaluated as proposed by PG&E (Siskin et. al., 2009).

Site 482-12-08/H consists of a multi-component prehistoric and historic archaeological resource containing an obsidian flake and a refuse scatter. The historic component of the site is likely associated with an early 20th century work camp related to logging in the area, or the installation of the penstock and the construction of the Kilarc forebay. This resource is eligible under criterion D (Siskin et. al., 2009).

Site 484-12-11/H consists of a multi-component prehistoric and historic archaeological resource containing a lithic scatter, and a developed spring with a concrete damn, an excavated water caption, and a riveted penstock pipe, all enclosed by a contemporary t-post and chicken wire fence. The site was previously investigated in 1989; however, no formal site record was provided. This resource has not been evaluated (Siskin et. al., 2009).

Historic Resources

Three historic resources were identified within the APE for the Kilarc Development. Of these resources, one is eligible for listing on the National Register under criteria A and C, and two have been determined not eligible for listing (Siskin et. al., 2009).

Site 482-12-06H includes the Kilarc powerhouse and associated structures, which consist of three interconnected rectangular stone buildings with center-gable roofs, built in 1903-1904. This resource is eligible for listing on the National Register under criteria A and C (Siskin et. al., 2009).

Site 482-12-07H consists of the Kilarc canal system, which includes the Kilarc main diversion dam, about 3.65 miles of canals and flumes, and the 4-acre Kilarc forebay and penstock. A total of 44 features, located between Old Cow Creek and the Kilarc powerhouse, are encompassed by the Kilarc canal system. This resource has been determined not eligible for listing on the National Register (Siskin et. al., 2009).

Site 482-12-10H consists of the North and South Canyon Creek ditch, which include the North and South Canyon Creek diversion and canal system. The site encompasses a total of eight features, including the North Canyon Creek canal diversion dam and spillway, the South Canyon Creek diversion dam and spillway, the siphon that delivers water across the Old Crow Creek canyon to the Kilarc main canal, a wooden flume, a metal flume, and a corrugated steel culvert. This resource has been determined not eligible for listing on the National Register (Siskin et. al., 2009).

Although only the Kilarc powerhouse was determined to be eligible for listing on the National Register, several public comments filed with the Commission have indicated that the community feels that the entire Kilarc water system is an important historic and cultural resource for the area. In addition, public comments specified concern over effects on these historic resources under the Proposed Action. Comments have generally indicated a preference for the preservation of these resources through continued use and maintenance; these alternatives, however, have been eliminated from further analysis due to feasibility issues.

Ethnographic Resources

No previously recorded TCPs, Sacred Sites, or cemeteries were identified within the APE for the Kilarc Development.[54] Consultation with Indian tribes and individuals that are historically associated with the area has been initiated by PG&E and are identified in appendix B of the GANDA study (Siskin et. al., 2009).

[54] TCPs are a type of historic property that is eligible for the National Register because of association with cultural practices or beliefs of a living community that: (1) are rooted in that community's history; or (2) are important in maintaining the continuing cultural identity of the community (Parker and King, 1998).

Table 21. Cultural resources identified within the Kilarc Development APE. (Source: Siskin et. al., 2009)

Temporary Site Number	State Number	Site Type	Property Type	Name/Location	National Register Status
482-12-06H	None	Historic	water systems	Kilarc powerhouse	Eligible Criteria A, C
482-12-07H	None	Historic	water systems	Kilarc canal	Not Eligible
482-12-08/H	None	Multi-component	obsidian flake, refuse deposit	not for public release	Eligible Criterion D
482-12-10H	P-45-003241*	Historic	water systems	North and South Canyon Creek ditch	Not eligible
482-12-11/H	no record; identified in Foster report THP#2-89-97-Sha*	Multi-component	lithic scatter, water systems	not for public release	Unevaluated

* Indicates resource was identified previous to GANDA study.

Cow Creek Development

Within the APE for the Cow Creek Development, six cultural resources were identified (Table 22). One of these resources, the South Cow Creek powerhouse (482-12-01H), is eligible for listing on the National Register. Two are not eligible for listing, and three have not been evaluated for listing.

Archaeological Resources

Three archaeological resources were identified within the APE for the Cow Creek Development. Of these resources, none have been evaluated for listing on the National Register; therefore, these resources would be treated as eligible until such time that they are fully evaluated as proposed by PG&E (Siskin et. al., 2009).

Site 482-12-03H consists of the Cow Creek caretaker's cottage remnants, along with the workers' camp near the Cow Creek powerhouse. The site encompasses 17 different features, including the main cottage ruins, concrete slabs, walkways, landscape rocks, power poles, footbridge footings, a privy and bath, retaining walls, trash scatters, ruins of the foreman's cottage, and an additional refuse deposit that was individually identified. This resource has not been evaluated (Siskin et. al., 2009).

Site 482-12-04 consists of a pre-historic lithic scatter. The site is located in a road cut, is currently in poor condition, and continues to suffer from surface erosion due to grading and run-off. This resource has not been evaluated (Siskin et. al., 2009).

Site 482-12-05/H consists of a multi-component prehistoric and historic archaeological resource containing a lithic scatter and a refuse scatter. The historic component of this site may be related to a workers' camp associated with the gunniting of the South Cow Creek canal. The site is located on a road and is susceptible to surface erosion due to grading and run-off. This resource has not been evaluated (Siskin et. al., 2009).

Historic Resources

Three historic resources were identified within the APE for the Cow Creek Development. Of these resources, one is eligible for listing on the National Register under criteria A and C, and two have been determined not eligible for listing (Siskin et. al., 2009).

Site 482-12-01H consists of the South Cow Creek powerhouse, which is a rectangular stone building with a center-gable roof, built in 1907-1908. This resource is eligible for listing on the National Register under criteria A and C (Siskin et. al., 2009).

Site 482-12-02H (CA-SHA-1764H) consists of the South Cow Creek canal system, which includes the timber crib diversion dam. The entire system encompasses 15 different features, including gates and spillways, Venturi flow meters, metal and concrete cross flumes, bridges, retaining walls, drain pipes, tunnels, an automated trash collector and outlet structure, dam and forebay, penstock inlet, and penstock. This

resource has been determined not eligible for listing on the National Register (Siskin et. al., 2009).

Site 482-12-09H includes the Mill Creek ditch and diversion dam, which consist of a formed concrete dam situated atop the naturally occurring basalt bedrock of the creek bed. This resource has been determined not eligible for listing on the National Register (Siskin et. al., 2009).

Only the South Cow Creek powerhouse was determined to be eligible for listing on the National Register. Public comments filed with the Commission have indicated that the community feels that the entire Cow Creek water system is an important historic and cultural resource for the area. Similar to the Kilarc facilities, public comments specified concern over effects on these historic resources under the Proposed Action, and have generally indicated a preference for the preservation of these resources through continued use and maintenance; these alternatives, however, have been eliminated from further analysis due to feasibility issues.

Ethnographic Resources

No previously recorded TCPs, Sacred Sites, or cemeteries were identified within the APE for the Cow Creek Development. Consultation with Indian tribes and individuals that are historically associated with the area has been initiated by PG&E and are identified in appendix B of the GANDA study (Siskin et. al., 2009).

By letter dated July 10, 2009, BIA indicated that the penstock associated with the Cow Creek canal system crosses Indian trust land. BIA also indicated that the proposed MOA lacked a sufficient definition of exterior structures associated with the Cow Creek powerhouse that would be secured and left in place. Further, BIA stated that PG&E should either purchase the Indian trust land in the easement surrounding the penstock crossing, or remove the penstock and return the land to pre-permit conditions. BIA also stated that clarification of the exterior structures to be abandoned in place, or disposition of the penstock, would be required before it would further consider becoming a party to the MOA. Comments from the BIA are summarized as part of the Kilarc Development description above. As the penstock was evaluated as part of the North and South Cow Creek canal system, which was determined to be ineligible for listing on the National Register and not part of the National Register eligible powerhouse resource, mitigation of the penstock as a cultural resource is not mandated under the section 106 process.

Table 22. Cultural resources identified within the Cow Creek Development APE. (Source: Siskin et. al., 2009).

Temporary Site Number	State Number	Site Type	Property Type	Name/Location	National Register Status
482-12-01H	N/A	Historic	water systems	South Cow Creek powerhouse	Eligible Criteria A, C
482-12-02H	CA-SHA-1764H*	Historic	water systems	South Cow Creek canal	Not eligible
482-12-03H	None	Historic	settlement	Cow Creek caretaker's cottage	Unevaluated
482-12-04	None	Prehistoric	lithic scatter	not for public release	Unevaluated
482-12-05/H	None	Multi-component	lithic scatter, refuse deposit	not for public release	Unevaluated
482-12-09H	None	Historic	water systems	Mill Creek ditch	Not Eligible

* Indicates resource was identified previous to GANDA study.

3.3.11.2 Environmental Effects of Proposed Action

Kilarc Development

Archaeological Resources

PG&E proposes mitigation techniques that would be part of the MOA, including such measures as suggested in the GANDA study (Siskin et al., 2009), as follows:

- Avoidance of ground disturbing in areas where archaeological resources have been identified would be required.
- The presence of an archaeological monitor for all project activities that occur within 50 feet of identified sites.
- Where avoidance is not possible, as with sites located on or adjacent to roads, or if PG&E cannot avoid ground-disturbing activities in or near these locations, formal evaluation for National Register eligibility of these sites would be required.
- Unidentified archaeological sites discovered during project implementation would require all construction work in the vicinity to stop until a qualified archaeologist can evaluate the site and provide recommendations.

Our Analysis

The Proposed Action would create minor to moderate adverse long-term effects on archaeological resources. The eligible 482-12-08/H resource has been identified within the APE for the Kilarc Development. The proposed MOA currently being developed, however, would mitigate any effects on archaeological resources created by implementation of the surrender. Overall, effects on archaeological resources are anticipated to be minor with the use of mitigation techniques that would be part of the MOA as proposed by the licensee.

Historic Resources

Surrender of the project would mean that the powerhouse would no longer be protected by federal jurisdiction under the NHPA, and would cause an unavoidable adverse effect. However, mitigation for effects under the proposed MOA are anticipated to follow BMPs set by DOI and outlined in the publication, *Preservation Brief 31: Mothballing Historic Structures*, and includes documentation, stabilization, and mothballing.

Documentation as part of the mitigation process was initiated with the completion of the GANDA study. Further documentation would include completion of a Historic American Building Survey / Historic American Engineering Record report including large format photography and architectural drawings.

Our Analysis

The Proposed Action would create major adverse long-term effects on the Kilarc powerhouse. In preparation for surrender, the facility would be abandoned in place and all associated hydropower, mechanical, and electrical equipment removed. The proposed MOA, as described above, would mitigate any effects on historic resources created by implementation of the surrender.

As the building is in sound condition and has been well maintained, stabilization of the building would consist of a modified condition assessment prepared by an architect, structural engineer, or preservation specialist. The condition assessment would identify and prioritize any maintenance activities required for the short- and long-term protection of the resource, especially from moisture infiltration. The stabilization process also would address the removal of hydropower-related equipment from the buildings.

Mothballing of the building would consist of managing the long-term deterioration of the unoccupied resources, as well as securing the building from fire hazards and vandalism. In addition, a maintenance and monitoring plan would be implemented, protecting the building from permanent damage.

Although removal of hydropower-related mechanical and electrical equipment from the Kilarc powerhouse would diminish the historic integrity of this resource, the above-described measures would ensure that the unavoidable adverse effects to cultural resources and historic properties, as part of the surrender process, are successfully mitigated for to the extent possible and should be included as part of surrender implementation.

Ethnographic Resources

In the event that human remains are encountered during any portion of project implementation, PG&E proposes that all potentially disruptive activities (i.e., construction) within the vicinity of the remains would cease and the County Coroner would be contacted. If an appointed archaeological monitor were not present, a qualified archaeologist would also be contacted to evaluate the site. The California Native American Heritage Council would be contacted within 24 hours if the remains were discovered to be Native American in origin. Additionally, the SHPO should be contacted in the event of any unanticipated discoveries.

Our Analysis

The Proposed Action would have no effects on ethnographic resources. While there is the possibility that human remains associated with prehistoric occupation may be encountered, treatment of such remains is mandated under federal legislation such as the Native American Graves and Repatriation Act (Public Law 101-601; 25 U.S.C. 3001 et seq., and 43 CFR 10), as well as section 7050.5 of the California Health and Safety Code, and section 5097.99 of the Public Resources Code, making it a misdemeanor to knowingly disturb a human burial and making it a felony to obtain Native American

grave goods. PG&E's proposed measures should be included as part of implementation of the surrender.

Cow Creek Development

Archaeological Resources

The MOA proposed by PG&E would mitigate any effects to archaeological resources created by surrender implementation. Implementation of mitigation mandated by the proposed MOA would be identical to that discussed for the Kilarc Development.

Our Analysis

The Proposed Action would create minor to moderate adverse long-term effects for archaeological resources. Although no National Register eligible archaeological resources were identified within the APE for the Cow Creek Development, three unevaluated resources have been identified within the APE. These resources would be treated as National Register-eligible until such time that they are fully evaluated.

Although mitigation would be implemented to minimize adverse effects on archaeological resources, the remaining unevaluated sites are located on roads (482-12-04 and 482-12-05/H) and likely would continue to experience surface erosion, creating minor to moderate effects for those resources. Overall, effects to archaeological resources under the MOA are anticipated to be minor.

Historic Resources

Surrender of the project would mean that the powerhouse would no longer be protected by federal jurisdiction under the NHPA, and would cause an unavoidable adverse effect. However, the proposed MOA currently being developed would mitigate any effects on historic resources created by implementation of the surrender. Implementation of mitigation mandated by the proposed MOA would be identical to that discussed for the Kilarc Development.

Our Analysis

The Proposed Action would create major effects on historic resources. One historic resource, the Cow Creek powerhouse (482-12-01H), was identified within the APE for the Cow Creek Development. In preparation for surrender, the facility would be abandoned in place and all associated hydropower mechanical and electrical equipment removed.

Although removal of hydropower-related mechanical and electrical equipment from the Cow Creek powerhouse would diminish the historic integrity of this resource, creating adverse effects, the above-described measures would ensure that the unavoidable adverse effects to cultural resources and historic properties, as part of the surrender process, are successfully mitigated for to the extent possible and should be included as part of surrender implementation.

Ethnographic Resources

The Proposed Action would have no effects on ethnographic resources. Mandated treatment of accidental discovery of human remains would be identical to that discussed for the Kilarc Development.

3.3.11.3 Environmental Effects of Action Alternative 1

Kilarc Development

Under AA1, the Kilarc forebay and related infrastructure would be maintained in order to provide recreational access. Features of the Kilarc Development that are not necessary to forebay maintenance would be removed as described in the Proposed Action. Features not needed to maintain the forebay would include the penstock and penstock intake, as well as the Kilarc powerhouse and switchyard. All unneeded features would be decommissioned as described in the Proposed Action.

Our Analysis

Anticipated adverse effects on archaeological, historic, and ethnographic resources within the Kilarc Development under AA1 would be the same as those under the Proposed Action and in comparison to the No-Action Alternative, as discussed above in section 3.3.11.2, *Environmental Effects of Proposed Action*. The proposed MOA, as described above, would mitigate any adverse effects on historic resources created by implementation of the surrender.

Cow Creek Development

Under AA1, the Cow Creek Development would be decommissioned as described in the Proposed Action.

Our Analysis

Anticipated adverse effects on archaeological, historic, and ethnographic resources within the Cow Creek Development under AA1 would be identical to those under the Proposed Action and in comparison to the No-Action Alternative, as discussed above in section 3.3.11.2, *Environmental Effects of Proposed Action*. The proposed MOA, as described above, would mitigate any effects on historic resources created by implementation of the surrender.

3.3.11.4 Environmental Effects of Action Alternative 2

Kilarc Development

Under AA2, the Kilarc Development would be decommissioned as described in the Proposed Action.

Our Analysis

Anticipated adverse effects on archaeological, historic, and ethnographic resources within the Kilarc Development under AA2 would be the same as those under the Proposed Action and in comparison to the No-Action Alternative, as discussed in section

3.3.11.2, *Environmental Effects of Proposed Action*. The proposed MOA, as described above, would mitigate any effects on historic resources created by implementation of the surrender.

Cow Creek Development

Under AA2, the South Cow Creek main canal would be maintained; however, the Cow Creek powerhouse and switchyard would be decommissioned as described in the Proposed Action.

Our Analysis

Anticipated adverse effects on archaeological, historic, and ethnographic resources within the Cow Creek Development under AA2 would be the same as those under the Proposed Action and in comparison to the No-Action Alternative, as discussed in section 3.3.11.2, *Environmental Effects of Proposed Action*. The proposed MOA, as described above, would mitigate any effects on historic resources created by implementation of the surrender.

3.3.11.5 Environmental Effects of No Action

Kilarc Development

Under the No-Action Alternative, the project would continue to operate in the same manner as the current license. All cultural resources and historic properties would continue to be managed as such at the Kilarc Development.

Our Analysis

The No-Action Alternative would create no adverse effects on archaeological, historic, or ethnographic resources in the Kilarc Development. Effects on historic resources would be beneficial under the No-Action alternative as the National Register eligible Kilarc powerhouse would remain in use, and therefore continue to receive routine maintenance and up-keep.

Cow Creek Development

Under the No-Action alternative, the project would continue to operate in the same manner as the current license. All cultural resources and historic properties would continue to be managed as such at the Cow Creek Development.

Our Analysis

The No-Action Alternative would create minor to moderate adverse effects on archaeological resources and no adverse effects on historic or ethnographic resources in the Cow Creek Development. The two archaeological sites that are located on roads (482-12-04 and 482-12-05/H) likely would continue to experience surface erosion, creating minor to moderate effects on those resources. Effects on historic resources would be beneficial under the No-Action Alternative, as the National Register eligible Cow Creek powerhouse would remain in use, and therefore continue to receive routine maintenance and up-keep.

3.4 CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing NEPA, a cumulative effect is the effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Based on PG&E's pre-filing consultation and public scoping comments, staff have identified five potentially cumulatively affected resources for analysis relative to this action: geology and soil (sediment), water quantity (flow distribution), water quality (water temperature and sediment transport), aquatic resources (migratory fish species), land use (agricultural uses), and cultural resources.

3.4.1 Past Actions

3.4.1.1 Geology and Soil

Accumulated sediments behind the diversion dams of the Kilarc-Cow Creek Project have reduced water storage capacity to negligible. Given the bed load and upstream sources of material, it appears that sediment quickly filled these impounded areas within a short time following their construction. Unlike large dams and reservoirs that accumulate sediment and starve downstream reaches of sediment, the project dams are small and it is likely that flow events capable of mobilizing and transporting sediment have overflowed the diversion dams and resulted in a relatively natural transport and distribution of sediment material downstream.

3.4.1.2 Water Quantity

The quantity of water available from runoff and groundwater discharge to stream channels of many Central Valley tributaries has been affected by diversions for hydroelectric power generation, agriculture, livestock, industrial, and residential use. In 1969, water rights in the Cow Creek watershed were adjudicated in Shasta County Superior Court. The Cow Creek Adjudication Decree (No. 38577, August 25, 1969) details, as appropriate, the priority class, location, timing, magnitude, diversion share, use, and acres irrigated for each existing water right in the watershed. The Adjudication Decree maps 16 non-project water rights upstream of the South Cow Creek main canal diversion dam, the project diversions on Mill Creek and South Cow Creek, and the non-project Wagoner Ditch and Abbott Ditch on South Cow Creek between Mill Creek and Hooten Gulch. The total water allocation excluding the project diversions within and upstream of the Cow Creek development is 64.79 cfs. In addition to the three project-related diversions, one water right is mapped on Canyon Creek and one on Old Cow Creek between Canyon Creek and the Kilarc tailrace in proximity to the Kilarc Development. There is one water allocation (1.51 cfs) in addition to the project diversions within the affected reach of the Kilarc Development on Canyon Creek. Numerous other rights are mapped downstream of the project on South Cow and Old Cow Creeks and continuing down Cow Creek below their confluence totaling 118.57 cfs.

3.4.1.3 Water Quality

Water quality in the Central Valley watershed including Cow Creek and its tributaries is affected by natural geomorphologic conditions in portions of the watershed, e.g., mass wasting of steep unstable stream banks, as well as anthropogenic factors, e.g., hydraulic and hardrock mining, timber harvesting, livestock grazing. Tributaries such as Old Cow and South Cow Creeks that originate and drain the western slope of the Cascades have extensive reaches with steep channel gradients and steep banks. Unconsolidated material comprising the steep banks in some of these areas can be unstable and subject to mass wasting, particularly during rapid changes in flow and high flow periods, causing fluctuations in turbidity. These conditions can be exacerbated when disturbed by human activities in the riparian zone.

Many of these tributaries are managed for coldwater fisheries (e.g., trout and other migratory salmonids) and are dependent on runoff from snow melt and groundwater discharge to maintain cool water temperatures throughout the year and particularly during periods of low flow during the summer. In addition to the potential effects on water temperature of low flows in bypassed reaches associated with hydropower generation at projects like Kilarc-Cow Creek (see section 3.3.2, *Water Resources*), loss of shade from clearing in riparian areas and increased temperature of return water from diversions used for flood irrigation of pasturage and agricultural acreage can also lead to increases in water temperature.

Runoff from historic mining activities has transported contaminants, metals in particular, into stream channels where depositional areas (e.g., upstream of diversion dams for hydropower and other water users) can accumulate sediments with elevated metal concentrations. Leaching and resuspension during periods of high and scouring flows have the potential to result in elevated concentrations of dissolved and suspended contaminants in the water column.

Historic timber harvest practices (e.g., clearing and access construction and maintenance) have been a potential source of sediment and turbidity in streams. Existing permitting and requirements for implementation of BMPs have reduced these sources. Recently implemented regulations in California increased the size of riparian buffer zones and significantly restricted activities such as timber harvest adjacent to streams designated as habitat for listed species of anadromous salmonids, providing further protection to water and aquatic resources. Sierra Pacific Industries has specifically commented on the potential effects on their operations and land management associated with removal of fish migration barriers at the Kilarc Development and restoration of anadromous populations to Old Cow Creek.

3.4.1.4 Fisheries

Migratory fish runs in the Sacramento River and its Central Valley tributaries have significantly declined as a result of many factors, including excessive commercial harvest of migratory fish stocks, freshwater habitat degradation associated with mining activities

during the 1800s, and construction of the first dams and water projects on the Central Valley system in the 1880s. Population growth and demands for water resources and associated changes in land use, including agriculture and timber management, also affected aquatic habitat for these species. Replacement of riverine habitats with impoundments, together with blocked access to upstream spawning areas, severely reduced the numbers of steelhead trout, various runs of Chinook salmon, and other migratory species in the Central Valley area. Loss of migratory fish runs had an immediate effect on the public's ability to use the resource for commercial and recreational purposes. The historical reliance of Indian tribes on the river's large runs of fish for sustenance and cultural purposes also was curtailed. Loss of native fish stocks also had ecological impacts, by reducing forage provided by juvenile of these anadromous species for predatory fish and wildlife and by interrupting the exchange of marine-derived nutrients between freshwater and marine ecosystems.

Various remedies have been tried over the years to restore fish populations in the Sacramento/San Joaquin system, typically involving construction of fish ladders and screens at dams and water diversions/intakes and stocking of hatchery raised steelhead and salmon. Although such measures have helped maintain the existence of some migratory species, the robustness of stocks has been impaired due to reduced genetic diversity, fewer distinct populations, and far fewer adults returning to spawn. Many of these stocks have been federally listed or considered for listing with development of associated restoration and management plans and protection of critical habitat and essential fish habitat. The presence of multiple dams can result in significant cumulative losses, as a result of delay in upstream movement and injury or mortality to migratory fish during passage up or downstream at dams and unscreened diversions. In recent years, in addition to stocking and fish ladders, breaching or removal of dams have become serious considerations at selected sites as part of migratory fish species restoration strategies.

Consumptive water rights throughout the Central Valley, and specifically within the Cow Creek watershed, affect the volume of water within natural stream channels and thus aquatic habitat for migration and spawning by anadromous and resident fish. The need for these diversions is typically greatest during the dry season when natural flows in stream channels are at their annual low levels. Reduced natural flows due to diversion projects may have also adversely affected the ability of migratory species to negotiate upstream passage at some natural barriers that might otherwise be passable.

3.4.1.5 Land Use

Agricultural lands exist in the Old Cow Creek and South Cow Creek valleys that are supported by runoff and groundwater discharge to stream channels, and by diversions as described in section 3.3.2.1, *Water Quantity*. The Abbott Diversion (Abbott Ditch), an agricultural diversion located a short distance upstream of the Hooten Gulch and South Cow Creek confluence, diverts water pursuant to the Cow Creek Adjudication Decree (see section 3.3.2.1, *Water Quantity*) throughout the year from Hooten Gulch below the

Cow Creek powerhouse. The water diverted is used by Tetrick Ranch and ADU for agricultural uses and irrigation on 312 acres of pasture and hay lands.

3.4.1.6 Cultural Resources

Within the Kilarc Development, cumulative effects based on past actions are anticipated to create minor to moderate adverse effects for two archaeological sites (482-12-04 and 482-12-05/H). These two sites, however, are located on roads and would likely continue to suffer from surface erosion under any action, creating minor to moderate impacts for these resources. No cumulative effects are anticipated under past actions for historic or ethnographic resources within the Kilarc Development, or for any cultural resources within the Cow Creek Development.

3.4.2 Proposed Action

3.4.2.1 Geology and Soil

The Proposed Action would result in partial removal of the diversion dams on Old Cow Creek and South Cow Creek. The volume of sediment retained behind these diversion structures is relatively small and PG&E has proposed to allow high flows (e.g., bank full or higher flow events) to mobilize and redistribute this material. Downstream movement of the sediment after dams are removed would not likely affect substrate quality or quantity beyond the bypassed reaches. As discussed in section 3.3.2.2, *Water Quality*, the capacity of these diversion structures to retain sediment material was probably exhausted early in the life of these structures, and sediment mobilization and transport at appropriate flows have been relatively natural for many years.

Removal of the diversion structures would not affect the frequency and magnitude of bed mobilizing flows and thus would not be likely to change the existing regimen of downstream sediment transport after the initial redistribution of trapped sediment. These reaches are sediment starved; specifically, the capacity of the natural flows to mobilize and transport sediment is greater than the available material. This would not change under the Proposed Action; thus, we do not expect the Proposed Action to contribute to cumulative effects on geology and soil resources in the Cow Creek watershed.

3.4.2.2 Water Quantity

The Proposed Action would restore full natural flows and a seasonal hydrograph to the project-related bypassed reaches of North Canyon Creek, South Canyon Creek, Old Cow Creek, Mill Creek, and South Cow Creek. Flows in Old Cow Creek, South Cow Creek, and Cow Creek still would be affected by withdrawal at other adjudicated water diversions, many of which are consumptive in nature. PG&E's share (1.44 cfs) of the German Ditch diversion from South Cow Creek to Mill Creek for rediversion back to South Cow Creek would be surrendered and remain in South Cow Creek. Perennial flows in Hooten Gulch downstream of the Cow Creek powerhouse would be reduced to seasonal ephemeral conditions similar to Hooten Gulch upstream of the powerhouse. The Kilarc and Cow Creek forebays would be drained, graded, and filled, resulting in a

permanent loss of these water resources. Over-all the Proposed Action would have a positive net benefit on water quantity resources in the project area but this would not contribute significantly to cumulative effects on water quantity in the Cow Creek watershed.

3.4.2.3 Water Quality

The return of a natural flow regime to the Old Cow and South Cow Creek bypassed reaches would likely result in slightly lower summer water temperatures in these reaches benefiting cold water aquatic resources. Construction activities associated with the Proposed Action would likely have short term, minor adverse impacts to water quality. Over-all, the Proposed Action would not contribute significantly to cumulative effects on water quality in the Cow Creek watershed.

3.4.2.4 Fisheries

The anticipated benefit to fisheries from the Proposed Action would be expansion of available habitat to benefit restoration of populations of RTE anadromous species, specifically Central Valley Steelhead DPS and Central Valley fall and late-fall Chinook salmon ESU. Removing the Kilarc Development diversion structure would improve flows during low flow periods and improve access to spawning substrates in the lower portion of the Old Cow Creek bypassed reach. The seasonal flow regime at Whitmore Falls would not change; therefore, access for steelhead to the Old Cow Creek bypassed reach upstream of this location would continue to be restricted to periods of high flows. It is not likely that fall and late-fall run Chinook would gain access to habitat upstream of Whitmore Falls. Access above barrier OC-11 in the middle of the Old Cow Creek bypassed reach would not be provided by the Proposed Action.

Steelhead are able to pass through the South Cow Creek bypassed reach and use the existing fish ladder at the diversion dam to access upstream portions of the watershed. The existing fish ladder is considered by the resource agencies to not meet current state-of-the-art standards; therefore, removal of the diversion dam could improve access to habitat in the upstream watershed. Higher flows and associated water depths also could improve spawning substrate availability within the bypassed reach. Additional habitat for spawning and juvenile growth of Chinook salmon could become more accessible after removing the Cow Creek Development diversion structure; however, based on information related to the historic use of these reaches, it is uncertain that useable habitat in the Cow Creek watershed for Chinook salmon would expand as a result.

3.4.2.5 Land Use

As described in section 3.3.2.1, *Water Quantity*, the Proposed Action would restore full natural flows and a seasonal hydrograph to the project-related bypassed reaches of North Canyon Creek, South Canyon Creek, Old Cow Creek, Mill Creek, and South Cow Creek. Flows in Old Cow Creek, South Cow Creek, and Cow Creek still would be affected by withdrawal at other adjudicated water diversions, many of which are consumptive in nature. Under the Proposed Action, PG&E's share (1.44 cfs) of the

German Ditch diversion from South Cow Creek to Mill Creek for rediversion back to South Cow Creek would be surrendered and remain in South Cow Creek. Perennial flows in Hooten Gulch downstream of the Cow Creek powerhouse would be reduced to seasonal ephemeral conditions similar to Hooten Gulch upstream of the powerhouse.

The seasonal loss of existing flows in the lower reach of Hooten Gulch would potentially interrupt irrigation water flowing from Hooten Gulch at the Abbott Diversion. There would be a major long-term adverse effect on agricultural uses for crop, pasture, and livestock production, as well as on the preservation of agricultural land and land uses as contained in Shasta County's General Plan and the Stewardship Council's LCP Recommended Concept for the Cow Creek Planning Unit, respectively, by indirectly removing the perennial water supply to Abbott Diversion.

As a result of the Proposed Action, it would be necessary for ADU to relocate their diversion from Hooten Gulch to South Cow Creek, as described above in section 3.3.2.1, *Water Quantity*, in order to maintain use of their water right for use to irrigate agricultural farming and ranching operations on the 312 acres currently irrigated by Abbott Ditch.

The Proposed Action at the Kilarc Development would not have any cumulative effects on existing land use.

3.4.2.6 Cultural Resources

Cumulative Effects based on the Proposed Action are anticipated to create minor to moderate adverse effects for the two archaeological sites (482-12-04 and 482-12-05/H) located within the Kilarc Development. These resources are located on roads and would likely continue to suffer from surface erosion. No cumulative effects are anticipated under the Proposed Action for historic or ethnographic resources within the Kilarc Development, or for any cultural resources within the Cow Creek Development.

3.4.3 Action Alternative 1

3.4.3.1 Geology and Soil

Under AA1, effects on geology and soil resources would be similar to those under the Proposed Action. Most of the sediment trapped behind the existing Kilarc diversion dam would remain in place, although some material in the immediate vicinity of the dam may be released in order to construct the new fish ladder and screen and modify the spillway to increase minimum flows. As with the Proposed Action, we do not expect this alternative to contribute to cumulative effects on geology and soil resources in the Cow Creek watershed.

3.4.3.2 Water Quantity

Action Alternative 1 would have cumulative water quantity effects similar to those under the Proposed Action. The main difference would be the maintenance of the Kilarc forebay and the continued restriction of flows in the Old Cow Creek bypassed reach,

although flows in this reach would be greater than those under the No-Action Alternative and would still provide a long-term benefit to water quality and aquatic resources. Overall AA1 would have a positive net benefit on water quantity resources in the project area but this would not contribute significantly to cumulative effects on water quantity in the Cow Creek watershed.

3.4.3.3 Water Quality

Under AA1, the increase in flows in the Old Cow and South Cow Creek bypassed reaches would likely result in slightly lower summer water temperatures in these reaches benefiting cold water aquatic resources. Construction activities associated with this alternative would likely have short term, minor adverse impacts to water quality. Overall, AA1 would not contribute significantly to cumulative effects on water quality in the Cow Creek watershed.

3.4.3.4 Fisheries

The cumulative effects on fisheries under AA1 would be similar to those under the Proposed Action. In the long-term, the re-establishment of a natural flow regime in North and South Canyon Creeks, Mill Creek, and South Cow Creek, with removal of the diversion dams and canals, would benefit fish through improvements to aquatic habitat and water quality. The continued diversion of flows from Old Cow Creek at the Kilarc diversion dam, although less than those in the Proposed Alternative, would potentially benefit fish habitat in the bypassed reach when natural flows are low. Higher flows would decrease the transit time through the Old Cow Creek bypassed reach and sustain cooler water temperatures in the channel between the Kilarc diversion dam and the Kilarc tailrace. Under this alternative, a fish ladder installed at the Kilarc main canal diversion dam and a fish screen installed at the entrance to the Kilarc main canal would benefit fish by respectively facilitating upstream access for anadromous salmonids that are able to negotiate other natural downstream barriers (Whitmore Falls and OC-11) and preventing entrainment of fish from Old Cow Creek into the canal.

3.4.3.5 Land Use

The cumulative effects on land use at the Cow Creek Development under AA1 would be the same as those under the Proposed Action. The effects of AA1 at Kilarc would be similar to those under the No-Action Alternative. Under AA1 at the Kilarc Development, there would not be any cumulative effects on existing land use.

3.4.3.6 Cultural Resources

The cumulative effects on cultural resources under AA1 would be the same as those under the Proposed Action.

3.4.4 Action Alternative 2

3.4.4.1 Geology and Soil

Under AA2, effects on geology and soil resources would be similar to those under the Proposed Action. Most of the sediment that has accumulated upstream of the South Cow Creek diversion dam would remain in place, although a portion of the bed material in the immediate vicinity of the dam could be removed to facilitate modifications to the spillway, fish ladder, and fish screen. As with the Proposed Action, we do not expect AA2 to contribute to cumulative effects on geology and soil resources in the Cow Creek watershed.

3.4.4.2 Water Quantity

Action Alternative 2 would have cumulative water quantity effects similar to those under the Proposed Action. The main difference would be the maintenance of the Cow Creek forebay and flows in the Hooten Gulch, and the continued restriction of flows in the South Cow Creek bypassed reach, although flows in this reach would be greater than those under the No-Action Alternative and would still provide a long-term benefit to water quality and aquatic resources. Over all, AA2 would have a positive net benefit on water quantity resources in the project area but this would not contribute significantly to cumulative effects on water quantity in the Cow Creek watershed.

3.4.4.3 Water Quality

Under AA2, the increase in flows in the Old Cow and South Cow Creek bypassed reaches would likely result in slightly lower summer water temperatures in these reaches benefiting cold water aquatic resources. Construction activities associated with this alternative would likely have short term, minor adverse impacts to water quality. Over-all, Action Alternative 2 would not contribute significantly to cumulative effects on water quality in the Cow Creek watershed.

3.4.4.4 Fisheries

The cumulative effects on fisheries under AA2 would be similar to those under the Proposed Action. In the long-term, the re-establishment of a natural flow regime in the Kilarc Development's bypassed reaches could result in benefits to fish through improvements to spawning substrate and water temperature in the bypassed reaches. Natural high flows would be relatively unaffected by the by AA2 during late fall through early spring when steelhead and late fall-run Chinook salmon are present. Continued flows through Hooten Gulch, downstream of the Cow Creek powerhouse, could potentially sustain aquatic habitat for adult steelhead, although the extent to which steelhead would utilize this habitat and the effects of reducing flows in this reach as compared to the No-Action Alternative are unknown. An unknown percentage of young steelhead hatched in Hooten Gulch would continue to be susceptible to entrainment into Abbott Ditch without construction of a fish screen at the entrance to the ditch.

3.4.4.5 Land Use

Under AA2, there would be a long-term benefit at the Cow Creek Development on land use. As described in section 3.3.2.1, *Water Quantity*, under AA2, there would be continued diversion of some flows from South Cow Creek at the Cow Creek main canal diversion to continue augmentation of water flows to Hooten Gulch from Cow Creek powerhouse to support the consumptive water rights of ADU at the Abbott Diversion for irrigation of Tetrick Ranch and ADU's agricultural crop and pasture lands with no perceived effect to these land uses or to their future preservation. The effects of AA2 at Kilarc would be similar to those under the Proposed Action. Under AA2 at the Kilarc Development, there would not be any cumulative effects on existing land use.

3.4.4.6 Cultural Resources

The cumulative effects on cultural resources under AA2 would be the same as those under the Proposed Action.

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4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 COMPARISON OF ALTERNATIVES

4.1.1 Geologic and Soil Resources

Under the Proposed Action, the full, natural, geomorphically significant peak flows along South Cow Creek and Old Cow Creek would be nearly the same as under existing licensed conditions. The removal of the Mill Creek, North Canyon Creek, and South Canyon Creek diversion dams under the Proposed Action would restore the annual peak runoff magnitude, and the associated sediment transport capacity of these channels. Following removal of the Kilarc main canal diversion dam, about 580 cubic yards of total stored sediment would be redistributed downstream by natural flow conditions, although about 230 to 290 cubic yards of this material would be readily mobilized only at very high flows. Following removal of the South Cow Creek diversion dam, the entire 1,400 cubic yards of sediment eventually would be transported downstream.

Under AA1, the long-term environmental effects at the Kilarc Development would be similar to those effects described under the No-Action Alternative. There would be potential short-term effects due to disturbance and erosion during construction of the fish ladder and fish screen. Additional short-term effects could occur at the Kilarc forebay during construction to reconfigure the relative location of the spillway and main canal discharge. Environmental effects at the Cow Creek Development would be the same as for the Proposed Action.

Under AA2, the long-term environmental effects at the Cow Creek Development would be similar to those effects under the No-Action Alternative. There would be potential short-term effects due to disturbance and erosion during removal and reconstruction of the fish ladder and fish screen, and any necessary modification of the spillway and gates at the South Cow creek main canal diversion dam, and during deconstruction of the Mill Creek structures. Additional short-term effects could occur at the Cow Creek forebay during filling, grading, and construction to extend the main canal to the penstock intake. Environmental effects at the Kilarc Development would be the same as for the Proposed Action.

Under the No-Action Alternative, Kilarc-Cow Creek Project infrastructure and adjacent areas would continue to be well vegetated, armored, or generally protected from erosion. Sediment accumulated upstream of the Kilarc and South Cow Creek main canal diversion dam would remain in place and would not be available to bypassed stream channels.

4.1.2 Water Resources

Under the Proposed Action, and Action Alternatives 1 and 2, there would be an increase in average monthly flows and natural seasonal flows would be restored. Tables

23 and 24 present a comparison of estimated average monthly flows in the bypassed reaches of Old Cow Creek and South Cow Creek, respectively, under the existing license, Proposed Action, and alternatives, as they were calculated in the methods described in section 3.3.2.1, *Water Quantity*.

Table 23. Comparison of estimated average monthly flow conditions in the bypassed reach of Old Cow Creek at the Kilarc main diversion dam under the existing license, Proposed Action, and Alternatives (Source: Staff).

Month	Licensed Condition (cfs)	Proposed Action (cfs)	AA1 (cfs)	AA2 (cfs)	No-Action Alternative (cfs)
January	103	140	120	140	103
February	95	137	117	137	95
March	88	131	111	131	88
April	52	97	77	97	52
May	59	105	85	105	59
June	38	75	55	75	38
July	31	62	42	62	31
August	30	56	36	56	30
September	14	39	20	39	14
October	8	33	20	33	8
November	25	55	35	55	25
December	57	94	74	94	57

Table 24. Comparison of estimated average monthly flow conditions in the bypassed reach of South Cow Creek at the Cow Creek Diversion Dam under the existing license, Proposed Action, and Alternatives (Source: Staff).

Month	Licensed Condition (cfs)	Proposed Action (cfs)	AA1 (cfs)	AA2 (cfs)	No-Action Alternative (cfs)
January	204	252	252	232	204
February	185	236	236	216	185
March	196	249	249	229	196

Month	Licensed Condition (cfs)	Proposed Action (cfs)	AA1 (cfs)	AA2 (cfs)	No-Action Alternative (cfs)
April	126	179	179	159	126
May	74	122	122	102	74
June	30	68	68	48	30
July	10	35	35	15	10
August	6	26	26	6	6
September	6	27	27	7	6
October	9	38	38	18	9
November	55	93	93	73	55
December	123	174	174	154	123

Under the Proposed Action, average monthly flows in the Old Cow Creek bypassed reach would likely range from 33 to 140 cfs, compared to flows under the existing licensed condition which range from about 8 to 103 cfs (Table 23). In the South Cow Creek bypassed reach, average monthly flows under the Proposed Action would likely range from 26 to 252 cfs, compared to flows under the existing licensed condition which range from 6 to 204 cfs (Table 24). Under AA1, flows in Old Cow Creek would also increase above licensed conditions but average monthly flows would be less under AA1 than under the Proposed Action, while flows in the bypassed reach of South Cow Creek would be the same as under the Proposed Action. Similarly, under AA2, flows in South Cow Creek would increase above licensed conditions but average monthly flows would be less under AA2 than under the Proposed Action, while flows in the Old Cow Creek bypassed reach would be the same as under the Proposed Action. The greatest benefits from the increase in flows in the bypassed reaches under the Proposed Action, and Action Alternatives 1 and 2 would be realized under low flow conditions. There would be no adverse effects in the bypassed reaches associated with the negligible changes in the annual peak flow regime from the Proposed Action. Flows in the bypassed reaches are the same under the No Action Alternative and licensed conditions.

The Proposed Action and AA2 would result in a permanent loss of the 4.5 acre Kilarc forebay because flows would no longer be diverted for power generation. Action Alternative 1 and the No-Action Alternative would preserve the forebay at its current volume, surface area, and elevation, although flows to the forebay would be less than under licensed conditions.

The Proposed Action and AA1 would result in less flow in Hooten Gulch below the powerhouse. This reach of Hooten Gulch would return to natural seasonal ephemeral

conditions similar to those upstream of the powerhouse. The loss of flows to this stretch of Hooten Gulch would permanently and significantly reduce flows available to the Tetrick Hydroelectric Project and for ADU at the existing Abbott Ditch diversion. Action Alternative 2 and the No-Action Alternative would maintain sufficient flow in Hooten Gulch so that Tetrick Hydroelectric Project could continue to operate and ADU could maintain access to their water right at the existing diversion.

The increase in flows in the bypassed reaches of Old Cow and South Cow Creek under the Proposed Action and Action Alternatives 1 and 2 would likely decrease average stream temperatures slightly. There would likely be minor adverse impacts to water quality as a result of the construction activities associated with the Proposed Action and Action Alternatives 1 and 2. However, these impacts are expected to be temporary and would be minimized by PG&E's proposed mitigation measures.

4.1.3 Fisheries and Aquatic Resources

Under the Proposed Action, fisheries and aquatic resources would significantly benefit over the long-term. Restoration of the natural full seasonal variability of flows, associated restoration of a more natural sediment transport regime, and redistribution of entrapped coarse sediment upstream of the diversion dams (see section 3.3.1, *Geology and* Soils; section 3.3.2, *Water Resources*) could improve and expand fish spawning substrate for resident and migratory salmonids in the bypassed reaches of both Old Cow Creek and South Cow Creek. Generally higher flows year-round through the bypassed reaches would improve accessibility within the bypass and opportunities for fish passage at marginal barriers in the Old Cow Creek bypassed reach and Wagoner Canyon in the South Cow Creek bypassed reach. Water temperatures in the Old Cow Creek bypassed reach would be expected to be cooler. While the improved flow regime would also likely result in lower water temperatures in the South Cow Creek bypassed reach, it is still unlikely that summer temperatures would improve enough to meet the coldwater fisheries criteria. During deconstruction actions, there may be short-term adverse effects on resident fish due to possible stranding during impoundment drawdowns and on fish habitat, but PG&E's proposed environmental measures would reduce these impacts.

Action Alternative 1 would expand and improve available habitat by increasing flows in the Old Cow Creek bypassed reach above the No-Action Alternative, as described in section 3.3.2, *Water Resources*, with potential enhancement of habitat in the bypassed reach during periods when flows in Old Cow Creek are less than 50-70 cfs. However, flows in the bypass would be less than flows under the Proposed Action. Action Alternative 1 also would require installation of a fish screen at the entrance to the Kilarc main diversion canal to exclude juvenile and adult fish in Old Cow Creek from entering the canal and moving downstream to the Kilarc forebay. Action Alternative 1 would continue to support existing aquatic and riparian habitat along the Kilarc diversion canal. Action Alternative 1 also would retain the Kilarc forebay and the associated recreational facilities and fishery. Effects on fisheries and aquatic resources at the Cow

Creek Development, under Action Alterative 1 would be the same as those described under the Proposed Action.

Action Alternative 2 would expand and improve available habitat by increasing flows in the South Cow Creek bypassed reach above the No-Action Alternative, as described in section 3.3.2, *Water Resources*, with potential enhancement of habitat in the bypassed reach during periods when natural flows at the South Cow Creek diversion dam are less than 50-60 cfs. However, flows in the bypass reach would be less than flows under the Proposed Action. Continued flows to Hooten Gulch would maintain aquatic habitat and cool water temperatures year-round similar to the No-Action Alternative, although it is uncertain whether adult steelhead could negotiate the low flows in Hooten Gulch below the Abbott Ditch diversion dam without modification of the channel configuration and construction of a fish ladder. Providing access for steelhead to Hooten Gulch would leave an unknown percentage of young steelhead hatched in Hooten Gulch susceptible to entrainment into Abbott Ditch unless a fish screen was constructed at this diversion. The environmental effects on aquatic resources at the Kilarc Development, under Action Alternative 2 would be the same as described for the Proposed Action.

Under the No-Action Alternative, there would be no disturbance of existing environmental conditions at the site, and there would be no new environmental protection, mitigation, or enhancement measures implemented.

4.1.4 Botanical Resources

Under the Proposed Action, disturbance of upland, riparian, and wetland vegetation within the Kilarc and Cow Creek Developments generally would be temporary. A riparian and wetland system more natural to the seasonal and cyclic hydrologic conditions that prevailed prior to the existence of the project would be established over the long-term. Elimination of seepage from project facilities could adversely affect vegetation associated with wetlands, swales, and seeps that have become established adjacent to existing project facilities. Freshwater wetlands fringing forebay shorelines would be adversely affected by dewatering and back-filling of the forebays. Existing riparian areas within Hooten Gulch may be reduced in extent as augmentation of flows downstream of the Cow Creek powerhouse would end after the surrender is complete. Activities that result in soil disturbance and alterations in water levels may adversely provide mechanisms for the establishment and spread of invasive plant species. Special status species mountain lady's slipper and big-scale balsam-root are expected to be unavoidably adversely affected by the Proposed Action. Additional short-term adverse effects on vegetation would occur as a result of the construction of temporary access roads or the improvement of existing roads for deconstruction work. However, implementation of PG&E's proposed PM&E measures, including pre-construction surveys, maintaining the existing seed bank, and mitigation and monitoring to restore riparian and wetland areas, would minimize adverse effects of the Proposed Action.

Under AA1, the amount of vegetation adversely affected generally would be less than under the Proposed Action since not all of the Kilarc Development would be decommissioned. Disturbance/removal of vegetation would be temporary in nature, and once activities are completed, it is expected that vegetation would become re-established. Decommissioning of the North and South Canyon diversions, canals, siphon and penstock, penstock intake, powerhouse, and switchyard at the Kilarc Development would result in some disturbance or temporary removal of vegetation. Additional disturbance or temporary removal of vegetation would occur during installation of a fish passage facility at the Kilarc main canal diversion dam but would be minor and short-term. The effects of implementing AA1 at the Cow Creek Development would be the same as for the Proposed Action.

Effects on vegetation including riparian, wetland, and special status plant species as a result of the implementation of AA2 would result in the disturbance or removal of vegetation as described for the Proposed Action, but would be specific to the activities of the Proposed Action at the Kilarc Development and for the decommissioning of the Mill Creek diversion dam, canal, powerhouse, and switchyard at the Cow Creek Development. The special status plant species mountain lady's slipper and big-scale balsam-root likely would be unavoidably adversely affected as described for the Proposed Action. Implementation of PG&E's proposed PM&E measures would mitigate effects to populations of big-scale balsam-root. Fringe freshwater wetlands along the shoreline of the Cow Creek forebay would be adversely affected as the forebay is dewatered, filled, and graded. Action Alternative 2 would therefore result in minor, limited adverse effects to vegetation communities in the Cow Creek Development and long-term benefits to riparian and wetland habitat within Hooten Gulch and along South Cow Creek.

Under the No-Action Alternative, continued operation of the Kilarc Development under current license conditions and operational requirements would have no effect on upland vegetation resources within the project boundary. Continued operation of the Cow Creek Development would continue to provide a long-term benefit to the riparian habitat and wetlands of Hooten Gulch and the project area. Riparian areas and seeps that occur as a result of project operations (flows and leakage) would also continue to benefit by remaining undisturbed and subject only to periodic flooding/inundations as a result of meteorological events. No impacts to upland vegetation or big-scale balsam-root would occur during continued operation of the Cow Creek Development under the No-Action Alternative.

4.1.5 Wildlife

The Proposed Action may result in temporary effects on wildlife species sensitive to noise, lighting, and human activity. Species intolerant of disturbance that are mobile enough to flee or avoid the areas of activity would leave until activity subsides. Activity associated with the Proposed Action may also result in the mortality of non- or minimally mobile wildlife species. The foothill yellow-legged frog and northwestern pond turtle that have been observed in the South Cow Creek bypassed reach and Hooten Gulch may

be adversely affected by sediment releases and disappearance of backwater pools at the diversions associated with diversion removal. However, discontinuation of diversions to the Cow Creek powerhouse during spring would minimize potential effects on amphibians and turtles from rapid loss of aquatic habitat, and the expected increase in summer flows to South Cow Creek would provide long-term habitat benefits to the foothill yellow-legged frog. The Proposed Action may have minor adverse effects on existing potential habitat for special status bird species. For non-status bird species that may nest in vegetation communities at the Kilarc and Cow Creek Developments, unavoidable removal of vegetation during the nesting season could result in nest abandonment, direct loss of nests, and the loss of a breeding season for the affected species. The removal of structures or sealing of tunnels could cause disturbance or direct mortality to bat species that may roost in affected structures. The proposed pre-construction surveys and subsequent measures, if needed; personnel training; wildlife exclusion; and post-decommissioning monitoring proposed by PG&E would help mitigate any potential adverse effects.

Action Alternative 1 would initially affect the foothill yellow-legged frog and northwestern pond turtle in the South Cow Creek bypassed reach and Hooten Gulch as a result of ground disturbance, but would provide long-term benefits to these species by enhancing riparian habitat through improved flow in the bypassed reach. Effects on wildlife at the Kilarc Development would primarily occur as a result of localized disturbance in the vicinity of the North and South Canyon diversions, canals, and siphons. The open water of the Kilarc forebay would remain and would continue to provide beneficial foraging and resting habitat for mammals and birds. Maintenance of a minimum instream flow in the bypassed reach would provide a more consistent water source and would benefit wildlife, especially amphibians and foraging species.

Under AA2, the loss of open water habitat for aerial foraging birds, waterfowl, and piscivorous species such as osprey and bald eagle would occur with the dewatering and backfilling of the Kilarc and Cow Creek forebays. Birds that have previously used the open waters of the forebays would relocate to another water source to forage; therefore, significant long-term adverse effects to birds would not result from the dewatering of the forebays. Mammals that use the forebays as a water source could have long-term adverse effects from the dewatering of the forebays but will likely find a nearby water source. Over the long-term, foothill yellow-legged frogs and northwestern pond turtles would benefit by continuation of flows to Hooten Gulch.

Under the No-Action Alternative, the current environmental conditions are a combination of natural processes and cycles that are influenced by hydroelectric power production at the Kilarc-Cow Creek Project, and the existing wildlife would continue to persist into the future.

4.1.6 Rare, Threatened, and Endangered Species

Under the Proposed Action or AA1 and AA2, it is not expected that any federally-listed species will experience any long-term adverse impacts. Proposed protection through avoidance of any elderberry shrubs would protect potential habitat for the VELB. Additionally, the proposed pre-construction surveys and subsequent measures, if needed; personnel training; and biological monitoring would help prevent adverse effects on RTE species to include: the California red-legged frog, northern spotted owl, and Pacific fisher, although there are no reported actual occurrences of these species within a 5-mile radius of the Kilarc and Cow Creek Developments.

The Proposed Action is not likely to have a significant effect on available habitat for either steelhead or fall-run Chinook salmon in the Old Cow Creek watershed upstream of barriers in the bypassed reach. However, short and long term benefits would be associated with the release of native sediment stored behind the dam, which would enhance downstream spawning habitat. Under the AA1, with the diversion dam remaining in place, the release of sediment and enhancement of downstream fish spawning habitat would not occur.

The Proposed Action likely would lower water temperatures in the South Cow Creek bypassed reach, however, temperatures likely would continue to exceed criteria for coldwater fisheries. Restoration of full natural flows would allow steelhead and fall-run Chinook salmon to migrate upstream through the bypass during their respective spawning run. Removal of the diversion structures would enhance opportunities for both steelhead and Chinook salmon to access habitat in these upstream areas. Short and long term benefits would be associated with the release of native material stored behind the dam, which would enhance downstream spawning habitat. Under the AA2, with the diversion dam remaining in place, the release of sediment and enhancement of downstream fish spawning habitat would not occur.

Relative to the No-Action Alternative, the Proposed Action and AA1 and AA2 likely would benefit ESA-listed fish species over the long-term by providing greater, unrestricted access to valuable spawning, feeding, nursery, and overwintering habitats. The Proposed Action would provide the greatest quantity of flow increase, and would restore the Old Cow Creek and South Cow Creek to more natural conditions. The Proposed Action is also supported by the resource agencies.

4.1.7 Recreation

Under the Proposed Action, there would be unavoidable adverse effects on recreational opportunities and public access to the Kilarc Development. Individuals who have traditionally used the Kilarc forebay and the day use area for recreational activities, such as bank fishing, sightseeing, picnicking, and general recreation, would be directly affected over the long-term as access to the forebay and the recreation facilities would no longer exist. The loss of the Kilarc forebay area to underserved youth would represent a minor unavoidable adverse impact. There are other comparable recreation areas within

driving distance of the project that provide similar recreational opportunities, including those that are accessible to the disabled, although the drive times to these areas may be inconvenient for the local community that regularly recreates at the Kilarc forebay. Although it is possible that the recreation use of PG&E's Lake Nora and Lake Grace which are relatively close to the project, or other recreation areas, may increase, we expect this effect would be minimal. There would be no effect of the Proposed Action on recreation resources at the Cow Creek Development, because it is not currently accessible to the public and no public recreation facilities are currently provided.

The effects under AA1 and AA2 at the Cow Creek Development and under AA1 at the Kilarc Development would be the same as the No-Action Alternative. The effects under the No-Action Alternative at Kilarc forebay would be beneficial as compared to those under AA2. Under AA1, there would be no changes from the current conditions for public access and recreational facilities and opportunities available to the public at Kilarc forebay. Under AA2, there would be adverse changes from the current conditions for public access and recreational facilities and opportunities available to the public at the Kilarc forebay since the recreation facilities and forebay would be removed, as compared to the No-Action Alternative under which they would remain in place. Under AA1 and AA2, additional miles of Old Cow Creek and South Cow Creek, respectively, above the proposed fish passage facilities would be open to anadromous fish which may result in additional fishing restrictions by Cal Fish and Game; however, public access to the these reaches is limited so effects would be expected to be minimal.

4.1.8 Land Use

Under the Proposed Action, 95.50 acres of the project land at the Kilarc Development and 14.20 acres of the project land at the Cow Creek Development would remain in ownership by PG&E. PG&E would relinquish its easement rights to use the remaining project land for hydroelectric purposes, returning this land to private sole ownership to be used for other purposes compatible with existing land uses and county zoning requirements. The Proposed Action at the Kilarc Development would require the construction of about 0.5 mile of new, temporary access road on project land and adjacent private land. These access roads would be sited and restored using BMPs in consultation with private landowners, as appropriate, to minimize any long-term adverse effects on uses of adjacent lands.

Removal of the Kilarc forebay would require Cal FIRE and WVCFC to obtain other sources of water for fire suppression. This effect would be minor since other local sources of water are available in the area. Removal of the Kilarc forebay and Kilarc day use area would be in conflict with and have a long-term unavoidable effect on the Stewardship Council Recommended Concept in the LCP for land and land uses at the Kilarc Reservoir Planning Unit. Section 3.3.7, *Recreational Resources*, further discusses impacts to recreation associated with this land use impact. Under the Proposed Action at the Cow Creek Development, PG&E proposes to acquire land rights on 1.87 acres held in trust by DOI for the BIA located on the Cow Creek penstock route. Under the Proposed

Action, the removal of augmented water flows to Hooten Gulch and resulting loss of flows to Abbott Diversion would have major long-term adverse effects on agricultural users of these flows for irrigation. The Proposed Action at the Cow Creek Development could have a potential conflict with the Shasta County General Plan as it relates to the preservation of agricultural farmlands by adversely affecting, indirectly, the existing agricultural lands irrigated by Abbott Diversion. The Proposed Action at the Cow Creek Development could, indirectly, conflict with the Stewardship Council Recommended Concept in the LCP for agricultural land and land uses at the Cow Creek Planning Unit.

Under AA1, there would be long-term beneficial effects at the Kilarc Development on land use. A new owner would upgrade and maintain the main canal structures and overflow spillways at Kilarc. This would likely result in the construction of some additional new, temporary access roads to reach some of the elevated flume structures with minimal short-term effects on land use. The Kilarc forebay would remain a source of water for fire suppression for Cal FIRE and WVCFC. The Kilarc forebay would remain with no change to the Stewardship Council's Land Conservation Program for land and land uses at the Kilarc forebay. Otherwise, the effects of AA1 would be the same as those effects described under the No-Action Alternative. The effects of implementing AA1 at the Cow Creek Development on land use would be the same as for the Proposed Action.

Under AA2, there would be long-term beneficial effects at the Cow Creek Development on land use. A new owner would upgrade and maintain the main canal structures and overflow spillways at Cow Creek. Augmentation of water flows to Hooten Gulch from the Cow Creek powerhouse would continue, providing artificial perennial flows to Abbott Diversion for irrigation of Tetrick Ranch and ADU's agricultural crop and pasture lands with no perceived effect to these land uses. Action Alternative 2 at the Cow Creek Development would not conflict with the Shasta County General Plan or with the Stewardship Council's Recommended Concept for the Cow Creek Planning Unit. Otherwise, the effects of this Action Alternative would be the same as those effects described above for the No-Action Alternative. The effects of implementing AA2 at the Kilarc Development on land use would be the same as for the Proposed Action.

Under the No-Action Alternative, the existing land use resources within the Old Cow Creek and South Cow Creek watersheds described in section 3.3.8.1, *Affected Environment,* for the Kilarc and Cow Creek Developments, respectively, would persist into the future with no effect on current land management activities or land uses. The existing conditions are a combination of natural processes and cycles that are influenced by hydroelectric power production at the Kilarc-Cow Creek Project.

4.1.9 Aesthetics

The Proposed Action would return the Kilarc forebay area to a more natural setting without a man-made pond and, by terminating public access to this area, would remove from the sightseeing public the scenic views from this location. Defined as

having an average scenic value, the loss of Kilarc forebay area as a visual resource would represent a minor long-term effect on project area aesthetics. In addition, the loss of water flows to Abbott Diversion under the Proposed Action would have a minor long-term adverse effect on aesthetic features associated with the flows in Abbott Ditch and associated riparian habitat only viewable by private landowners.

Under AA1, there would be long-term beneficial effects at the Kilarc Development on aesthetics as compared to the Proposed Action. Kilarc forebay would remain with no change to existing visual and aesthetic resources. Otherwise, the effects of this Action Alternative would be the same as those effects described above for the No-Action Alternative. The effects of implementing AA1 at the Cow Creek Development on aesthetics would be the same as for the Proposed Action.

Action Alternative 2 would result in long-term beneficial effects at Cow Creek on aesthetics. The aesthetic features associated with flows in Abbott Ditch and associated riparian habitat would remain unaffected. Otherwise, the effects of AA2 would be the same as those effects described for the No-Action Alternative. The effects of implementing AA2 at the Kilarc Development on aesthetics would be the same as for the Proposed Action.

Under the No-Action Alternative, the existing aesthetic resources within the Old Cow Creek and South Cow Creek watersheds for the Kilarc and Cow Creek Developments, respectively, would persist into the future. The existing conditions are a combination of natural processes and cycles that are influenced by hydroelectric power production at the Kilarc-Cow Creek Project.

4.1.10 Socioeconomics

Under the Proposed Action, minor, adverse effects would occur to socioeconomic resources at the Kilarc Development, including recreation and tax base. Removal of the Kilarc forebay would have some minor, localized effects on reduced spending at local businesses in Whitmore by primarily local recreation users. The Proposed Action would reduce annual property taxes paid by PG&E to Shasta County from $43,543 to $1,996 annually compared to the No-Action Alternative. This revenue loss to the county would be minor in terms of the expected 2009 Shasta County revenues and the relatively low property taxes currently being paid by PG&E for the Kilarc Development.

Under the Proposed Action, the following socioeconomic resources would be adversely affected at the Cow Creek Development: income, agriculture, tax base, and property values. The Tetrick Hydroelectric Project would potentially cease operation during certain times of the year due to the seasonal and cyclic hydrological conditions that prevail under natural flows in Hooten Gulch, which would have a long-term adverse effect on income to Tetrick Ranch from the loss in the production and sale of energy. Subjecting the Abbott Diversion to the seasonal and cyclic hydrological conditions that prevail under natural flows in Hooten Gulch, as a result of the Proposed Action, would result in the loss of irrigation water flows from Abbott Diversion during certain periods

of the year and cause major long-term adverse effects on Tetrick Ranch and ADU's farming and ranching operations. Although the loss of irrigation flow to 312 acres of agricultural crop and pasture land could result in the potential loss of income, crops, livestock, and domestic water for Tetrick Ranch and ADU, the effects relative to Shasta County would be minor. The Proposed Action would reduce annual property taxes paid by PG&E to Shasta County from $42,724 to $5,187 annually compared to the No-Action Alternative. This revenue loss to the county would be minor in terms of the expected 2009 Shasta County revenues and the relatively low property taxes currently being paid by PG&E for the Cow Creek Development. The Proposed Action would adversely affect the productivity on the 312 acres of agricultural crop and pasture lands irrigated by Abbott Diversion which could decrease the property values of this land used for agricultural purposes as well as adversely affect the quality of life for Tetrick Ranch and ADU. Currently, the assessed value by the state of California for these agricultural lands for grazing is estimated to be between $156,000 and $218,000.

Action Alternative 1 would result in long-term beneficial effects at the Kilarc Development for socioeconomic issues, including recreation and tax base. Kilarc forebay would remain accessible to the public for recreation enabling visitors and recreationists to use the facility, and retain visitor and recreation user spending at local businesses. Tax revenues paid to Shasta County would be considerably greater than under the Proposed Action due to the retention of some facilities ($37,862 vs. $1,996 annually for the Proposed Action). Otherwise, the effects of AA1 at the Kilarc Development would be the same as those effects described above for the No-Action Alternative. The effects of implementing AA1 at the Cow Creek Development on socioeconomics would be the same as for the Proposed Action.

Action Alternative 2 would result in long-term beneficial effects at the Cow Creek Development for socioeconomic issues, including income, agriculture, tax base, and property values. The Tetrick Hydroelectric Project would continue to utilize artificial flows from Hooten Gulch and remain in operation with income to its owner. The Abbott Diversion would continue to utilize the artificial flows from Hooten Gulch and provide flood irrigation flows to 312 acres of agricultural farm land, retaining income, livestock, and crops for Tetrick Ranch and ADU. Tax revenues paid to Shasta County would be considerably greater than under the Proposed Action due to the retention of some facilities ($27,822 vs. $5,187 annually for the Proposed Action). Retention of Abbott Diversion and the availability of augmented flows from Hooten Gulch would not diminish property values for the 312 acres of agricultural crop and pasture land property irrigated by the diversion for Tetrick Ranch and ADU's farming and ranching operations. Otherwise, the effects of AA2 at the Cow Creek Development would be the same as those effects described above for the No-Action Alternative. The effects of implementing AA2 at the Kilarc Development on socioeconomics would be the same as for the Proposed Action.

Under the No-Action Alternative, the existing socioeconomic benefits associated with the Kilarc and Cow Creek Developments described in section 3.3.10.1, *Affected*

Environment, would continue to persist into the future. The existing conditions are a combination of natural processes and cycles that are influenced by hydroelectric power production at the Kilarc-Cow Creek Project.

4.1.11 Cultural Resources

The Proposed Action, AA1, and AA2 would create minor to moderate effects on cultural resources. One National Register eligible archaeological resource (482-12-08/H) and one historic property, the Kilarc powerhouse (482-12-06H), have been identified within the APE for the Kilarc Development. In addition, one unevaluated archaeological resource (482-12-11/H) has been identified in the APE for the Kilarc Development; this resource would be treated as National Register eligible until such time that it is fully evaluated. Although no National Register eligible archaeological resources were identified within the APE for the Cow Creek Development, one historic property, the Cow Creek powerhouse (482-12-01H), as well as three unevaluated archaeological resources (482-12-03H, 482-12-04, 482-12-05/H), have been identified within the APE. The unevaluated resources would be treated as National Register eligible until such time that they are fully evaluated. The proposed MOA would mitigate the effects created by the Proposed Action on archaeological and historical resources in both the Kilarc and the Cow Creek Developments. Erosion and ground disturbing activities associated with the Proposed Action have the potential to affect archaeological resources. Under the proposed MOA, however, overall effects on archaeological resources are anticipated to be minor. Although removal of hydropower-related mechanical and electrical equipment from the Kilarc and Cow Creek powerhouses would diminish the historic integrity of these resources, creating adverse effects, these effects would be mitigated by the proposed MOA.

The No-Action Alternative would create minor to moderate adverse effects on archaeological resources in the Cow Creek Development. The two archaeological sites that are located on roads (482-12-04 and 482-12-05/H) would likely continue to suffer from surface erosion, creating minor to moderate effects on those resources. Effects on historic resources would be beneficial under the No-Action Alternative as the National Register eligible Kilarc and Cow Creek powerhouses would remain in use, and therefore continue to receive routine maintenance and up-keep.

4.1.12 Economic Analysis

Proposed Action

Prior to filing its license surrender application, PG&E determined that the cost of the Proposed Action would be less than the cost of upgrading existing facilities to meet environmental requirements and for maintaining project facilities over the lifetime of a new license (relicensing). In addition, PG&E states that there would be a long-term benefit to rate payers from the decommissioning of a facility that is no longer economically viable. PG&E estimates the cost of decommissioning the project as proposed at $14.5 million dollars (PG&E, 2009a). PG&E's estimate includes costs

associated with the preparation and filing of the license surrender application, actual removal costs, and post-decommissioning monitoring costs.

Commission staff estimates the cost of the Proposed Action to be about $9,000,000 (in 2009 dollars), which differs from PG&E's proposed cost. Staff's estimate does not include PG&E's costs associated with the Commission license surrender process ($4,500,000) or with post-decommissioning monitoring ($1,000,000).

No-Action Alternative

As stated throughout this DEIS, under the No-Action Alternative, we assume the project would continue to operate as it exists today, under its existing annual license, with no additional costs for environmental enhancement measures (i.e., increased minimum flows or new fish passage facilities). Enhancement and mitigation measures that could be recommended by the resource agencies under a new license are not included in costs of the No-Action Alternative. In addition, our estimate of the No-Action Alternative does not include the cost for repairing or replacing the four existing turbine units.[55] However, over the long-term it is not practical that the existing project operation would be sustained without repairing and replacing units, nor could the licensee continue to operate over the long-term under its existing annual license. An annual license is not intended to allow a licensee to continue project operation indefinitely. Therefore, the No-Action Alternative defined throughout this DEIS was selected for the purpose of an environmental baseline. We must emphasize that over the long-term, the No-Action Alternative, for purposes of economic analysis, would actually be the equivalent of PG&E going through relicensing. The No-Action Alternative (today's annual license) serves as our baseline for evaluating the effects of the Proposed Action, AA1 and AA2.

The project has a total installed capacity of 4.67 MW (includes 3.23 MW at the Kilarc Development and 1.44 MW at the Cow Creek Development) and has generated an average 31,100 MWh of electricity annually, based on the period 1977-2001. We calculate the annual power value of the project under the No-Action Alternative to be $2,488,000 ($80/MWh) based upon the estimated short run avoided costs for energy prices for PG&E in 2008 (PG&E, 2010c). We calculate the average annual cost of producing this power to be about $1,395,952 ($44.89/MWh), resulting in an average annual net power benefit of $1,092,048 ($35.11/MWh), see Table 25.

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[55] Continued operation would eventually require repairing or replacing one or more of the existing four turbine units. These costs cannot be estimated with a degree of certainty because the amount of useful life left in the existing equipment is unknown and repairing the generating units could require the custom manufacturing of parts. Therefore, a specific estimate is not included in the analysis, but repair and replacement would be needed for continued operation.

Table 25. Summary of estimated annual costs and annual net power benefits (based on 1977-2001 data) for the No-Action Alternative at the Kilarc-Cow Creek Hydroelectric Project (Source: Staff).

	No-Action Alternative
Total Annual Generation	31,100 MWh
Annual Power Value	$80.00/MWh
Net Power Benefits (i.e., power value minus costs)	$35.11/MWh
KEY: MW – megawatt and MWh megawatt-hour	

Staff did an additional economic analysis based on more recent data. Staff calculated that based on the last three years of actual generation data, the total average annual generation is 21,272 MWh, and the net power benefit would be $29.94 MWh. The annual net power benefits assume operation and maintenance (O&M) costs and takes into account taxes paid.

Staff estimates that increasing minimum flows by 20 cfs, as described under the analysis sections of the action alternatives (see section 3.3.2.1.3 and 3.3.2.1.4), could also eventually be required under relicensing. Under the No-Action Alternative, increasing the minimum flows could reduce the total generation at the Project by about another 23 percent, and the Project would likely not have sufficient flows to operate approximately 3 months of the year.

Under the No-Action Alternative, staff also examines the O&M costs associated with retaining the two existing forebays. Assumptions for this calculation are: salary wages for five staff workers operating the developments 24 hours per day, 7 days per week; dredging each of the forebays every 30 years; dam maintenance and repair at the forebays every 10 years; and annual canal maintenance. We estimate annual O&M costs at $754,590.

Action Alternative 1 and Action Alternative 2

As part of our analysis, we estimate the most critical decommissioning costs of AA1 and AA2. Neither AA1 nor AA2 involve power generation (nor does the Proposed Action). In general, we estimate that the AA2 ($9,240,000) [56] could potentially involve minor cost savings by not removing some facilities in the Cow Creek Development but that would be offset by the cost of upgraded fish passage facilities at the South Cow

[56] Total alternative cost (for AA1 and AA2) does not include PG&E costs associated with the Commission license surrender process or with post-decommissioning monitoring, which are assumed to be similar costs under all alternatives examined.

Creek diversion dam, under AA2. We estimate that AA1 ($7,200,000) could potentially be even less expensive than the Proposed Action ($9,000,000), but still comparable in cost considering the large uncertainty in estimating costs at this point in the planning process.[57] The estimated cost savings under AA1 could accrue from the elimination or reduction of costs that, under the Proposed Action and AA2, would be associated with removal of the Kilarc diversion dam, canal, forebay, and existing roads, and the establishment and post-construction removal of new project roads at the Kilarc Development.

Additionally, the following actions would have associated implementation costs under the Proposed Action, AA1, and AA2:

- recordation of the removed portion of the historic diversions and preservation of the powerhouses and other identified cultural resources;
- archaeological monitoring;
- erosion and sediment control and revegetation measures;
- vegetation and wildlife surveys and monitoring;
- fish recovery efforts during removal of diversions, canals, and forebays;
- follow-up fish passage monitoring after removal of each diversion dam; and
- modification of any diversion dam cutoff walls that may obstruct anadromous fish passage.

Based on the best available information at the time of this analysis, staff finds the following would be associated with the Action Alternatives:

Cost of Operation and Maintenance of the Forebays

Staff estimates the annual O&M costs associated with AA1 (retaining the Kilarc forebay) to be $35,829 and with AA2 to be $33,482. The assumptions for AA1 and AA2 do not include salary wages because these alternatives do not include power generation. The estimates include: dredging each of the forebays every 30 years; dam maintenance and repair at the forebays every 10 years; and annual canal maintenance.

Cost of Fishery Enhancement Measures

Under AA1 and AA2 we examine the cost of: installing a new fish ladder at each of the diversion dams ($520,000 for Kilarc and $1,040,000 for Cow Creek); installing a fish screen at each development ($320,000 each); and additional regulatory and permit costs (includes California Environmental Quality Act (CEQA) and NEPA) that would accrue ($50,000 to $500,000). Estimates for the cost of the fish ladders is based on information from the Battle Creek Hydroelectric Project (FERC No. 1121) (Battle Creek

[57] Costs for AA1 and AA2 are based on 2009 dollars.

Working Group, 1999) and PG&E's response to our request for additional information (PG&E, 2009d). We include the capital cost for these fishery enhancement measures, and then convert all costs to equal (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its costs. Assuming an interest rate of 8 percent, for AA1 the total levelized cost is $633,972.59, which includes: a fish ladder ($91,573.82); fish screen ($28,176.56); permit and regulatory costs ($22,012.94); and Kilarc forebay maintenance ($33,482.00). For AA2, the total levelized cost is $813,598.16, which includes: a fish ladder ($45,786.91); fish screens ($28,176.56), permit and regulatory costs ($22,012.94); and forebay maintenance ($35,829.00). In addition to the above costs, there could be costs for the installation of staff gages (see sections 3.3.3.3 and 3.3.3.4).

Our Analysis

PG&E states (PG&E, 2009a) that after conducting relicensing studies and consulting with resource agencies, it concluded that providing the necessary level of protection, mitigation, and enhancement measures for the resources affected by the project would outweigh the economic benefit of power generation at the Project over the life of a new license (relicense). PG&E states that relicensing would result in the project no longer being an economical source of power for PG&E's electric consumers.

Therefore, staff calculated the net power benefits of the project (see *No-Action Alternative* and Table 25). With the incorporation of the measures listed above (increased minimum flows, O&M of the forebays, fisheries enhancement measures, and eventually repairing or replacing turbines), the project's economic feasibility would decrease significantly.

Cost of Other Measures Considered

Here we estimate the costs of other measures that could be needed as a result of the Proposed Action, AA1 and AA2. The Commission staff makes recommendations pertinent to the following two issues in section 4.3, *Staff Recommendations*.

Cost of Wells

Water wells located down-gradient of the Kilarc Forebay may be adversely impacted by the dewatering of the forebay. Of the eleven well-owners that were contacted by PG&E, only one responded stating that their well was no longer in use. In order to estimate the economic impact of dewatering the Kilarc forebay (under both the Proposed Action and AA2), we assume a worst-case scenario in that all of the remaining ten wells would need to be replaced in their entirety. According to the University of California Cooperative Extension, a domestic well in Shasta County can cost between $5,000 and $10,000 (Fulton et al., 2004). Based on this estimate, the cost of replacing ten wells would be between $50,000 and $100,000.

Cost of ADU Diversion

Under the Proposed Action and AA1, the ADUs would no longer be able to access their water right from Hooten Gulch for certain portions of the year. In order to access the full volume of its water right, the ADU would need to develop an alternate point of diversion. Commission staff acknowledges that to develop a new diversion could cost up to two million dollars or more, but depending on the type of diversion, the costs could be much less. For instance, a screened pipe intake could cost from $2,200 to $6,400 to construct per each cfs the intake diverts (i.e., $44,000 to $128,000 for 20 cfs for construction costs alone) (Brink, McClain, and Rothert, 2004). For the purposes of our analysis, we estimate that the cost of an alternate diversion structure would be one million dollars (including associated planning, siting, designing, and regulatory costs).

4.2 UNAVOIDABLE ADVERSE IMPACTS

There would be no unavoidable adverse effects on: geologic and soil resources, RTE, or aesthetics as a result of the Proposed Action. Unavoidable adverse impacts are discussed below.

4.2.1 Water Resources

Hooten Gulch is naturally an ephemeral stream with negligible flow during dry periods. Discharge from the Cow Creek powerhouse has artificially maintained year-round flows in Lower Hooten Gulch since the development began operation. The Proposed Action would cause unavoidable long-term adverse effects on water quantity, resulting from the termination of generation flows, and Hooten Gulch would unavoidably revert to intermittent seasonal dry conditions.

During in-water dam removal activities, there may be unavoidable short-term effects on water quality, including sedimentation and increased turbidity, but these would be minimized through implementation of proposed PM&E measures. Due to the limited amount of fine, mobile sediment in the construction area, these effects are expected to be minor and transitory. PG&E proposed BMPs, including bypassing flows around the construction area and erosion and sediment control measures, would be employed to limit the extent and duration of any effects.

4.2.2 Fisheries and Aquatic Resources

Short-term barriers for fish passage could be created during mobilization, transport, and redistribution of accumulated sediments downstream of the two main canal diversions. The duration of these temporary barriers would depend on the magnitude, frequency, and duration of high flows subsequent to the dam removal, the size distribution of the stored sediment, and channel configuration. To minimize the persistence of this barrier, PG&E proposes to promote channel formation, support sediment redistribution, monitor for formation of potential short-term barriers, and re-

establish passage immediately after dam removal until the channel and natural sediment transport dynamics stabilize.

The Proposed Action would result in permanent, unavoidable adverse effects on aquatic habitat in the two project forebays, and on aquatic and riparian habitat along the diversion canals, and in Hooten Gulch below the Cow Creek powerhouse. Dewatering the main canals and forebays could strand fish within these facilities. Sections of the canal would be deconstructed, filled in, or breached and abandoned in place and no longer would provide aquatic habitat. Fish remaining in the forebays and canals would be trapped and relocated. Additionally, the Proposed Action would result in the cessation of flows from the Cow Creek powerhouse downstream to Hooten Gulch, which could result in stranding or trapping of fish in isolated pools. PG&E proposes to minimize these potential effects by monitoring, trapping, and removing stranded fish. As a result of the Proposed Action, flows in Hooten Gulch below the powerhouse would revert to the natural ephemeral conditions similar to those in Hooten Gulch upstream of the powerhouse, which would not support the aquatic resources existing under the current license and the No-Action Alternative.

4.2.3 Botanical Resources

Some vegetation in riparian and wetland areas would be adversely affected due to dewatering and construction related to the Proposed Action. PG&E's proposed implementation of a mitigation and monitoring plan to mitigate and restore riparian and wetland areas would minimize the effects from the Proposed Action. Additionally, activities that result in soil disturbance may provide mechanisms for the establishment and spread of invasive plant species. The use of native seed mixes or sterile cereal seed and certified weed-free straw during re-seeding measures would minimize the potential for the spread of noxious weeds and non-native invasive plant species after construction is completed.

There likely would be unavoidable adverse effects to the special status plant species mountain lady's slipper, and possible unavoidable adverse effects to the big-scale balsam-root, as a result of the Proposed Action. The following proposed actions should minimize adverse effects and allow the plants to re-establish after deconstruction is complete: performing pre-construction surveys to identify sensitive areas; placing an on-call biological monitor and conducting construction personnel environmental awareness training; protecting the soil from exposure to weed seeds; and protecting and then re-establishing the seed bank by stockpiling the top 10 in. of soil from the area to be disturbed and returning the stockpiled soil at the end of construction.

4.2.4 Wildlife

As a result of the Proposed Action, northwestern pond turtles, foothill yellow-legged frogs, and the potential summer habitat for California red-legged frogs may be adversely affected by reduced flows and the disappearance of backwater pools at diversions. Mitigation measures proposed by PG&E to include pre-construction surveys,

installation of exclusion fencing around construction areas, and the safe relocation of any individuals of amphibians and reptiles would offset potential adverse effects on these species.

For non-status bird species that may nest in vegetation communities, unavoidable removal of vegetation during the nesting season may result in nest abandonment, direct loss of nests, and the loss of a breeding season for the affected individuals. Removal of dead standing trees during construction within the nesting season would have the potential to adversely affect nesting of Lewis' woodpecker, a cavity nesting species. If active nests of any raptors, special status species, or species protected under the Migratory Bird Treaty Act are observed during pre-construction surveys, avoidance of the affected area would be implemented along with restricted distances for construction activities until nestlings have successfully fledged.

4.2.5 Recreation

There would be long-term unavoidable adverse effects on recreational opportunities and public access, including access for the disabled, at Kilarc forebay as a result of the Proposed Action. The recreation facilities at the Kilarc-Cow Creek Project would no longer exist as they did before the Proposed Action. Additionally, the Commission's jurisdiction over project lands, and responsibility to seek the ultimate development of recreation resources at the project, would end once the license was surrendered. Finally, under the goals of the Stewardship Council LCP, established to oversee PG&E's Land Conservation Commitment, the loss of the Kilarc forebay area to youth would represent a minor long-term unavoidable environmental effect of the Proposed Action.

4.2.6 Land Use

Under the Proposed Action, the actual removal of project facilities across the length of the project, the result of equipment operation, location of new, temporary access roads affecting about 0.5 acres, and the creation of a number of temporary staging areas may result in unavoidable long-term effects on land use. Proposed BMPs, including the preparation of an MMP and use of erosion and sedimentation control measures, would be employed to limit the extent and duration of any effects.

Removal of the Kilarc forebay and Kilarc day use area is in conflict with the Stewardship Council LCP for land and land uses at the Kilarc Reservoir Planning Unit. However, the Stewardship Council would re-evaluate the Kilarc Planning Unit to make recommendations for the LCCP to reflect the status and outcome of the Proposed Action and terms of surrender, if applicable, in close coordination with the community stakeholders and all interested parties.

Removal of augmented water flows to Hooten Gulch and resulting loss of water flows to Abbott Diversion during certain periods of the year, following decommissioning

of the Cow Creek powerhouse, would have major long-term adverse effects on Tetrick Ranch and ADU's agricultural uses of their land that is dependent on this water.

The Proposed Action at the Cow Creek Development could have a potential conflict with the Shasta County General Plan as it relates to the preservation of agricultural farmlands by adversely affecting the existing irrigation source for 312 acres of agricultural lands irrigated by the Abbott Diversion.

The Proposed Action at the Cow Creek Development could conflict with the Stewardship Council's Recommended Concept objective to preserve and enhance agricultural uses at the Cow Creek Planning Unit. However, the Stewardship Council would re-evaluate the Cow Creek Planning Unit to make recommendations for the LCCP to reflect the status and outcome of the Proposed Action and terms of a Commission order, if applicable, in close coordination with the community stakeholders and all interested parties.

4.2.7 Socioeconomics

The Tetrick Hydroelectric Project would have to shut down during some periods of the year, following the Proposed Action at the Cow Creek powerhouse, with the potential loss of income to its owner.

Removal of augmented water flows to Hooten Gulch and resulting loss of water flows to the Abbott Diversion during certain periods of the year, under the Proposed Action at the Cow Creek powerhouse, would have a major long-term adverse effect on Tetrick Ranch and ADU's farming and ranching operations with the potential for loss of income, crops, livestock, and domestic water. In addition, these losses would adversely affect Tetrick Ranch and ADU's quality of life, and could decrease the property value of the farm and ranch land properties irrigated by Abbott Diversion.

The Proposed Action would result in reduced property tax revenues paid to Shasta County.

4.2.8 Cultural Resources

There is a potential for minor adverse effects, such as those due to surface erosion near National Register eligible sites, as a result of the Proposed Action. Archaeological sites and historical resources most susceptible to these effects would be documented before any action, and the following actions would further mitigate potential adverse effects: stabilization and mothballing of historic properties; avoidance of ground-disturbing activities in areas where archaeological resources have been identified; archaeological monitoring for all project activities that occur within 50 ft of identified sites; and where avoidance is not possible, formal evaluation for National Register eligibility of sites. Additionally, in the event that any previously unidentified archaeological site is discovered during project implementation, the California SHPO and relevant Tribes would be contacted and all construction work in the vicinity would stop until a qualified archaeologist could evaluate the site and provide recommendations.

Preparation of an MOA between the California SHPO and the Commission would provide for mitigation for unavoidable adverse effects on National Register-eligible sites at the project and would provide for measures in the event of any unanticipated discoveries.

Summary of Impacts

In summary, Table 26 provides an over-view of the impacts to the various resource areas under the Proposed Action, AA1, AA2, and the No-Action Alternative. The No-Action Alternative represents existing conditions under the annual license. Table 26 indicates major adverse impacts to cultural resources (see section 3.3.11) and recreational resources (see section 3.3.7) at the Kilarc Development under the Proposed Action and AA2. Table 26 indicates the following major beneficial impacts:

(a) to water quantity at the Kilarc and Cow Creek Developments from the increased flows under the Proposed Action, and to the Cow Creek Development under AA1 and to the Kilarc Development under AA2 (see section 3.3.2 *Water Resources*);

(b) to fisheries at both developments under the Proposed-Action, and to the Cow Creek Development under AA1 and to the Kilarc Development under AA2 (see section 3.3.3 *Fisheries and Aquatic Resources*);

(c) to threatened and endangered fish species at the Cow Creek Development under the Proposed Action and AA1; and

(d) to recreational resources at the Kilarc Development under AA1 which would include retaining the forebay.

Table 26. Summary and Comparison of Impacts under the Proposed Action, Action Alternative 1, Action Alternative 2, and No-Action Alternative. (Source: Staff)

RESOURCE ISSUE	**Impact Rating**							
	Proposed Action w/ Staff Modifications		**Action Alternative 1**		**Action Alternative 2**		**No-Action Alternative**	
	Kilarc	Cow Creek	Kilarc	Cow Creek	Kilarc	Cow Creek	Kilarc	Cow Creek
Geology and Soils	1,A,S	1,A,S	1,A,S	1,A,S	1,A,S	1,A,S	NI	NI
Water Quantity (Flows)	3,B,L	3,B.L	2,B,L	3,B,L	3,B,L	1,B,L	NI	NI
Water Quality	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,B,L	NI	NI

RESOURCE ISSUE	Impact Rating							
	Proposed Action w/ Staff Modifications		Action Alternative 1		Action Alternative 2		No-Action Alternative	
Fisheries	1,A,S 3,B,L	1,A,S 3,B,L	2,B,L	1,A,S 3,B,L	1,A,S 3,B,L	2,B,L	NI	NI
Botanical Resources	1,A,S	1,A,S 1,B,L	1,A,S	1,A,S 1,B,L	1,A,S	1,A,S 1,B,L	NI	NI
Wildlife Resources	1,A,S 1,A,L	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,B,L	1,A,S 1,A,L	1,A,S 1,B,L	NI	NI
Threatened and Endangered Terrestrial Species	1,A,S	1,A,S	1,A,S	2,A,S 1,A,L	1,A,A	1,A,S 1,B,L	NI	NI
Threatened and Endangered Fish Species	2,B,L	3,B,L	I,B,L	3,B,L	2,B,L	NI	NI	NI
Recreation Resources	3,A,L 1,A,L	NI	3,B,L	NI	3,A,L 1,A,L	NI	NI	NI
Aesthetic Resources	1,A,L	1,A,L	1,B,L	1,A,L	1,A,L	1,B,L	NI	NI
Land Use Resources	2,A,L 1,A,S	3,A,L 1,A,S	2,B,L 1,A,S	3,A,L 1,A,S	2,A,L 1,A,S	2,B,L 1,A,S	NI	NI
Cultural Resources	1,A,S 3,A,L	1,A,S 3,A,L	1,A,S 3,A,L	1,A,S 3,A,L	1,A,S 3,A,L	1,A,S 3,A,L	NI	NI
Socioeconomics	2,B,L 1,A,L	2,B,L 3,A,L	1,B,L	2,B,L 3,A,L	2,B,L 1,A,L	3,B,L	NI	NI
Staff's Impact Rating Key: 1-Minor; 2-Moderate; 3-Major. A-Adverse; B-Beneficial; NI-No Impact. S-Short-term; L-Long-term; I-Intermittent.								

4.3 STAFF RECOMMENDATIONS

Based on our independent review and evaluation of the environmental and economic effects of the Proposed Action, AA1, AA2, and the No-Action Alternative with the best available information, we recommend the Proposed Action, with staff additional recommendations, as the preferred action. We recommend this because: (1) the Proposed Action and Action Alternatives would be comparable in cost considering the large uncertainty in estimating costs at this point in the planning process (see section 4.1.12, *Economic Analysis*); (2) the cost of the Proposed Action and Action Alternatives would likely be less than the cost of the No-Action Alternative (existing annual license), which would eventually require greater construction costs for upgrading existing facilities in order to meet operational and/or environmental requirements; (3) there would be a long-term benefit to rate payers from the decommissioning of a facility that is no longer

economically viable; (4) the recommended environmental mitigation measures proposed by PG&E, with staff additional recommendations, would adequately protect environmental resources effected by the Proposed Action; (5) section 6 of the Commission's regulations allow licensees to surrender existing project licenses and cease project operation; (6) there are no proponents in place for long-term maintenance of facilities upgraded and left in place under AA1 or AA2; and (7) neither AA1 nor AA2 would provide suitable flows for aquatic habitat in Old Cow Creek and South Cow Creek. The overall benefits of the Proposed Action, with staff additional recommendations, would be worth the cost of the proposed and recommended environmental measures and on balance would outweigh the consequences of the other alternatives. Under the Proposed Action, restoring natural instream flows will enhance the listed Chinook salmon and steelhead. Under the Proposed Action, with staff additional recommendations, the Commission would authorize the decommissioning of the Kilarc and Cow Creek Developments. However, the surrender of license would become effective only after decommissioning activities at both developments and all mitigation measures are completed.

The Proposed Action would result in the loss of a 4.67 MW operating hydroelectric project that produces an average annual generation of about 31,100 MWh of electricity. With expected additions of generation in the region, this loss of generation would have a negligible overall effect on the region.

The Proposed Action would result in short-term and long-term environmental effects, along with significant long-term environmental benefits as outlined in section 4.1, *Comparison of Alternatives*. The most significant effects would be: the permanent, unavoidable adverse socioeconomic effects on ADU; the unavoidable adverse effects on aquatic habitat in the project forebays; aquatic and riparian habitat along the diversion canals and in Hooten Gulch below the Cow Creek powerhouse; and the unavoidable adverse effects of special status plant species mountain lady's slipper and big-scale balsam-root. PG&E has developed PM&E measures to minimize many of these effects, and staff concurs with these proposed measures.

The long-term environmental benefits include restoring natural flows and improving water quality in the Old Cow and South Cow Creeks and tributaries. The restoration of flows would enhance aquatic habitat in the currently bypassed reaches and will be consistent with the recovery plans for the listed species. The Proposed Action would also remove any project-related barriers to resident and anadromous fish passage in the bypassed reaches.

The Proposed Action would result in long-term adverse effects on recreation resources and aesthetics due to the loss of the 4.5 acre Kilarc forebay and day use area, which are used for recreational activities such as bank fishing, sightseeing, picnicking, and general recreation. However, other recreational facilities are available. Additionally, the Proposed Action would result in limitations to the aesthetic features associated with Abbott Ditch irrigation and its riparian habitat.

Removing the project would also create adverse effects for archaeological sites and historic resources. PG&E has proposed PM&E measures for archaeological and historic resources that appropriately mitigate these effects, and staff concurs with the proposed measures.

Based on this independent analysis, we recommend the following additional environmental measures to be included in any order the Commission issues for the proposed surrender of the Kilarc and Cow Creek Project:

- PG&E should file with the Commission documentation of providing the well-owners located downgradient of the Kilarc forebay ample notice before commencement of draining the Kilarc forebay in order to give them time to implement necessary measures to meet their water supply needs.
- PG&E should include SPI's requirement to maintain its access roads to minimum specifications when used during the Proposed Action within the project boundary.
- PG&E should file documentation of its cooperation with Tetrick Ranch and ADU regarding the date at which water delivery to the Hooten Gulch will cease.

Overall, the Commission staff believes that any short-term and long-term environmental impacts and loss of generation produced by the project would be outweighed by the significant long-term environmental benefits gained from the project removal. The environmental and public benefits of the Proposed Action, with additional staff recommendations, would exceed those of the No-Action Alternative. Therefore, staff recommends that PG&E's application for surrender of license be approved, as proposed, with the above stated additional staff recommendations.

4.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C. § 803 (a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed 27 qualifying comprehensive plans that are applicable to the Kilarc-Cow Creek Project, located in California. The Proposed Action is consistent with these comprehensive plans.

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Appendix A

Staff Response to Scoping Comments

Comment	Name, Organization, Filing Date	Response
Preference for maintaining Kilarc reservoir as a recreation and fishing facility that is accessible to the public, including disabled persons and underserved youth. Concerns regarding lack of proximity of other peaceful, aesthetically pleasing fishing areas. Recommend that mitigation actions include evaluation of costs associated with creation of a comparable recreation facility.	Robert Roth (10/14/2009, 10/16/2009 & 11/16/2009); Thomas "Glenn" Dye, Save Kilarc Committee (10/15/2009 & 2/8/2010); Tetrick Ranch (10/16/2009); KC Hydro (10/16/2009)/Davis Hydro (10/26/2009); Individual (11/16/2009); Maggie Trevelyan, Save Kilarc Committee (1/20/2010); Lynette Gooch (2/8/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/9/2010)	These concerns are addressed in EIS section 3.3.7, *Recreational Resources*, specifically in section 3.3.7.2, *Environmental Effects of Proposed Action.*. The Commission only has authority over the licensee and cannot force another party to accept an easement or funding if it chooses not to do so.
Concerns about trespassing and access to private lands, as well as the post-construction monitoring timeframe.	David Albrecht (10/8/2009 & 10/13/2009)	This concern is addressed in EIS section 3.3.8, *Land Use.*
Concerns regarding maintenance of access roads.	Sierra Pacific Industries (11/12/2009)	This concern is addressed in EIS section 3.3.8, *Land Use.*
Comments regarding geological/soil and hydrological effects related to the removal of project features including the South Cow Creek diversion dam and Kilarc forebay.	David Albrecht (10/14/2009); Individual (11/16/2009)	These comments are addressed in EIS sections 3.3.1, *Geologic and Soil Resources*, and 3.3.2, *Water Resources*.
Who will monitor flow at Mill Creek diversion after PG&E leaves project?	Robert Roth (10/14/2009)	If the project is decommissioned, there would be no diversion at Mill Creek and no need to monitor flow.

Comment	Name, Organization, Filing Date	Response
Concerns about proposed actions and agency recommendations regarding anadromous fish passage, particularly lack of evidence of anadromous fish above Whitmore Falls, fish passage through Whitmore Falls during low flows, and impassable stream reach above unnamed falls further upstream, as well as lack of detail provided by agencies about fish habitat improvements that would result from decommissioning.	Robert Roth (10/14/2009); Thomas "Glenn" Dye, Save Kilarc Committee (10/15/2009, 10/19/2009 & 10/22/2009); Shasta County (10/19/2009); KC Hydro (10/16/2009)/Davis Hydro (10/26/2009); Robert Roth (10/23/2009); Laura Carnley (11/30/2009); Tetrick Ranch (12/30/2009); Maggie Trevelyan, Save Kilarc Committee (1/20/2010)	These concerns are addressed in EIS section 3.3.3, *Fisheries and Aquatic Resources*.
Protest decommissioning due to associated large costs for decommissioning, replacement of lost green power by decommissioning, and potential rise in electric bills for consumers.	Frank Galusha, Save Kilarc Committee (10/16/2009); Individual (11/16/2009)	These concerns are addressed in sections 3.3.10, *Socioeconomics* and 4.1.12, *Economic Analysis*. PG&E determined that the cost of the Proposed Action would be less than that for upgrading existing facilities to meet environmental requirements. There would be a long-term benefit to rate payers from the decommissioning of a facility that is no longer economically viable. The Proposed Action would result in the loss of a 4.67 MW operation project that produces an average annual generation of about 31.1 million kWh/year (about 0.004 percent of U.S. annual hydropower production), but this emissions-free, California RPS-eligible renewable energy resource is no longer needed to meet the electricity needs of PG&E's electricity consumers since lower-cost, emissions-free, California RPS-eligible renewable energy is forecast to be available to replace it.

Comment	Name, Organization, Filing Date	Response
Concerns about economic effects of decommissioning on South Cow Creek landowners with adjudicated water rights. Request for determination about how consumptive water rights of landowners will be accommodated; there would be a need for a new water diversion to accommodate these landowners. Concerns about coverage of costs for a new diversion and potential challenges associated with obtaining permits for construction. Additionally, a portion of the flows that the resource agencies assume will remain in South Cow Creek will actually be diverted by the water users with consumptive water rights and may offset the benefit of increased flows from decommissioning. Concerns about the MOU and possible inconsistencies between Proposed Action and MOU, particularly regarding consumptive users' water rights.	David Albrecht (10/8/2009 & 10/13/2009); Frank Galusha, Save Kilarc Committee (10/16/2009); Tetrick Ranch (10/16/2009); Individual (11/16/2009); Erik Poole, Abbott Ditch Users (12/30/2009, 1/14/2010 & 1/19/2010); Maggie Trevelyan, Save Kilarc Committee (1/20/2010)	These concerns are addressed in EIS section 3.3.8, *Land Use*, specifically in section 3.3.8.2, *Environmental Effects of Proposed Action*. We recommend PG&E file documentation of cooperating with Tetrick Ranch and ADU regarding the date on which water delivery will stop to Hooten Gulch. The FPA reserves to the states jurisdiction over matters pertaining to water rights; therefore, the Commission cannot make a ruling on the disposition of water rights.
Concerns about ecological effects of decommissioning on aquatic and riparian ecology of Hooten Gulch and Abbott Ditch, and on wildlife and habitat at Kilarc forebay and project-wide.	David Albrecht (10/14/2009); Tetrick Ranch (10/16/2009); Individual (11/16/2009); Maggie Trevelyan, Save Kilarc Committee (1/20/2010); Lynette Gooch (2/8/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/9/2010)	These concerns are addressed in EIS sections 3.3.3, *Fisheries and Aquatic Resources*, 3.3.4, *Botanical Resources*, 3.3.5, *Terrestrial Resources*, and 3.3.6, *Rare, Threatened and Endangered Species*.

Comment	Name, Organization, Filing Date	Response
Support for maintaining facilities or for alternative proposals (e.g., Evergreen Shasta Power/Davis Hydro).	Julie Ann Garcia and 128 other petition signatories (11/16/2009); Tetrick Ranch (10/16/2009); KC Hydro (10/26/2009, 2/22/2010, 4/12/2010); Davis Hydro (11/12/2009 & 2/3/2010); Evergreen Shasta Power, LLC (11/16/2009); Individual (11/16/2009); Laura Carnley (11/30/2009); Sierra Pacific Industries (12/30/2009 & 1/4/2010); Maggie Trevelyan, Save Kilarc Committee (1/20/2010 & 2/8/2010); Lynette Gooch (2/8/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/9/2010)	The Evergreen Shasta Power and Davis Hydro proposals have been addressed in EIS section 2.6, *Alternatives Considered but Eliminated from Further Analysis*. Additional Action Alternatives are addressed in sections 2.4, *Action Alternative 1* and 2.5, *Action Alternative 2,* as well as under each resource area in Chapter 3, *Environmental Analysis*.
Concerns about economic effects of decommissioning on the local community and landowners, including Tetrick Ranch Hydroelectric Project. Suggest that mitigation by PG&E include offset of economic impact to local community and that mitigation plans include community input and be in place prior to decommissioning.	Tetrick Ranch (10/16/2009 & 10/30/2009); Lynette Gooch (2/8/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/9/2010)	These concerns are address in section 3.3.10, *Socioeconomics.*

Comment	Name, Organization, Filing Date	Response
Support for a new Abbott Ditch diversion, at the historic location documented in the 1969 Cow Creek Adjudication (Sec. 6, T31N, R1W) from lower South Cow Creek about 3.5 miles downstream of PG&E's current diversion.	Cal Fish and Game (12/22/2009)	As discussed in section 3.3.8, *Land Use* and 3.3.10, *Socioeconomics*, because the FPA reserves to the states jurisdiction over matters pertaining to water rights, the selection and ultimate construction of an alternative diversion location, wherever it is, would be subject to a separate state authorization and permitting process with associated environmental review. We recommend PG&E file documentation of its cooperation with Tetrick Ranch and ADU regarding the date on which water delivery will stop to Hooten Gulch.
Committed to cooperative decommissioning of project and principles outlined in the Early Decommissioning Agreement/License Surrender Application.	Steve Edmondson, NMFS (10/16/2009 & 11/9/2009); Cal Fish and Game 12/15/2009	No response necessary.
Concerns about cumulative effects on air quality, particularly if non-renewable generation replaces the existing renewable generation from the Kilarc facility. Concerns about cumulative effects on aquatic resources, including relocated fishing pressures due to decommissioning of Kilarc forebay. Recommendation that the environmental analysis include all geography affected by the destruction and the construction and operation of new facilities that would be necessary to replace power lost by decommissioning, as well as fire management areas in reach of helicopter from Kilarc forebay. Recommendation that the temporal scope of analysis include cumulative effects.	KC Hydro (10/16/2009)/Davis Hydro (10/26/2009 & 4/26/2010)	According to the National Academy of Sciences (http://needtoknow.nas.edu), total energy usage in the U.S. in 2008 was almost 100 quadrillion Btu (100 x 10^{15} Btu), or 100 quads. Of this, about 2.4 quads (or 7.0 x 10^{11} kWh) of electricity were provided by hydropower. The 31.1 million kWh/year Kilarc-Cow Creek project therefore represents about 0.004 percent of annual U.S. hydropower production and 0.0001 percent of annual U.S. energy usage. There would be no measurable cumulative effects on air quality from the Proposed Action.

Comment	Name, Organization, Filing Date	Response
Concerns regarding potential competition between resident trout and anadromous trout and salmonids.	KC Hydro (10/16/2009)/Davis Hydro (10/26/2009); Davis Hydro (11/12/2009)	If anadromous salmonid populations move back upstream into the project area, then Cal Fish and Game, NMFS, and FWS would discuss options based on the management plan for recovery of these populations.
Concerns regarding preservation of historical resources in project area.	David Albrecht (10/14/2009 & 10/16/2009); KC Hydro (10/16/2009 & 3/29/2010)/Davis Hydro (10/26/2009); Lynette Gooch (2/8/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/9/2010)	These concerns are addressed in EIS section 3.3.11, *Cultural Resources*, specifically in section 3.3.11.2, *Environmental Effects of Proposed Action.*
Support for salmon and Steelhead habitat protection in South Cow Creek.	Robert Roth (10/23/2009)	This comment is addressed in EIS section 3.3.3, *Fisheries and Aquatic Resources*.
Support for an EIS instead of an EA.	Tetrick Ranch (10/16/2009); KC Hydro (10/26/2009)	As noted in the Commission's Notice of Intention to Prepare an Environmental Impact Statement, filed on 2/19/2010, Commission staff has prepared an EIS as a result of the public scoping process and environmental site review and the determination that the proposed license surrender would constitute a major federal action significantly affecting the quality of the human environment.

Comment	Name, Organization, Filing Date	Response
Concerns regarding long-term maintenance of Kilarc water conveyance system, particularly because a ditch failure could cause resource damage due to erosion into Old Cow Creek and cause damage to Sierra Pacific Industries' adjacent timber and soil resources. Concerns regarding road maintenance. Statement that Sierra Pacific Industries has not granted any additional access or right to construct any structures or roads on its property. Concerns that if anadromous fish are introduced above Whitmore Falls and other upstream barriers, then upper watershed of Old Cow Creek could have additional restrictions placed on existing timber management.	Sierra Pacific Industries (11/12/2009)	These concerns are addressed in EIS section 3.3.8, *Land Use*, specifically in section 3.3.8.2, *Environmental Effects of Proposed Action*.
Commenter is one of the owners of land associated with the Cow Creek Development, including the forebay, canal and road. Comments regarding Cow Creek forebay easement and possible related restrictions on filling the forebay and removing the canal and access road.	James Fletter (12/14/2009)	This concern is addressed in EIS section 3.3.8, *Land Use*. Modifications to land ownership would include conveyance of PG&E's deeded easements through a quitclaim deed to the private landowner or extinguishing of PG&E's prescriptive rights over private lands.
Concerns that public comments during scoping were not taken into consideration appropriately.	Maggie Trevelyan (12/18/2009); Laura Carnley (1/25/2010); Earl and Joan Wetmore (4/21/2010)	All public scoping comments have been considered in the preparation of the DEIS.

Comment	Name, Organization, Filing Date	Response
Concern that Cal Fish and Game has not provided information related to minimum instream flow requirements.	Erik Poole, Abbott Ditch Users (12/30/2009); Tetrick Ranch (12/30/2009)	Cal Fish and Game supports project decommissioning under which there would be no minimum flow requirements. Future license applicants, if any, would need to complete instream flow studies and proposed minimum flow requirements for review by federal and state resource agencies.
Concerns about effects of decommissioning Kilarc forebay on fire protection, soil effects if there is an increase in fire prevalence, and also related socioeconomic effects.	KC Hydro (10/16/2009); Individual (11/16/2009); Sierra Pacific Industries (11/12/2009); Maggie Trevelyan (12/18/2009); Sierra Pacific Industries (12/30/2009 & 1/4/2010); Maggie Trevelyan, Save Kilarc Committee (1/20/2010); Arthur M. Tilles (2/19/2010);	The Commission concludes the Proposed Action would not have an adverse effect on forest products in the project area, given PG&E's propose PM&E measures to reduce the risk of wildland fire during decommissioning, in accordance with Cal FIRE's Fire and Resource Assessment Program. See section 3.3.10, *Socioeconomics.*
Comments in support of Settlement Offer.	Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC (1/22/2010 & 2/22/2010); Maggie Trevelyan, Save Kilarc Committee (1/27/2010); Jerry and Mary Richmond (2/5/2010); James and Sita Sherman (2/11/2010); Richard and Lynette Gooch, Tuscan Heights Lavender Gardens LLC, The Vineyards at Tuscan Heights (2/16/2010)	The Settlement Offer filed by Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC on January 22, 2010, is discussed in EIS section 2.6, *Alternatives Considered but Eliminated from Further Analysis*.

Comment	Name, Organization, Filing Date	Response
Comments opposed to Settlement Offer.	Randy Carnley (1/25/2010); KC Hydro (1/25/2010 & 2/5/2010); Joan and Earl Wetmore (1/25/2010); Sandy Winters (1/27/2010); Davis Hydro (2/5/2010); FWS (2/5/2010); Cal Fish and Game (2/8/2010); NMFS (2/8/2010); PG&E (2/10/2010); David Albrecht (2/16/2010); Peter Hufford, Hufford Ranch (2/16/2010); Brian Johnson, Trout Unlimited and Kelly L. Catlett, Friends of the River (2/16/2010)	The Settlement Offer filed by Tetrick Ranch, ADU, Shasta County, Sierra Pacific Industries, Inc., and Evergreen Shasta Power, LLC on January 22, 2010, is discussed in EIS section 2.6, *Alternatives Considered but Eliminated from Further Analysis*.
Maintains neutrality with regard to Settlement Offer and maintains independent regulatory authority to condition project operations to protect water quality and the beneficial uses of the affected lakes and stream reaches.	California SWRCB (2/11/2010 & 2/19/2010)	No response necessary.
Request for meetings to be held in California to facilitate dialogue among stakeholders before Draft Environmental Impact Statement is released.	KC Hydro (3/26/2010, 4/8/2010; 4/12/2010; 4/21/2010); Todd Wroe (3/29/2010); Earl and Joan Wetmore (4/21/2010)	The Commission staff will host its next public meeting regarding this project during the summer 2010 after issuance of the DEIS.
Comments in response to Evergreen Shasta's offer of settlement	NMFS (5/10/2010)	No response necessary.
Comment on maintaining forebay for recreation.	Susan Gummerus (5/16/2010)	This comment is addressed in EIS section 3.3.7 *Recreational Resources.*

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