FERC/EIS-F-0242

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR HYDROPOWER LICENSE

Middle Fork American River Hydroelectric Project—FERC Project No. 2079-069

California

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

February 2013

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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426

OFFICE OF ENERGY PROJECTS

To the Agency or Individual Addressed:

Reference: Final Environmental Impact Statement

Attached is the final environmental impact statement (EIS) for the Middle Fork American River Project (No. 2079-069), located on the Middle Fork of the American River and the Rubicon River with diversions on Duncan and North and South Long Canyon Creeks.

This final EIS documents the view of governmental agencies, non-governmental organizations, affected Indian tribes, the public, the license applicant, and Federal Energy Regulatory Commission (Commission) staff. It contains staff evaluations of the applicant's proposal and the alternatives for relicensing the Middle Fork American River Project.

Before the Commission makes a licensing decision, it will take into account all concerns relevant to the public interest. The final EIS will be part of the record from which the Commission will make its decision. The final EIS was sent to the U.S. Environmental Protection Agency and made available to the public on or about February ___, 2013.

Copies of the final EIS are available for review in the Commission's Public Reference Branch, Room 2A, located at 888 First Street, N.E., Washington, DC 20426. The EIS also may be viewed on the Internet at www.ferc.gov/docs-filing/elibrary.asp. Please call (202) 502-8222 for assistance.

Attachment: Final Environmental Impact Statement

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COVER SHEET

a. Title:	Relicensing the Middle Fork American River Project, FERC Project No. 2079-069.
b. Subject:	Final Environmental Impact Statement
c. Lead Agency:	Federal Energy Regulatory Commission (Commission)
d. Abstract:	The Middle Fork American River Project (FERC No. 2079-069) is located in Placer and El Dorado Counties, California. The existing project affects 1,883 acres within the Tahoe National Forest and 1,385 acres within Eldorado National Forest both of which are administered by the U.S. Department of Agriculture-Forest Service. Placer County Water Agency (PCWA) proposes modifications to the diversion structures, and French Meadow, Hell Hole, and Middle Fork interbay outlet works to accommodate increased instream flows. PCWA also proposes to increase the storage capacity of Hell Hole reservoir by approximately 7,600 acre-feet which, in turn, would increase the average annual generation at the Hell Hole powerhouse. The staff's recommendation is to relicense the project as proposed, with certain modifications, and additional measures recommended by the agencies.
e. Contact:	Carolyn Templeton Federal Energy Regulatory Commission Office of Energy Projects 888 First Street, N.E. Washington, DC 20426 (202) 502-8785
f. Transmittal:	This final environmental impact statement to relicense the Middle Fork American River Hydroelectric Project is being made available for public comment on or about February ___, 2013, as required by the National Environmental Policy Act of 1969[1] and the Commission's Regulations Implementing the National Environmental Policy Act (18 C.F.R., Part 380).

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

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FOREWORD

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

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

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

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

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

[4] 16 U.S.C. § 803(a).

[5] 16 U.S.C. § 803(g).

[6] 18 C.F.R. § 385.206 (2009).

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TABLE OF CONTENTS

COVER SHEET iii

FOREWORD v

LIST OF FIGURES xi

LIST OF TABLES xiii

ACRONYMS AND ABBREVIATIONS xvii

EXECUTIVE SUMMARY xix

1.0 INTRODUCTION 1
- 1.1 APPLICATION 1
- 1.2 PURPOSE OF ACTION AND NEED FOR POWER 1
  - 1.2.1 Purpose of Action 1
  - 1.2.2 Need for Power 3
- 1.3 STATUTORY AND REGULATORY REQUIREMENTS 4
  - 1.3.1 Federal Power Act 5
    - 1.3.1.1 Section 18 Fishway Prescriptions 5
    - 1.3.1.2 Section 4(e) Conditions 6
    - 1.3.1.3 Section 10(j) Recommendations 6
  - 1.3.2 Clean Water Act 6
  - 1.3.3 Endangered Species Act 6
  - 1.3.4 Coastal Zone Management Act 7
  - 1.3.5 National Historic Preservation Act 7
  - 1.3.6 Wild and Scenic Rivers Act 8
- 1.4 PUBLIC REVIEW AND COMMENT 9
  - 1.4.1 Scoping 9
  - 1.4.2 Interventions 9
  - 1.4.3 Comments on the Application 10
  - 1.4.4 Comments on the Draft EIS 10

2.0 PROPOSED ACTION AND ALTERNATIVES 13
- 2.1 NO-ACTION ALTERNATIVE 13
  - 2.1.1 Existing Project Facilities 13
    - 2.1.1.1 French Meadows Development 13
    - 2.1.1.2 Hell Hole Development 15
    - 2.1.1.3 Middle Fork Development 15
    - 2.1.1.4 Ralston Development 16
    - 2.1.1.5 Oxbow Development 17
    - 2.1.1.6 Project Recreation Facilities 18

2.1.2 Project Safety ... 18
2.1.3 Existing Project Boundary ... 18
2.1.4 Existing Project Operation ... 19
2.1.5 Existing Environmental Measures ... 22
2.2 APPLICANT'S PROPOSAL ... 23
2.2.1 Proposed Project Facilities ... 23
2.2.1.1 Duncan Creek Diversion ... 23
2.2.1.2 French Meadows Dam Outlet Works Modification ... 23
2.2.1.3 Hell Hole Storage Capacity Expansion and Outlet Works Modification ... 23
2.2.1.4 North and South Fork Long Canyon Diversion Modifications ... 24
2.2.1.5 Middle Fork Interbay Dam Outlet Works Modification 24
2.2.1.6 Proposed Flow Measurement Equipment ... 24
2.2.1.7 Trails ... 25
2.2.1.8 Recreation Facilities ... 25
2.2.2 Proposed Project Boundary ... 26
2.2.3 Proposed Project Operation ... 28
2.2.4 Proposed Environmental Measures ... 28
2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions .. 30
2.3 ALTERNATIVE 1 ... 33
2.4 STAFF ALTERNATIVE ... 33
2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS ... 37
2.5.1 Issuing a Non-Power License ... 37
2.5.2 Federal Government Takeover of the Project ... 37
2.5.3 Retiring the Project ... 37

3.0 ENVIRONMENTAL ANALYSIS ... 39
3.1 GENERAL DESCRIPTION OF THE RIVER BASIN ... 39
3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS ... 40
3.2.1 Geographic Scope ... 40
3.2.2 Temporal Scope ... 41
3.3 PROPOSED ACTION AND ACTION ALTERNATIVES ... 41
3.3.1 Geologic and Soil Resources ... 41
3.3.1.1 Affected Environment ... 41
3.3.1.2 Environmental Effects ... 52
3.3.2 Aquatic Resources ... 76
3.3.2.1 Affected Environment ... 76
3.3.2.2 Environmental Effects ... 110
3.3.2.3 Cumulative Effects ... 144
Central Valley Steelhead ... 145
3.3.3 Terrestrial Resources ... 147

3.3.3.1 Affected Environment 147
3.3.3.2 Environmental Effects 160
3.3.4 Threatened and Endangered Species 207
3.3.4.1 Affected Environment 207
3.3.4.2 Environmental Effects 209
3.3.5 Recreation and Land Use 212
3.3.5.1 Affected Environment 212
3.3.5.2 Environmental Effects 233
3.3.6 Cultural Resources 272
3.3.6.1 Affected Environment 272
3.3.6.2 Environmental Effects 286
3.3.7 Aesthetic Resources 292
3.3.7.1 Affected Environment 292
3.3.7.2 Environmental Effects 295
3.4 NO-ACTION ALTERNATIVE 296

4.0 DEVELOPMENTAL ANALYSIS 299
4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT 299
4.2 COMPARISON OF ALTERNATIVES 300
4.2.1 No-action Alternative 302
4.2.2 PCWA's Proposal 302
4.2.3 Staff Alternative 302
4.2.4 Alternative 1 302
4.2.5 Staff Alternative with Mandatory Conditions 303
4.3 COST OF ENVIRONMENTAL MEASURES 303

5.0 CONCLUSIONS AND RECOMMENDATIONS 331
5.1 COMPARISON OF ALTERNATIVES 331
5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE 339
5.3 UNAVOIDABLE ADVERSE EFFECTS 375
5.4 SUMMARY OF SECTION 10(J) RECOMMENDATIONS AND 4(E) CONDITIONS 376
5.4.1 Fish and Wildlife Agency Recommendations 376
5.4.2 Land Management Agencies' Section 4(e) Conditions 387
5.5 CONSISTENCY WITH COMPREHENSIVE PLANS 390

6.0 LITERATURE CITED 393

7.0 LIST OF PREPARERS 399

8.0 LIST OF RECIPIENTS 401

APPENDIX A—STAFF RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT A-1

APPENDIX B—COMPARISON OF PROPOSED ACTION, AGENCY CONDITIONS AND RECOMMENDATIONS, AND ALTERNATIVE 1 ..... B-1

APPENDIX C—DRAFT LICENSE ARTICLES FOR THE MIDDLE FORK AMERICAN RIVER PROJECT C-1

LIST OF FIGURES

Figure 1. Location of Middle Fork American River Hydroelectric Project 2

Figure 2. Middle Fork Project schematic 14

Figure 3. Ralston afterbay sediment augmentation 59

Figure 4. French Meadows reservoir water surface elevation in relation to the French Meadows boat ramp operational range and minimum pool elevations by forecasted water year 79

Figure 5. Hell Hole reservoir water surface elevation in relationship to the Hell Hole Boat ramp operational range and minimum pool elevations by forecasted water year 80

Figure 6. French Meadows water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October)..... 100

Figure 7. Hell Hole reservoir water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October)..... 100

Figure 8. Ralston afterbay water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October)..... 101

Figure 9. Fish passage barrier locations and frequency..... 104

Figure 10. Stream and reservoir gage locations..... 135

Figure 11. French Meadows reservoir, recreation facilities 214

Figure 12. Hell Hole reservoir, recreation facilities 215

Figure 13. Long Canyon, recreation facilities 216

Figure 14. Ralston afterbay, recreation facilities..... 217

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LIST OF TABLES

Table 1. Major statutory and regulatory requirements for the Middle Fork American River Hydroelectric Project 4

Table 2. Average number of days gravel motion is initiated by water year type 45

Table 3. Proposed, Alternative 1, and final 4(e) condition (in parentheses when different from proposed) pulse flow schedule for wet and above normal water years 62

Table 4. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Middle Fork American River below French Meadows dam 63

Table 5. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Rubicon River below Hell Hole dam 65

Table 6. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Middle Fork American River below Middle Fork interbay dam 66

Table 7. Proposed, Alternative 1, and final 4(e) condition (in parenthesis when different from Alternative 1) implementation schedule of pulse flows and flow measurement locations 68

Table 8. Key characteristics of project impoundments related to water storage..... 77

Table 9. Minimum pool requirements 78

Table 10. Hydrology for selected sites (hydrology nodes) in waters associated with the Middle Fork Project 82

Table 11. Minimum stream maintenance flow requirements 88

Table 12. Hydrology for project powerhouses (hydrology nodes) at the Middle Fork Project 91

Table 13. Summary of project area water rights permits 93

Table 14. Water quality objectives to support designated beneficial uses in the project area 96

Table 15. Minimum instream flows (cfs) by water year under the proposed action and Alternative 1 118

Table 16. Proposed, Alternative 1, and final Forest Service condition no. 24 (in parentheses when different from Alternative 1) downramping rates following spills from Hell Hole reservoir dam into Rubicon River and from French Meadows reservoir dam into Middle Fork American River 124

Table 17. Proposed, Alternative 1, and Forest Service final condition up- and downramping rates proposed for March through October at Oxbow powerhouse 125

Table 18. Vegetation communities and wildlife habitats in the Middle Fork Project vicinity 148

Table 19. Special-status plant species known to occur in the project vicinity 150

Table 20. Project priority noxious weeds list 154

Table 21. Summary of riparian vegetation around project reservoirs and diversion pools 156

Table 22. Special-status wildlife species that potentially occur within the project vicinity 161

Table 23. Stebbins' phacelia populations at Hell Hole reservoir that may be affected by the proposed Hell Hole reservoir seasonal storage increase 186

Table 24. Project recreation facilities 218

Table 25. Whitewater boating opportunities on the bypassed reaches 221

Table 26. Whitewater boating opportunities on the peaking reach 222

Table 27. Average number of days per month when peaking reach ramping occurs in different water year types when flows were less than 2,000 cfs 223

Table 28. Project roads and trails 229

Table 29. Notable facility differences between the Proposed and Alternative 1 234

Table 30. Minimum water surface elevations for French Meadows and Hell Hole reservoirs 244

Table 31. Reservoir level objectives specified in final Forest Service condition no. 38 250

Table 32. Notable recreation management differences between the PCWA and Alternative 1 recreation plans 252

Table 33. PCWA's proposed flow schedule to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse 259

Table 34. Flow schedule provided in final Forest Service condition no. 40 and Interior 10(a) recommendation no. 5 to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse 260

Table 35. Flow schedule provided in final Forest Service condition no. 40 and Interior 10(a) recommendation no. 5 to support class II boating opportunities on the Confluence Run 262

Table 36. Average (for all water year types) number of hours between 7 a.m. and 7 p.m. during the summer when flows are suitable for easy crossing 266

Table 37. Average (for all water year types) number of hours between 7 a.m. and 7 p.m. during the fall when flows are suitable for easy crossing 266

Table 38. Archaeological and historic-era resources located within the Middle Fork American River APE 278

Table 39. Parameters for the economic analysis of the Middle Fork American River Project 300

Table 40. Summary of annual costs and annual power benefits for the alternatives for the Middle Fork Project 301

Table 41. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Middle Fork Project 304

Table 42. Comparison of alternatives for the Middle Fork Project 332

Table 43. Staff-recommended minimum instream flows (cfs) by water year 346

Table 44. Minimum flows in the peaking reach when Ralston powerhouse experiences an unplanned outage from June through September and Middle Fork powerhouse is operational 352

Table 45. Staff-recommended pulse flow schedule for wet and above normal water years 353

Table 46. Staff-recommended pulse flow schedule for wet and above normal water years for the Middle Fork American River below French Meadows dam 354

Table 47. Staff-recommended pulse flow schedule for wet and above normal water years for the Rubicon River below Hell Hole dam 355

Table 48. Staff-recommended flow schedule to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse 357

Table 49. Staff-recommended flow schedule to support class II boating opportunities on the Confluence Run 359

Table 50. Staff-recommended minimum water surface elevations (feet) for French Meadows and Hell Hole reservoirs 362

Table 51. Fish and wildlife agency recommendations for the Middle Fork American River Hydroelectric Project 377

Table 52. Forest Service preliminary section 4(e) conditions for the Middle Fork American River Hydroelectric Project 387

ACRONYMS AND ABBREVIATIONS

Advisory Council	Advisory Council on Historic Preservation
APE	area of potential effects
basin plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins
BLM	U.S. Department of the Interior-Bureau of Land Management
°C	degrees Celsius
BMP	best management practice
California DWR	California Department of Water Resources
California Fish and Game	California Department of Fish and Game
California SHPO	California State Historic Preservation Office
California State Parks	California Department of Parks and Recreation
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Commission	Federal Energy Regulatory Commission
Corps	U.S. Army Corps of Engineers
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
draft recovery plan	NMFS' *Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead*
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EVC	existing visual condition
°F	degrees Fahrenheit
FR	Federal Register
FERC	Federal Energy Regulatory Commission
Foothills Water Network et al.	Foothill Angler Coalition, California Sportfishing Protection Alliance, California Outdoors, American Whitewater, Protect American River Canyons, Trout Unlimited, Granite Bay Flycasters, Federation of Flyfishers, Upper American River Foundation, Horseshoe Bar Fish and Game Preserve, Bill Carnazzo, Hilde Schweitzer, and John Donovan
Forest Service	U.S. Department of Agriculture-Forest Service
FPA	Federal Power Act

FR	Federal Register
FWS	U.S. Department of the Interior-Fish and Wildlife Service
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
kW	kilowatt
LRMP	land and resource management plan
LWD	large woody debris
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
mm	millimeter
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NFS	National Forest System
NHPA	National Historic Preservation Act of 1966
NMFS	U.S. Department of Commerce-National Marine Fisheries Service
OEHHA	California Office of Environmental Health Hazard Assessment
OHV	Off-highway vehicle
PA	Programmatic Agreement
PAOT	people-at-one-time
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric Company
Reclamation	U.S. Department of the Interior-Bureau of Reclamation
RM	river mile
ROS	Recreation Opportunity Spectrum
RV	recreational vehicle
TCP	traditional cultural property
U.S.C.	United States Code
USGS	U.S. Geological Survey
VIPMP	Vegetation and Integrated Pest Management Plan
VQO	Visual Quality Objectives
Washoe Tribe	Washoe Tribe of Nevada and California
Water Board	California State Water Resources Control Board
WSE	water surface elevation
YOY	young-of-the-year

EXECUTIVE SUMMARY

Proposed Action

On February 23, 2011, Placer County Water Agency (PCWA) filed an application with the Federal Energy Regulatory Commission (Commission or FERC) for a new major license to operate and maintain its Middle Fork American River Project (Middle Fork Project or project) No. 2079. The 223.753-megawatt (MW) project is located on the Middle Fork of the American (Middle Fork) and Rubicon Rivers and Duncan and North and South Fork Long Canyon Creeks in Placer and El Dorado Counties, California. The project occupies about 3,268 acres of federal land: 1,883 acres within the Tahoe National Forest and 1,385 acres within the Eldorado National Forest, both of which are administered by the U.S. Department of Agriculture-Forest Service (Forest Service).

Project Description

The Middle Fork Project includes five developments: French Meadows, Hell Hole, Middle Fork, Ralston, and Oxbow.

The French Meadows development is on the Middle Fork and a tributary, Duncan Creek, and includes: (1) the Duncan Creek diversion consisting of: (a) a concrete gravity diversion dam with an uncontrolled ogee spillway; (b) a 2-acre impoundment; (c) an instream flow maintenance pipe conveying flows from the Duncan Creek diversion impoundment to Duncan Creek with a maximum discharge capacity of 8 cubic feet per second (cfs); (d) a low level outlet pipe also conveying water from the Duncan Creek diversion impoundment to Duncan Creek with a maximum discharge capacity of 310 cfs; (e) the Duncan Creek-Middle Fork tunnel, that routes water from the Duncan Creek diversion to the French Meadows reservoir with a maximum capacity of 400 cfs; (2) the French Meadows dam and reservoir on the Middle Fork consisting of: (a) a rock and gravel-filled dam with a spillway extending to the Middle Fork about 1,000 feet downstream of the dam which includes two radial gates; (b) a 1,408-acre reservoir; (c) an instream flow maintenance pipe conveying flows from the French Meadows reservoir to the Middle Fork with a maximum discharge capacity of 8 cfs; and (d) a low level outlet pipe also conveying water from the French Meadows reservoir to the Middle Fork with a maximum discharge capacity of 1,430 cfs; (3) the French Meadows-Hell Hole tunnel, which routes water from the French Meadows reservoir to the French Meadows powerhouse penstock which has a maximum discharge capacity of 800 cfs; (4) a penstock conveying water from the end of the French Meadows-Hell Hole tunnel to the powerhouse; (5) the French Meadows powerhouse housing a Francis-type unit with an authorized installed capacity of 15.3-MW discharging water to Hell Hole reservoir; and (6) the French Meadows switchyard. The diversion of water at the French Meadows development results in an 8.6-mile-long bypassed reach in Duncan Creek and an 11.6-mile-long bypassed reach in the Middle Fork.

The Hell Hole development is located southeast of the French Meadows development on the Rubicon River and includes: (1) the rock filled Hell Hole dam with

an uncontrolled spillway; (2) the 1,253-acre Hell Hole reservoir; (3) an outlet tunnel that leads from Hell Hole reservoir to two outlet pipes that convey flows to the Rubicon River (an instream flow maintenance pipe with a maximum discharge capacity of 20 cfs and a low level outlet pipe with a maximum discharge capacity of 852 cfs); (4) a penstock conveying water from a bifurcation in the low level outlet pipe to the powerhouse; and (5) the Hell Hole powerhouse that houses a Francis-type unit with an authorized installed capacity of 725 kW discharging tailrace water to the Rubicon River. The diversion of water at the development results in a 30.5-mile-long bypassed reach in the Rubicon River.

The Middle Fork development is located on the Middle Fork and on two tributaries (North Fork and South Fork) of Long Canyon Creek (a tributary of the Rubicon River) and includes: (1) the North Fork Long Canyon Creek diversion consisting of: (a) a diversion dam with an uncontrolled ogee spillway; (b) an instream flow maintenance pipe conveying water from the diversion dam to the North Fork with a maximum discharge capacity of 2 cfs; (c) a low level outlet pipe conveying water from the diversion dam to the North Fork with a maximum discharge capacity of 100 cfs; (d) a conveyance structure that routes water from the diversion dam to the Hell Hole-Middle Fork tunnel consisting of a buried steel pipe, a vertical shaft, and a tunnel with a maximum capacity of 100 cfs; (2) the South Fork Long Canyon Creek diversion consisting of: (a) a diversion dam with an uncontrolled ogee spillway; (b) an instream flow maintenance pipe conveying flows from the diversion dam to the South Fork with a maximum discharge capacity of 5 cfs; (c) a low level outlet pipe conveying water from the diversion dam to the South Fork with a maximum discharge capacity of 140 cfs; (d) a conveyance structure that routes water from the diversion dam to the Hell Hole-Middle Fork tunnel and consisting of a buried steel pipe, a vertical shaft, and a tunnel with a maximum capacity of 200 cfs; (3) the Hell Hole-Middle Fork tunnel that routes water from Hell Hole reservoir to the Middle Fork powerhouse penstock with a maximum capacity of 920 cfs; (4) the Hell Hole-Middle Fork tunnel surge shaft and tank located at the end of the Hell Hole-Middle Fork tunnel; (5) a penstock conveying water from the end of the Hell Hole-Middle Fork tunnel to the Middle Fork powerhouse; and (6) the Middle Fork powerhouse that houses two Pelton-type units each having an authorized installed capacity of 61,200 kW, discharging water into the Middle Fork interbay pool. The diversion of water at the Middle Fork development results in a 3.1-mile-long bypassed reach in North Fork Long Canyon Creek, a 3.3-mile-long bypassed reach in the South Fork Long Canyon Creek, and an 11.4-mile-long bypassed reach on Long Canyon Creek from the confluence of the North and South Forks to the confluence with the Rubicon River.

The Ralston development is located on the Rubicon River and the Middle Fork and includes: (1) the concrete Middle Fork interbay[7] dam with a spillway controlled by two radial gates; (2) an impoundment (interbay pool) that is less than 7 acres; (3) an instream flow maintenance pipe conveying water from the interbay pool to the Middle Fork with a maximum discharge capacity of 23 cfs; (4) a low level outlet pipe conveying water from the interbay pool to the Middle Fork with a maximum discharge capacity of 890 cfs; (5) the Middle Fork-Ralston tunnel which routes water from the Middle Fork interbay pool to the Ralston powerhouse penstock with a maximum capacity of 836 cfs; (6) the Middle Fork-Ralston tunnel surge shaft and tank at the end of the Middle Fork-Ralston tunnel; (7) a penstock leading from the end of the Middle Fork-Ralston tunnel to the Ralston powerhouse; (8) the Ralston powerhouse that houses a Pelton-type unit with an authorized installed capacity of 79.2-MW discharging water to the Ralston afterbay,[8] which impounds the Middle Fork and the Rubicon Rivers; and (9) the Ralston switchyard. The diversion of water at the Ralston development results in a 10.8-mile-long bypassed reach in the Middle Fork.

The Oxbow development is located on the Middle Fork and includes: (1) the concrete Ralston afterbay dam with an ogee spillway containing five radial gates; (2) the 83-acre Ralston afterbay impoundment; (3) an instream flow maintenance pipe conveying flows from the impoundment through the dam to the Middle Fork with a maximum discharge capacity of 155 cfs; (4) a low level outlet pipe through the dam that conveys water from the Ralston afterbay impoundment to the Middle Fork with a maximum discharge capacity of 1,132 cfs; (5) the Ralston-Oxbow tunnel which connects the Ralston afterbay to the Oxbow powerhouse penstock with a maximum capacity of 1,088 cfs; (6) a penstock leading from the end of the Ralston-Oxbow tunnel to the Oxbow powerhouse; (7) the Oxbow powerhouse that houses a Francis-type unit with an authorized installed capacity of 6.128-MW discharging water into the Middle Fork; and (8) the Oxbow switchyard. The diversion of water at the Oxbow development results in a 0.48-mile-long bypassed reach in the Middle Fork.

No primary transmission lines are part of the Middle Fork Project license; grid interconnections are either made at switchyards located at the French Meadows, Hell Hole, Middle Fork, Ralston, and Oxbow powerhouses or via separately licensed transmission lines. The French Meadows switchyard connects to the 60-kV French Meadows-Middle Fork transmission line owned and operated by Pacific Gas and Electric Company (PG&E). The Hell Hole switchyard also connects to the 60-kV French Meadows-Middle Fork transmission line. The Middle Fork switchyard connects to the

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[7] The term interbay refers to the impoundment's function as both an afterbay (receives flow from the Middle Fork powerhouse) and a forebay (provides flows to the Ralston powerhouse).

[8] The Ralston afterbay impoundment serves as the afterbay of the Ralston powerhouse and the forebay of the Oxbow powerhouse.

Ralston switchyard via 60-kV and 230-kV lines, referred to as the Middle Fork-Ralston transmission line, owned and operated by PG&E. The Ralston switchyard connects to PG&E's 230-kV transmission line that extends to its Goldhill substation. The Oxbow switchyard is connected to PG&E's 60-kV line that extends to its Foresthill/Weimar/Halsey Junction substation.

The project is operated in a seasonal store and release mode. Typical annual operation of the project results in the capture of runoff, which is diverted to increase storage in the French Meadows and Hell Hole reservoirs during the winter and spring. Reservoir storage is later released during the summer, fall, and early winter. Storage and release of flows varies from year to year based on the timing and magnitude of spring runoff, which is influenced by winter snow pack, temperature conditions, and precipitation.

Project operation is prioritized to first ensure consumptive water demands are met and second, to maximize peak power generation. However, in all but dry years, water supply demands are met as a byproduct of power generation because both consumptive water and electrical demands tend to coincide seasonally. Annually, the project generally stores and releases more water in most water years (except in dry years) than necessary to meet the consumptive water demand.

The current license requires PCWA to maintain constant pool elevations at the Duncan Creek diversion and seasonal pool elevations at French Meadows and Hell Hole reservoirs; maintain minimum flows ranging from 4 to 23 cfs in project bypassed reaches and 75 cfs in the peaking reach (the reach from Oxbow powerhouse to the confluence of the Middle Fork with the North Fork American River); ensure releases from Oxbow powerhouse do not cause vertical fluctuations greater than 3 feet per hour; and operate and maintain numerous recreation facilities.

Proposed Facilities and Operation

PCWA proposes several modifications to the existing project including: (1) retrofit the Duncan Creek, North Fork Long Canyon Creek and South Fork Long Canyon Creek diversions by increasing the height of the dams to increase the storage of the diversion impoundments, install wedge-wire screens on the intakes to the Duncan Creek-Middle Fork or Hell Hole-Middle Fork tunnels to protect fish from entrainment, and modify the low level and instream flow outlets to facilitate increased instream flows and downstream sediment transport; (2) modify the French Meadows dam outlet works by adding new flow meters to monitor increased instream flows; (3) modify outlet works at the Hell Hole development by adding a new flow meter, valve operator, and discharge hood to facilitate increased instream flows; (4) modify the existing instream flow outlet at the Middle Fork interbay dam by adding a new butterfly valve, fixed cone valve, and discharge hood to facilitate increased instream flows and bedload transport; and (5) installation of new flow measurement equipment.

PCWA also proposes to increase the available storage in Hell Hole reservoir by installing 6-foot-high, pneumatically operated steel spillway crest gates on the dam crest to allow storage of additional water during the spring and summer for increased generation in the fall and/or winter.

In all but the driest years, PCWA proposes to shift the timing of some of the project's generation from the spring runoff period to the summer peak energy demand period.

Proposed Environmental Measures

PCWA proposes the following environmental measures.

- Implement a Sediment Management Plan (that includes total mercury and methylmercury testing prior to removal of sediment from Ralston afterbay) to protect water quality and aquatic and riparian habitat to enhance ongoing sediment removal operations at the Duncan, North Fork Long Canyon, and South Fork Long Canyon creek diversion impoundments and the Middle Fork interbay and Ralston afterbay impoundments and increase delivery and downstream transport of sediment downstream of these impoundments to enhance aquatic and riparian habitat (same as Forest Service condition no. 46).
- Implement monitoring plans for: Geomorphology/Riparian; Water Quality; Fish Populations; Water Temperature; Mercury Bioaccumulation; Benthic Macroinvertebrates; Foothill Yellow-Legged Frog; and Western Pond Turtle. These plans would document changes in the quality or quantity of these resources as a result of changes in instream flows and project-related operation and maintenance, and provide a basis for adjusting flows or protective measures, if needed.
- Develop and implement an entrainment study plan for Ralston and Oxbow powerhouses to provide information that would indicate whether or not protective measures are warranted at these two powerhouses (same as Forest Service condition no. 29).
- Develop an erosion and sedimentation control plan prior to construction activities to ensure that best management practices are in place during and after ground-disturbing activities.
- Provide spring pulse flows to Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek, Middle Fork American River downstream of French Meadows and Middle Fork interbay dams, and the Rubicon River as shown in tables 3, 4, 5, and 6 during wet and above normal water years to move gravel into the bypassed reaches, scour the channel bed, and facilitate cottonwood and willow regeneration in the bypassed reaches.

- Provide the minimum flows to the project bypassed reaches and the peaking reach shown in table 15 to mimic natural seasonal and year-to-year variability in the watershed to maintain or enhance aquatic habitat
- Provide the ramping rates shown in table 16 (downramping rates following spills from Hell Hole dam into the Rubicon River and from French Meadows dam into the Middle Fork) and 17 (up- and downramping rates for March through October at Oxbow powerhouse) to reduce the potential for stranding of aquatic biota during downramping and recreational visitors along the peaking reach during upramping.
- Provide a minimum flow of from 75 to 150 cfs from the Oxbow powerhouse to the peaking reach for up to 30 days during the annual planned outage and for up to 48 hours during unplanned outages at Middle Fork and/or Ralston powerhouses to protect aquatic habitat in the peaking reach.
- Release the flows shown in table 33 from the Oxbow powerhouse to provide class IV whitewater boating opportunities for commercial and private recreational use in the peaking reach.
- Operate the French Meadows and Hell Hole reservoirs with the minimum water surface elevations shown in table 30 to maintain recreational use.
- Implement a Vegetation and Integrated Pest Management Plan (VIPMP) to ensure project-related vegetation management and noxious weed control protects water quality and fish and wildlife habitat, and is consistent with Forest Service best management practices.
- Implement a Bald Eagle Management Plan to document active nest locations that includes protective measures that would be implemented near active nests, provides for employee training regarding protective measures, and ensures power lines meet applicable raptor protection guidelines (same as Forest Service condition no. 27).
- Implement a Recreation Plan that provides for new and enhanced recreation facilities, operation and maintenance of existing and proposed facilities, protection of natural resources during facility modification and construction and public use, and dissemination of information regarding recreational opportunities to the public.
- Implement a Transportation System Management Plan that provides for maintenance of existing and proposed roads and trails.
- Implement a Fire Prevention and Suppression Plan to improve planning, management, and coordination of wildfire protection and prevention measures with the Forest Service.

- Implement a Historic Properties Management Plan (HPMP) to ensure the protection of resources that are eligible for inclusion in the National Register of Historic Places and resources that are important to Native American tribes.
- Implement a Visual Resource Management Plan to protect these resources and to maintain or improve the existing visual condition of project facilities with respect to Forest Service objectives, standards, and guidelines (same as Forest Service condition no. 41).

Alternatives Considered

This EIS considers the following alternatives: (1) PCWA's proposal, as outlined above; (2) PCWA's proposal with staff modifications (staff alternative); (3) Alternative 1, filed by PCWA, which includes most of the agency-recommended environmental measures; and (4) no action, meaning that PCWA would continue to operate the project with no changes.

Alternative 1 was developed by PCWA and filed November 30, 2011, after submittal of the final license application. Alternative 1 includes: (1) revised (compared to proposed measures) instream flows, reservoir minimum pool elevations, and additional recreation enhancements included in the resource agencies' preliminary conditions and recommendations; (2) a Streamflow and Reservoir Elevation Gaging Plan filed by PCWA on September 6, 2011; and (3) three revised management plans (VIPMP, Transportation System Management, and a draft final HPMP). PCWA has indicated that although it supports the conditions and recommendations included in Alternative 1, it does not supersede its licensing proposal. Alternative 1 does not include all of the Forest Service preliminary 4(e) conditions. However, on December 3, 2012, the Forest Service filed final 4(e) conditions that replaced many of its preliminary conditions and includes many revised plans and flows compared to Alternative 1.

Additional and Modified Measures

Under the staff alternative, the project would include most of PCWA's proposed measures, as outlined above, with the exception of the following revisions or additional measures:

- Develop and implement a plan to identify optimal water release locations when project flow conduits need to be drained and protocols that would be used to drain the conduits to minimize erosion and sedimentation (same as Forest Service condition no. 33).
- Develop and implement an erosion and sediment control management plan to protect project water and aquatic habitat from degradation (same as Forest Service condition no. 46).

- Develop and implement a large woody debris (LWD) management plan for passage of LWD downstream of all project dams (same as Forest Service condition no. 30).
- If the sediment testing specified in the proposed Sediment Management Plan shows unacceptable levels of methylmercury, do not use that sediment for sediment augmentation.
- Implement the following Forest Service monitoring plans: Geomorphology/Riparian; Water Quality; Water Temperature; Fish Population; Benthic Macroinvertebrate; Foothill Yellow-legged Frog; Western Pond Turtle (same as Forest Service condition no. 28).
- Release the Forest Service pulse flows shown in tables 45 through 47 (same as Forest Service condition no. 23).
- Release the Alternative 1 minimum flows shown in table 43 (same as Forest Service condition no. 22).
- During the first two spill events when the Forest Service-specified downramping of spill flows occurs at French Meadows and Hell Hole dams, test the project's ability to manage spill flows on the declining limb of the spill event using the spillway, low-level outlet, and minimum flow outlet at French Meadows dam and the proposed new crest gates, modified low-level outlet, minimum flow outlet, and powerhouse at Hell Hole dam to provide the specified flow schedules. After the first two downramping events at French Meadows and Hell Hole dams, provide a testing report to the agencies and Commission documenting PCWA's ability to manage spill flows to provide the specified ramping rates and, if appropriate, include recommendations for ramping rate modifications (same as Forest Service condition no. 24).
- Release the peaking reach minimum flows specified in table 43 during planned annual outages and unplanned outages at Middle Fork and Ralston powerhouses during May through September and peaking reach minimum flows shown in table 44 when the Ralston powerhouse experiences an unplanned outage from June through September (Forest Service condition no. 25).
- Release the whitewater boating flows shown in tables 48 and 49 (same as Forest Service condition no. 40).
- Maintain the minimum water surface elevations shown in table 50 (same as Forest Service condition no. 38).
- Implement the Forest Service Streamflow and Reservoir Elevation Gaging Plan with the exception of not installing and operating a new gage on the

North Fork American River and two new gages on the lower end of the Rubicon River (Forest Service condition no. 32).

- Develop and implement a spawning habitat improvement plan for the Middle Fork downstream of Ralston afterbay dam (same as Forest Service condition no. 26).
- Monitor the status of, and notify the Commission in the event of likely restoration of, California Central Valley steelhead in the American River watershed, because passage upstream of Nimbus and Folsom dams may occur during the term of a new license, which could result in this federally-listed species gaining access to project-affected waters.
- Implement the Alternative 1 VIPMP (same as Forest Service condition no. 47).
- Expand the scope of the proposed preconstruction raptor nest surveys to include observations of special status wildlife.
- Revise the Forest Service Recreation Plan (Forest Service condition no. 34), which is similar to the Alternative 1 Recreation Plan but does not include a public access trail to the bypassed reach downstream of Middle Fork interbay dam and adds a publicly accessible catwalk around Middle Fork powerhouse. The revised plan should include:
    - provisions to replace the water system infrastructure and access roads associated with the following project recreational facilities: French Meadows North water system as necessary to provide water to Lewis campground; Gates group campground, Coyote group campground; McGuire picnic area; McGuire boat ramp; and French Meadows recreational vehicle dump station within 9 years;
    - clarification of PCWA's responsibility to operate and maintain the project recreation facilities without funding law enforcement;
    - provision of recreation opportunity marketing materials (maps and brochures). PCWA would develop the maps and brochures, and provide an electronic copy to the agencies;
    - monitoring and reporting procedures for bear-related incidents and an evaluation of existing and potential new measures for reducing interactions between humans and bears at project recreation facilities;
    - provisions for posting on PCWA's project website adjustment factors regarding predicted timing and magnitude of peaking reach flows immediately upstream of the confluence of the North Fork American River that can be applied to real-time flow information from U.S. Geological Survey (USGS) gage no. 11433300 (Middle

Fork American River near Foresthill) to provide visitors with information on whitewater boating and river crossing conditions;

  - provisions for inspecting signage at prominent points of public entry to the peaking reach for adequacy and assessing whether additional signage is needed to warn the public about potentially hazardous conditions associated with fluctuating peaking reach flows;
  - provisions for installing and maintaining permanent visual water level markers at Western States Trail river crossings, including interpretive information regarding the location of the markers in brochures, project websites, and on-site signage to enable visitors to assess conditions for crossing the river;
  - provisions to revise and update recreation maps and brochures every 6 years;
  - geographically organized descriptions of all project recreation facilities and a comprehensive description of all existing and proposed improvements and amenities at each project facility;
  - correct errors in the text to make it consistent with all tabular information;
  - expand the project boundary beyond those areas identified in PCWA's license application to include the entire length of Hell Hole trail between the dam and McKinstry trail (Forest Service trail no. 15E02); and
  - update cross-references to plans or documents to reflect the most current plans or documents (e.g., the Alternative 1 and Forest Service Recreation Plans both reference a Transportation System Management Plan that has since been updated by the Forest Service Transportation System Management Plan).

- Implement the Forest Service Transportation System Management Plan, with visual condition assessments every 6 years instead of every 5 years to synchronize data collection and reporting with the FERC Form 80 filing schedule (Forest Service condition no. 44).
- Implement the Forest Service Fire Prevention and Suppression Plan (same as Forest Service condition no. 45)..
- Modify the Visual Resource Management Plan to conduct visual condition assessments every 12 years instead of every 5 years to synchronize data collection and reporting with the FERC Form 80 filing schedule and revise the plan every 12 years instead of every 5 years.

- Implement the final HPMP filed on September 21, 2012 (same as Forest Service condition no. 41).

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented.

Public Involvement and Areas of Concern

Before filing its license application, PCWA conducted pre-filing consultation under the Integrated Licensing Process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to application filing.

After application filing, we conducted scoping to determine what issues and alternatives should be addressed. On February 11, 2008, we distributed a scoping document to interested parties, soliciting comments, recommendations, and information on the project. We held two scoping meetings on March 4, 2008, in Auburn, California, to request oral comments on the project. On June 7, 2011, we issued notice that the application was ready for environmental analysis and requested conditions and recommendations.

On August 3, 2012, we issued the draft EIS on the application to relicense the project. We conducted two public meetings regarding our draft EIS on August 28, 2012, in Auburn, California. Comments on the draft EIS were due by October 2, 2012, and we received comments from: the U.S. Department of the Interior, Office of Environmental Policy and Compliance; Foothills Water Network; PCWA; Western States Trail Foundation; California State Water Resources Control Board; the Forest Service; California Department of Fish and Game; California State Parks; U.S. Environmental Protection Agency; Jamin Horn; Patricia Gibbs; and Hilde Schweitzer.

The primary issues associated with relicensing the project are sediment management, flow regimes in project bypassed and peaking reaches, whitewater boating opportunities, recreational enhancements, and cultural resources.

Staff Alternative

Geology and Soils

Project dams interrupt the downstream transport of sediment and LWD, which can have an adverse effect on aquatic habitat. Project-related ground-disturbing activities related to the proposed recreation facility changes and improvements and project upgrades could result in erosion and sedimentation.

Infrastructure improvements proposed at the three small diversion dams would enhance sediment and LWD transport downstream of these dams. Gravel augmentation

downstream of Middle Fork interbay and Ralston afterbay dams would enhance spawning and riparian habitat. Assessing the feasibility of options to enhance downstream LWD transport at all project dams could enhance aquatic habitat at stream reaches if these options are implemented. Developing an erosion and sediment control management plan would ensure that best management practices are in place during and after ground-disturbing activities. The plan would minimize erosion and sedimentation associated with recreation facility changes and improvements and construction of project upgrades at the three small dams and French Meadows, Hell Hole, and Middle Fork interbay dams, in addition to installation of new instream flow gages in various project-affected reaches.

Aquatic Resources

Current project operation maintains relatively constant year-round minimum flows in the project bypassed reaches, which is not representative of the natural seasonal and year-to-year variations that can provide important geomorphic and aquatic biotic functions. Daily changes in flow associated with peaking operation of the Oxbow powerhouse can range from 75 to 1,025 cfs causing changes in the water surface elevation of 1 to 2.3 feet during a typical summer peaking event. Such rapid changes in flow can displace fish and invertebrates that serve as prey for fish to downstream locations, strand organisms during downramping, and quickly change the character of aquatic habitat. Trout spawning and rearing under such variable conditions is minimal. Entrainment of fish into project intakes is low at the small diversion dams and at French Meadows and Hell Hole reservoirs, but has not been successfully studied at the Ralston and Oxbow powerhouse intakes.

Some enhancement of trout recruitment to the peaking reach would occur from gravel augmentation in the Ralston afterbay bypassed reach where spawning habitat would be enhanced. Implementing minimum flows in the bypassed reaches, with higher minimum flows during the spring trout spawning and incubation period, would increase spawning habitat and enhance trout populations. Implementing spring pulse flows, which simulate natural high flows during wet and above normal water year types, would facilitate gravel dispersion without scouring redds and provide flow-related cues for breeding foothill yellow-legged frogs. Implementing downramping following spill events at French Meadows and Hell Hole dams would reduce the potential for stranding aquatic biota. Implementing gravel augmentation would result in increased downstream gravel dispersion and increased trout spawning habitat in the bypassed reach downstream of Middle Fork interbay dam and the peaking reach. Implementing higher minimum flows in the peaking reach would reduce the range of daily water level fluctuations and enhance trout rearing and foraging habitat. Implementing the spawning habitat improvement plan for the bypassed reach downstream of Ralston afterbay dam would enhance trout recruitment in the peaking reach. Implementing entrainment studies at the Ralston and Oxbow powerhouses would provide data to determine whether or not

protective measures are necessary. Installing the proposed screens at the three small diversion dams would essentially eliminate entrainment of fish at these diversions.

Terrestrial Resources

Natural plant and wildlife communities would be disturbed or displaced by the proposed project facility upgrades and during operation and maintenance as follows: there would be a permanent loss of about 1.08 acres of riparian vegetation at the peaking reach sediment augmentation sites and new project features such as PCWA's proposed new stream gaging stations; 0.24 acre of vegetation would be temporarily removed at Hell Hole dam during construction of the proposed new crest gate and outlet modifications; and an additional 0.07 acre of vegetation would be permanently removed for the new French Meadows reservoir trail.

Implementing the VIPMP would provide for the specification of specific practices that would be used for vegetation management and weed control and include provisions for surveying for and protecting special status plants and wildlife during treatments. The plan includes more detail than PCWA's proposed plan regarding management measures, which would better protect sensitive plants and wildlife, including those that may be important to Native Americans, such as more specificity about treatment at each of the 193 sites where vegetation management would occur and revegetation procedures that would be used following noxious weed treatments. Implementation of the plan would ensure temporarily disturbed vegetation is revegetated following construction or maintenance activities and the effectiveness of revegetation monitored. The plan would effectively control noxious weeds within the project boundary for the term of a new license, whereas PCWA's proposed plan would only treat limited areas over a 2-year period.

Implementing PCWA's proposed modifications to existing facilities and eliminating certain recreation facilities near Stebbins phacelia populations would reduce project effects on this rare species. Implementing PCWA's proposed increase in the storage capacity of Hell Hole reservoir may adversely affect some populations of Stebbins phacelia because of potential more frequent inundation. Implementing the Recreation Plan would continue fish stocking at historic rates, which would maintain the bald eagle and osprey prey base.

Recreation, Land Use, and Aesthetic Resources

The proposed recreation plan would provide the means to maintain existing recreation facilities and develop new recreation opportunities by upgrading campsites and parking areas, extending boat ramps, installing accessible restrooms, installing trailheads, extending existing trails, stocking reservoirs, providing real-time flow information for recreational boaters, and creating a visitor brochure outlining recreation opportunities at and near the project. In addition, the plan includes monitoring recreation use over the term of the license to meet recreation user needs and provide quality recreation

experiences while minimizing the effects of recreation use on other resources at the project.

Implementing the staff alternative Recreation Plan would provide:

- clarification of the licensee's recreation facility maintenance responsibilities;
- potable water, group use facilities, and trails that meet identified recreation needs;
- increased public access to project reservoirs with new and extended boat ramps;
- brochures and maps to increase public awareness of recreation opportunities associated with the project;
- a program to stock fish at French Meadows and Hell Hole reservoirs at historical levels to maintain angling opportunities; and
- periodic monitoring to identify emerging recreation-related issues and assess recreational use relative to established capacity thresholds for providing additional or changed facilities to address project effects during the license term.

The staff alternative Recreation Plan would be similar to the Forest Service Recreation Plan but would: (1) require improvements to the French Meadows North water system that are only necessary to ensure potable water is provided to the project recreation facilities; and (2) not include new facilities at Ellicott Bridge because recreation use at this location is not project related.

Implementing scheduled releases of 1,000 cfs in the peaking reach would improve conditions for whitewater boating because these flows, which are generally higher than what is currently released, would be within the range of optimum flows (1,000 to 1,250 cfs) for whitewater boating. There would also be more whitewater boating opportunities provided by longer duration releases that would occur earlier in the day as compared to PCWA's proposed flow schedule and existing conditions. The scheduled releases in the peaking reach would also support suitable conditions for river crossings by the public during special events such as the Western States 100 Endurance Run and Tevis Cup Equestrian Ride. Providing public flow information and visual water level markers would reduce the potential for visitors being stranded by fluctuating flows in the peaking reach.

Implementing the Transportation Management System Plan would define maintenance responsibilities and provide for periodic monitoring during the license term that would ensure project roads and trails are safe and properly maintained. The measures and procedures contained in the Fire Prevention and Suppression Plan would ensure PCWA operates and maintains the project to protect life, health, and property.

Implementing the Visual Resource Management Plan would protect or improve the aesthetic quality of the area by implementing specific treatments at 14 project locations, conducting periodic condition assessments, and consultation with the Forest Service when implementing future actions (e.g., constructing or reconstructing facilities).

Cultural Resources

Project-related facility construction (including proposed infrastructure modifications at the three small diversion dams, French Meadows, Hell Hole, and Middle Fork interbay dams, at the new stream gaging stations, and at the new and modified recreational facilities), as well as maintenance (including sediment management, gaging stations, and project-related hydroelectric and recreational facilities), and operation (including impoundment fluctuations and variable streamflows) could disturb sensitive cultural resources including the submersion of cultural sites beneath project reservoirs, disturbance of previously unknown sites during construction, and unintentional or intentional disruption of sites by the public. Specifically, PCWA identified nine archaeological resources within the project's area of potential effects (APE) that are experiencing or are susceptible to project-related effects. Four sites are eligible for listing on the National Register of Historic Places and may be affected by recreational use or improvements; one of these sites is also potentially affected by reservoir fluctuations. Two additional sites were reported to be within the APE but were inundated during field inspections, and their National Register of Historic Places eligibility and condition are unknown. One resource could be affected by road maintenance and trail upgrades, one by maintenance of an existing project gaging station, and a final site could be affected by trail maintenance activities. Implementing the final HPMP would protect these and other cultural resources and historic properties from project-related effects for the term of a new license.

No-action Alternative

Under the no-action alternative, PCWA would continue to operate the project as it currently does without making any of its proposed modifications to project facilities including new recreation facilities. Environmental conditions would remain the same, and no enhancement of environmental resources would occur.

Conclusions

Based on our analysis, we recommend licensing the project as proposed by PCWA with some staff modifications and additional measures.

In section 4.2 of the EIS, we estimate the likely cost of alternative power for each of the three alternatives identified above. Our analysis shows that, during the first year of operation under the no-action alternative, project power would cost $23,069,170, or $22.20 per megawatt-hour (MWh) less than the likely alternative cost of power. Under the proposed action alternative, project power would cost $19,302,360, or $19.41/MWh less than the likely alternative cost of power. Under the staff alternative, project power

would cost $18,634,700, or $18.90/MWh less than the likely alternative cost of power. Under Alternative 1, project power would cost $18,527,570, or $18.79/MWh less than the likely alternative cost of power. We chose the staff alternative as the preferred alternative because: (1) the project would provide a dependable source of electrical energy for the region (985,877 MWh annually); (2) the project could save an equivalent amount of fossil-fueled generation and capacity, which may help conserve non-renewable energy resources and reduce atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures proposed by PCWA, as modified by staff, would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the proposed and recommended environmental measures.

FINAL ENVIRONMENTAL IMPACT STATEMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

Middle Fork American River Hydroelectric Project
FERC Project No. 2079-069--California

1.0 INTRODUCTION

1.1 APPLICATION

On February 23, 2011, Placer County Water Agency (PCWA) filed an application for new license with the Federal Energy Regulatory Commission (Commission or FERC) for the Middle Fork American River Hydroelectric Project (Middle Fork Project). The 223.753-megawatt (MW) project[9] is located within the Middle Fork American River (Middle Fork) watershed on the Middle Fork of the American and Rubicon Rivers and Duncan and North and South Fork Long Canyon Creeks (figure 1). Nearby population centers include the town of Foresthill and city of Auburn. The existing project occupies about 3,268 acres of federal land within the Tahoe and Eldorado National Forests, administered by U.S. Department of Agriculture-Forest Service (Forest Service). The project generates an average of about 1,039,078 megawatt-hours (MWh) of energy annually. PCWA proposes modifications to the diversion structures, and French Meadow, Hell Hole, and Middle Fork interbay outlet works to accommodate increased instream flows. PCWA also proposes to increase the storage capacity of Hell Hole reservoir by approximately 7,600 acre-feet which, in turn, would increase the average annual generation at the Hell Hole powerhouse.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Middle Fork Project is to continue to provide a source of hydroelectric power and serve as a water supply for both domestic and irrigation purposes. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to PCWA for the Middle Fork Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will

[9] The authorized installed capacity of the project is 223.753 MW as per Commission order issued September 8, 2004.

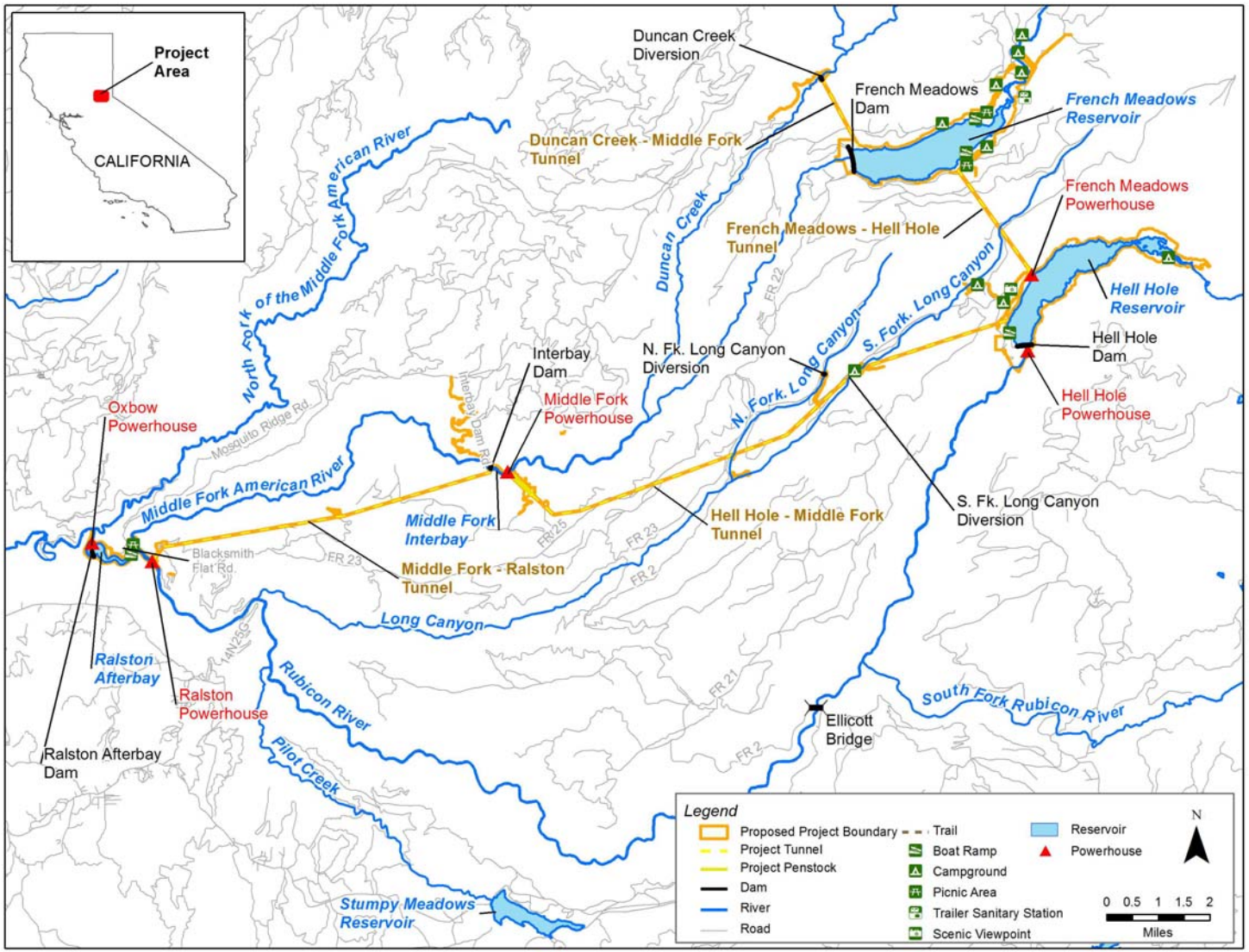

Figure 1. Location of Middle Fork American River Hydroelectric Project (Source: PCWA, 2011a, as modified by staff).

be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the Middle Fork Project would allow PCWA to continue generating electricity for the term of a new license, making electrical power from a renewable resource available to the California electrical grid.

This environmental impact statement (EIS) assesses the effects associated with operation of the project and alternatives to the proposed project. It also includes recommendations to the Commission on whether to issue a new license, and if so, includes the recommended terms and conditions to become a part of any license issued.

In this EIS, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by the applicant; (2) as specified in Alternative 1, a complete project alternative; and (3) with our recommended measures. We also consider the effects of the no-action alternative. Important issues that are addressed include: establishing sediment management; establishing flow regimes in project bypassed and peaking reaches for aquatic resources and, in the peaking reach, whitewater boating opportunities; recreational enhancements; and cultural resources.

1.2.2 Need for Power

The Middle Fork Project provides hydroelectric generation to meet part of the state of California's power requirements, as well as its resource diversity and capacity needs. The proposed project would have an authorized installed capacity of 223.753 MW and generate approximately 994,444 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Middle Fork Project is located in the California-North subregion of the Western Electricity Coordinating Council (WECC) region of the NERC. According to NERC's 2011 forecast, summer total internal demand for the California-North subregion is projected to grow at an annual rate of 1.35 percent from 2011 through 2021 (NERC, 2011). NERC projects summer and winter resource capacity margins (generating capacity in excess of demand) will not fall below target margins throughout the 2011-2021 period. WECC's projections of capacity margin through the 2012 to 2020 period anticipate additional capacity resources will come on line in the California-North subregion as follows: wind—219 MW; hydro—390 MW, thermal—5,609 MW; solar—5,182 MW; and other—50 MW (WECC, 2011).

We conclude that power from the Middle Fork Project would help meet a need for power in the California-North subregion of the Western Electricity Coordinating Council in both the short- and long-term. The project provides low-cost power that displaces non-

renewable, fossil-fired generation and contributes to a diversified generation mix. Displacing the operation of fossil-fueled facilities may avoid some power plant emissions, which creates an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the Middle Fork Project is subject to numerous requirements under the FPA and other applicable statutes. We summarize the major regulatory requirements in table 1 and describe them below.

Table 1. Major statutory and regulatory requirements for the Middle Fork American River Hydroelectric Project.

Requirement	Agency	Status
Section 18 of the FPA (fishway prescriptions)	Interior, NMFS	NMFS and Interior reserved its authority to prescribe fishways by letters filed on August 1 and 5, 2011, respectively
Section 4(e) of the FPA (land management conditions)	Forest Service	Section 4(e) conditions filed on August 5, 2011, and modified conditions filed on December 3, 2012
Section 10(j) of the FPA	NMFS, California Department of Fish and Game	NMFS and California Department of Fish and Game filed section 10(j) recommendations on August 1 and 5, 2011, respectively
Clean Water Act—water quality certification	California State Water Resources Control Board	Application for water quality certification withdrawn and refiled by PCWA, and received by the Water Board on June 12, 2012
Endangered Species Act Consultation	FWS	We sought concurrence from FWS by letter dated July 24, 2012, with our conclusion regarding federally listed species in this EIS; to date, no reply has been received

Requirement	Agency	Status
Coastal Zone Management Act Consistency	California Coastal Commission	Project is outside the designated coastal zone
National Historic Preservation Act	California SHPO	A PA will be issued that implements the final HPMP
Wild and Scenic Rivers Act	Reclamation and Forest Service	We conclude project would not diminish outstandingly remarkable values
Magnuson-Stevens Fishery Conservation and Management Act	NMFS	No designated essential fish habitat for salmonids is located upstream of Nimbus dam; project would not affect

Notes: California SHPO–California State Historic Preservation Officer

FPA–Federal Power Act

Forest Service–U.S. Department of Agriculture-Forest Service

FWS–U.S. Fish and Wildlife Service

HPMP–Historic Properties Management Plan

Interior–U.S. Department of the Interior

NMFS–U.S. Department of Commerce-National Marine Fisheries Service

PA–Programmatic Agreement

Reclamation–U.S. Department of Interior-Bureau of Reclamation

Water Board—California State Water Resources Control Board

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 Commerce or the U.S. Department of the Interior (Interior). The U.S. Department of Commerce-National Marine Fisheries Service (NMFS), by letter filed on August 1, 2011, and Interior, by letter filed on August 5, 2011, request that a reservation of authority to prescribe fishways under section 18 be included in any license issued for the project.

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 will 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 Forest Service filed conditions on August 5, 2011, and modified conditions on December 3, 2012, pursuant to section 4(e) of the FPA. These conditions are described under section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*.

1.3.1.3 Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

NMFS and the California Department of Fish and Game (California Fish and Game) timely filed, on August 1 and August 5, 2011, respectively, recommendations under section 10(j), as summarized in table 51, in section 5.4.1, *Recommendations of Fish and Wildlife Agencies*. The U.S. Department of the Interior-Fish and Wildlife Service (FWS) did not file any recommendations under section 10(j). In section 5.4, we discuss how we address the agency recommendations and comply with section 10(j).

1.3.2 Clean Water Act

Under section 401 of the Clean Water Act, a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the Clean Water Act. On July 15, 2011, PCWA applied to the California State Water Resources Control Board (Water Board) for 401 water quality certification for the Middle Fork American River Project. On June 12, 2012, PCWA simultaneously withdrew and refiled its request for 401 water quality certification for the Middle Fork American River Project. The Water Board received this request on June 12, 2012. The Water Board has until June 12, 2013, to act on the request.

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 endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. Although no federally listed species are known to occur in the

project vicinity, three federally listed species have the potential to occur: the threatened Layne's ragwort (*Senecia layneae*), the threatened valley elderberry longhorn beetle (*Desmorcerus californicus dimorphus*); and the threatened California red-legged frog (*Rana draytonii*). Our analyses of project impacts on threatened and endangered species are presented in section 3.3.4, *Threatened and Endangered Species*, and our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative*.

We conclude that the relicensing of the Middle Fork American River Project, as proposed with staff-recommended measures, is not likely to adversely affect the Layne's ragwort and would have no effect on the valley elderberry longhorn beetle or California red-legged frog. We requested FWS concurrence with our conclusion regarding Layne's ragwort by letter dated July 24, 2012. FWS has not yet replied to our request.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code (U.S.C.) § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

The project is not located within the state-designated coastal zone (http://ceres.ca.gov), and relicensing the project would not affect California's coastal resources. Therefore, the project is not subject to California coastal zone program review, and no consistency certification is needed for the action. We sought concurrence with our conclusion from the California Coastal Commission by letter dated July 24, 2012. The California Coastal Commission has not yet replied to our request.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) 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 inclusion in the National Register of Historic Places (National Register).

To meet the requirements of section 106, the Commission staff intends to execute a Programmatic Agreement (PA) that would have PCWA implement the final Historic Properties Management Plan (HPMP). Commission issued a draft PA on August 23, 2012, concurrent with issuance of the draft EIS. Commission staff intends to issue a final PA for signatures concurrent with issuance of the final EIS.

1.3.6 Wild and Scenic Rivers Act

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to make a determination as to whether the operation of the project under a new license would invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the designated river corridor. Public Law 95-111 (November 10, 1978) designated portions of the North Fork American River, the Middle Fork American River, and the Rubicon River as eligible or suitable for inclusion in the National Wild and Scenic River system.

Eligible segments of the Middle Fork American River were nominated for their outstandingly remarkable values of:

- Recreation—Western States Trail (Tevis Cup and Western States Endurance Run);
- Scenic—Land and water form due to deep and steep canyon walls;
- Wildlife—High quality and diverse habitat for valley elderberry longhorn beetle and other candidate endangered or threatened species;
- Fish—Rainbow trout and habitat provided by coldwater releases from Oxbow powerhouse;
- Ecological and other values—Biological communities for Lindsey's Skipper butterfly; and
- Cultural—One of the first manmade bedrock tunnels (Horseshoe Bar Tunnel) in California.

Suitability studies have not been conducted and are not planned at this time. Regardless, federal agencies, including Reclamation, manage the river and the area within 0.25 mile either side of the river to preserve the values for which the river is considered eligible under the Wild and Scenic Rivers Act.

Three segments of the Rubicon River, from Hell Hole dam to Ralston afterbay, were found to be eligible and suitable for inclusion in the National Wild and Scenic Rivers system by the Forest Service; however, none of these segments have been formally included in the National Wild and Scenic Rivers system. Regardless, Eldorado National Forest manages the Rubicon River and a 0.25-mile corridor on each side of the river to protect fisheries, which is the outstandingly remarkable value identified in its Wild and Scenic River eligibility and suitability studies. A small segment of the Rubicon River below Hell Hole dam (0.48 mile) and a small section (0.12 mile) of the Rubicon River upstream of Ralston afterbay are within the project boundary, and project operation affects streamflow in the Rubicon River.

We conclude that none of the action alternatives would diminish the outstandingly remarkable values of the eligible river segments.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [C.F.R.], sections 5.1–5.16) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EIS, we conducted scoping to determine what issues and alternatives should be addressed. A scoping document was distributed to interested agencies and others on February 11, 2008. It was noticed in the Federal Register on February 19, 2008. Two scoping meetings, both advertised in the local newspaper, were held on March 4, 2008, in Auburn, California, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
FWS	April 2, 2008
Protect American River Canyons	April 11, 2008
Forest Service and California Fish and Game	April 11, 2008

The commenting entities did not identify any new issues or alternatives beyond those that were identified in the scoping document. Therefore, the scoping document issued on February 11, 2008, was not revised.

1.4.2 Interventions

On June 7, 2011, the Commission issued a notice that PCWA had filed an application to relicense the Middle Fork Project. This notice set August 8, 2011, as the deadline for filing protests and motions to intervene. In response to the notice, the following entities filed motions to intervene:

Intervenor	Date Filed
Pacific Gas and Electric Company	June 13, 2011
State Water Resources Control Board	June 23, 2011
Sackheim Consulting	June 25, 2011
California Fish and Game	July 28, 2011

Intervenor	Date Filed
NMFS	August 1, 2011
Foothill Angler Coalition, California Sportfishing Protection Alliance, California Outdoors, American Whitewater, Protect American River Canyons, Trout Unlimited, Granite Bay Flycasters, Federation of Flyfishers, Upper American River Foundation, Horseshoe Bar Fish and Game Preserve, Bill Carnazzo, Hilde Schweitzer, and John Donovan (Foothills Water Network et al.)	August 2, 2011
Interior	August 5, 2011
El Dorado Water & Power Authority	August 5, 2011
Forest Service	August 8, 2011

1.4.3 Comments on the Application

A notice requesting comments on the application was issued on June 7, 2011. The following entities commented:

Commenting Agency and Other Entity	Date Filed
NMFS	August 1, 2011
Forest Service	August 5, 2011
California Fish and Game	August 5, 2011
Interior	August 5, 2011
PCWA	August 8, 2011

The applicant filed reply comments on September 6, 2011.

1.4.4 Comments on the Draft EIS

On August 3, 2012, we issued a draft EIS for the proposed Middle Fork American River Project. Comments on the draft EIS were due by October 2, 2012. In addition, we conducted two public meetings to receive oral comments on the draft EIS in Auburn, California, on August 28, 2012. In addition to comments received at the public meetings, written comments on the draft EIS were filed by the following entities:

Commenting Entity	Filing Date
U.S. Department of the Interior, Office of Environmental Policy and Compliance[a]	September 26, 2012
Foothills Water Network	October 1, 2012
Placer County Water Agency	October 1, 2012
Western States Trail Foundation	October 1, 2012
California State Water Resources Control Board	October 2, 2012
U.S. Department of the Interior, Office of Environmental Policy and Compliance	October 2, 2012
Forest Service	October 2, 2012
California Fish and Game	October 2, 2012
California Department of Parks and Recreation	October 2, 2012
U.S. Environmental Protection Agency	October 3, 2012

Individual Commenter	Filing Date
Jamin Horn	August 7, 2012
Patricia Gibbs	September 17, 2012
Hilde Schweitzer	September 28, 2012

[a] This agency comment letter did not contain any comments, and Interior states that its comment letter dated October 2, 2012, supersedes this letter.

Appendix A summarizes all comments received, includes our responses to those comments, and indicates where we made modifications to the EIS.

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2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is the baseline from which to compare the proposed action and all action alternatives that are assessed in the environmental document. Under the no-action alternative, the project would continue to operate under the terms and conditions of the current license.

2.1.1 Existing Project Facilities

The Middle Fork Project includes five developments: French Meadows, Hell Hole, Middle Fork, Ralston, and Oxbow. These developments include seven diversion structures, various water conveyance tunnels, pipes and penstocks, and five powerhouses. The locations of the various facilities and features are shown in figure 1, and a schematic of project facilities is provided in figure 2.

2.1.1.1 French Meadows Development

The French Meadows development is on the Middle Fork and a tributary, Duncan Creek, and includes: (1) the Duncan Creek diversion consisting of: (a) a 32-foot-high, 165-foot-long, concrete gravity diversion dam with a crest at elevation 5,275 feet[10] and a 100-foot-wide uncontrolled ogee spillway; (b) a 2-acre impoundment at elevation 5,265 feet with 20-acre-feet of gross storage and negligible active storage; (c) a 10-inch-diameter instream flow maintenance pipe conveying flows from the Duncan Creek diversion impoundment to Duncan Creek with a maximum discharge capacity of 8 cubic feet per second (cfs); (d) a 60-inch-diameter low level outlet pipe also conveying water from the Duncan Creek diversion impoundment to Duncan Creek with a maximum discharge of 310 cfs; (e) the 1.5-mile-long, 9-foot-wide by 10-foot-high Duncan Creek-Middle Fork tunnel, which routes water from the Duncan Creek diversion to the French Meadows reservoir, with a maximum discharge capacity of 400 cfs; (2) the French Meadows dam and reservoir on the Middle Fork consisting of: (a) a 231-foot-high, 0.5-mile-long rock and gravel-filled dam with a crest at elevation 5,273 feet and a 40-foot-wide spillway (extending to the Middle Fork American river about 1,000 feet downstream of the dam) that includes two 20-foot-wide radial gates; (b) a 1,408-acre reservoir at elevation 5,262 feet with 134,993 acre-feet of gross storage and 127,358 acre-feet of active storage; (c) an 8-inch-diameter instream flow maintenance pipe conveying flows from the French Meadows reservoir to the Middle Fork with a maximum discharge capacity of 8 cfs; and (d) a 72-inch-diameter low level outlet pipe also conveying water from the French Meadows reservoir to the Middle Fork with a maximum discharge capacity of 1,430 cfs; (3) the 2.6-mile-long, 12.3-foot-wide French Meadows-Hell Hole tunnel, which routes water from the French Meadows reservoir to the French Meadows powerhouse penstock; (4) a 6.25-foot-diameter, 691-foot-long penstock conveying water

[10] All elevations are referenced to mean sea level.

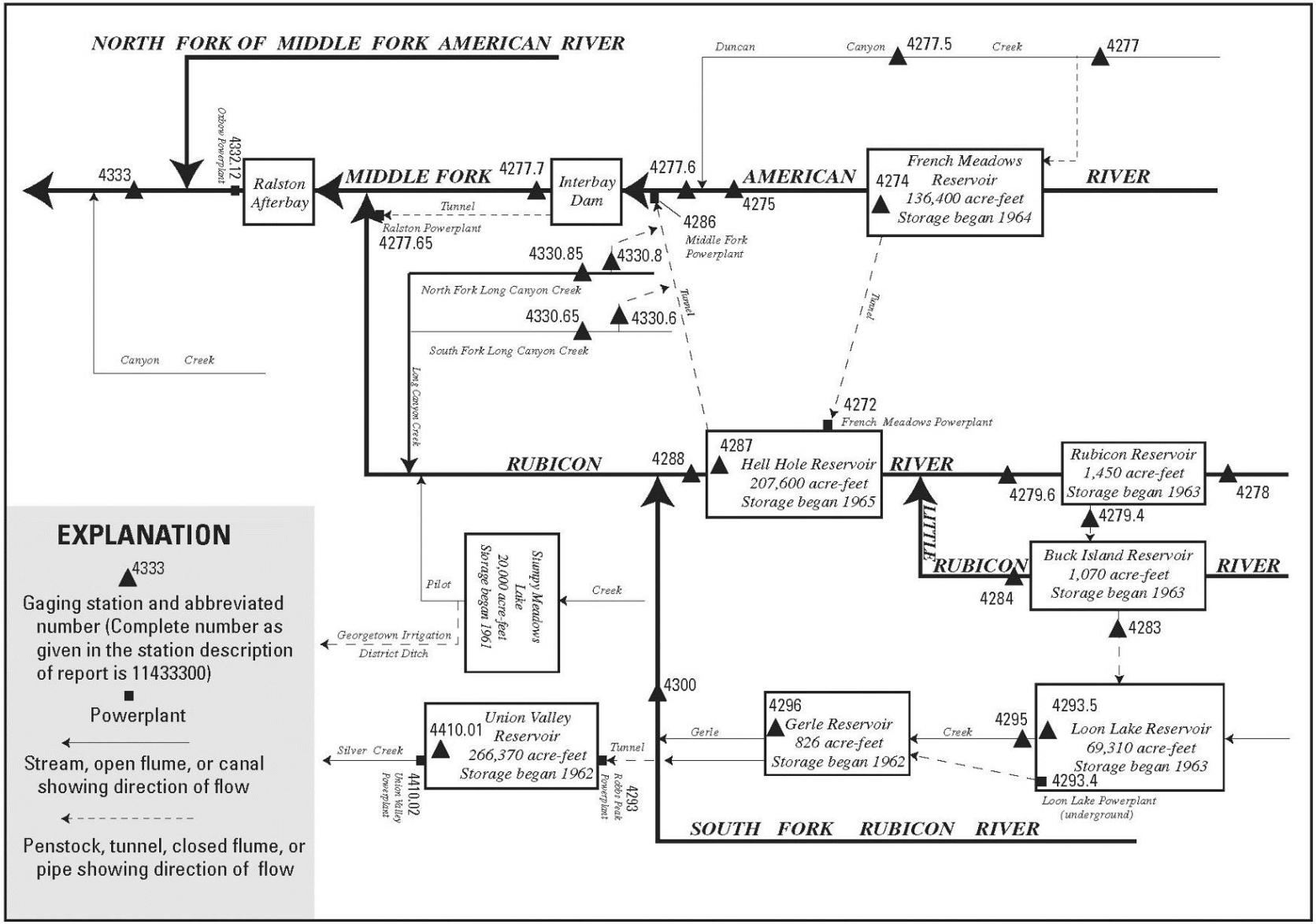

Figure showing diversions and storage in Middle Fork American and Rubicon River Basins.

Figure 2. Middle Fork Project schematic and relationship to other reservoirs in the Middle Fork American and Rubicon River basins (Source: USGS, 2012).

from the French Meadows-Hell Hole tunnel to the French Meadows powerhouse; (5) the 45-foot by 68-foot French Meadows powerhouse housing a Francis-type unit with an authorized installed capacity of 15.3 MW discharging a maximum of 800 cfs to Hell Hole reservoir on the Rubicon River; and (6) the French Meadows switchyard. The diversion of water at the French Meadows development results in an 8.6-mile-long bypassed reach in Duncan Creek and an 11.6-mile-long bypassed reach in the Middle Fork.

2.1.1.2 Hell Hole Development

The Hell Hole development is located southeast of the French Meadows development on the Rubicon River and includes: (1) the rock-filled 410-foot-high, 1,570-foot-long Hell Hole dam with a crest at elevation 4,650 feet and a 350-foot-wide uncontrolled spillway; (2) the 1,253-acre Hell Hole reservoir at elevation 4,630 feet with 207,590 acre-feet of gross storage and 205,057 acre-feet of active storage; (3) an outlet tunnel that leads from Hell Hole reservoir to a 16-inch-diameter instream flow maintenance pipe that conveys flows to the Rubicon River with a maximum discharge capacity of 20 cfs and a 48-inch-diameter low level outlet pipe conveying flows to the Rubicon River or to the powerhouse penstock with a maximum discharge capacity of 852 cfs; (4) a 100-foot-long, 48-inch to 20-inch-diameter penstock that also conveys flows from the low level outlet pipe to the powerhouse; and (5) the 24-foot by 26-foot Hell Hole powerhouse located at Hell Hole dam on the Rubicon River housing a Francis-type unit with an authorized installed capacity of 725 kW discharging tailrace water to the Rubicon River. The diversion of water at the development results in a 30.5-mile-long bypassed reach in the Rubicon River.

2.1.1.3 Middle Fork Development

The Middle Fork development is located on the Middle Fork and on two tributaries (North Fork and South Fork) of Long Canyon Creek (a tributary of the Rubicon River) and includes: (1) the North Fork Long Canyon Creek diversion consisting of: (a) a 10-foot-high, 120-foot-long diversion dam with a crest at elevation 4,720 feet; (b) a 12-inch-diameter instream flow maintenance pipe conveying water from the diversion dam to the North Fork with a maximum discharge capacity of 2 cfs; (c) a 36-inch-diameter low level outlet pipe conveying water from the diversion dam with a maximum discharge capacity of 100 cfs; and (d) a conveyance structure that routes water from the diversion dam to the Hell Hole-Middle Fork tunnel consisting of a 36-inch-diameter, 0.7-mile-long buried steel pipe, a 403-foot-long, 6-foot-diameter vertical shaft, and a 54-foot-long tunnel with a maximum capacity of 100 cfs; (2) the South Fork Long Canyon Creek diversion consisting of: (a) a 27-foot-high, 145-foot-long diversion dam with a crest at elevation 4,650 feet and a 60-foot-long uncontrolled ogee spillway; (b) a 12-inch-diameter instream flow maintenance pipe conveying flows from the diversion dam to the South Fork with a maximum discharge capacity of 5 cfs; (c) a 36-inch-diameter low level outlet pipe conveying water from the diversion dam with a maximum discharge capacity of 140 cfs; and (d) conveyance structure that routes water from the

diversion dam to the Hell Hole-Middle Fork tunnel and consisting of a 42-inch-diameter, 50-foot-long buried steel pipe, a 387-foot-long, 6-foot-diameter vertical shaft, and a 27-foot-long tunnel with a maximum capacity of 200 cfs; (3) the Hell Hole-Middle Fork tunnel that routes water from the Hell Hole reservoir to the Middle Fork powerhouse penstock and is a 13.4-foot-wide, 10.4-mile-long, horseshoe-shaped tunnel with a maximum capacity of 920 cfs; (4) the Hell Hole-Middle Fork tunnel surge shaft and tank located at the end of the Hell Hole-Middle Fork tunnel 1,800 feet from the tunnel outlet and consisting of an 8-foot-diameter surge shaft and a 60-foot diameter by 22-foot high above-ground surge tank; (5) (5) a 0.7-mile-long penstock conveying water from the end of the Hell Hole-Middle Fork tunnel to the Middle Fork powerhouse 7.5 to 9 feet in diameter above the bifurcation and 5.5 feet in diameter below; and (6) the 62-foot by 154-foot Middle Fork powerhouse (11 miles downstream from the French Meadows dam) that houses two Pelton-type units each having an authorized installed capacity of 61.200 MW, discharging water into the Middle Fork interbay pool. The diversion of water at the Middle Fork development results in a 3.1-mile-long bypassed reach in North Fork Long Canyon Creek, a 3.3-mile-long bypassed reach in the South Fork Long Canyon Creek, and an 11.4-mile-long bypassed reach on Long Canyon Creek from the confluence of the North and South Forks to the confluence with the Rubicon River.

2.1.1.4 Ralston Development

The Ralston development is located on the Rubicon River and the Middle Fork and includes: (1) the Middle Fork interbay[11] dam (about 0.5 mile downstream of the Middle Fork powerhouse), a 70.5-foot-high, 233-foot-long dam with a crest at elevation 2,536 feet; (2) the interbay impoundment that is less than 7 acres with 175 acre-feet of gross storage and 173 acre-feet of active storage; (3) a 23-inch-diameter instream flow maintenance pipe conveying water from the interbay pool to the Middle Fork with a maximum discharge capacity of 23 cfs; (4) a 60-inch-diameter low level outlet pipe conveying water from the interbay pool with a maximum discharge capacity of 890 cfs; (5) the 13.4-foot-wide, 6.7-mile-long horseshoe-shaped Middle Fork-Ralston tunnel which routes water from the Middle Fork interbay pool to the Ralston powerhouse with a maximum capacity of 836 cfs; (6) the Middle Fork-Ralston tunnel surge shaft and tank located at the end of the Middle Fork-Ralston tunnel 500 feet from the tunnel outlet and consisting of a 10-foot-diameter surge shaft and a 60-foot diameter by 22-foot high above-ground surge tank; (7) a 1,670-foot-long, 8- to 9.5-foot-diameter penstock leading from the end of the Middle Fork-Ralston tunnel to the Ralston power house; (8) the 82-foot by 90-foot Ralston powerhouse (located 30 miles downstream from the Hell Hole powerhouse on the Ralston afterbay formed by the Rubicon and Middle Fork Rivers) that houses a Pelton-type unit with an authorized installed capacity of 79.2 MW and

[11] The term interbay refers to the impoundment's function as both an afterbay (receives flow from the Middle Fork powerhouse) and a forebay (provides flows to the Ralston powerhouse).

discharges water to the Ralston afterbay[12] on the Middle Fork and Rubicon Rivers; and (9) the Ralston switchyard. The diversion of water at the Ralston development results in a 10.8-mile-long bypassed reach in the Middle Fork.

2.1.1.5 Oxbow Development

The Oxbow development is located on the Middle Fork and includes: (1) the Ralston afterbay dam (located 9.5 miles downstream of the Middle Fork interbay impoundment), an 89-foot-high, 560-foot-long dam with a crest at elevation 1,189 feet and a 232-foot-wide gated ogee spillway containing five 40-foot-wide radial spillway gates; (2) the 83-acre Ralston afterbay impoundment at elevation 1,177 feet with 2,782 acre-feet of gross storage and 1,804 acre-feet of active storage of which 756 acre-feet is available to the Oxbow powerhouse; (3) a 30-inch-diameter instream flow maintenance pipe conveying flows from the Ralston afterbay impoundment through the dam to the Middle Fork with a maximum discharge capacity of 155 cfs; (4) a 72-inch-diameter low level outlet pipe through the dam with a maximum discharge capacity of 1,132 cfs; (5) the Ralston-Oxbow tunnel, which connects the Ralston afterbay to the Oxbow powerhouse and consists of a 13.25-foot-wide, 403-foot-long horseshoe-shaped tunnel with a maximum capacity of 1,088 cfs; (6) a 5-foot-long, 9-foot-diameter penstock leading from the end of the Ralston-Oxbow tunnel to the Oxbow powerhouse; (7) the 60-foot by 98-foot Oxbow powerhouse that houses a Francis-type unit with an authorized installed capacity of 6.128 MW discharging water into the Middle Fork; and (8) the Oxbow switchyard. The diversion of water at the Oxbow development results in a 0.48-mile-long bypassed reach in the Middle Fork.

No primary transmission lines are part of the Middle Fork Project license; grid interconnections are either made at switchyards located at the French Meadows, Hell Hole, Middle Fork, Ralston, and Oxbow powerhouses or via separately licensed transmission lines. The French Meadows switchyard connects to the 60-kV French Meadows-Middle Fork transmission line owned and operated by Pacific Gas and Electric Company (PG&E). The Hell Hole switchyard also connects to the 60-kV French Meadows-Middle Fork transmission line. The Middle Fork switchyard connects to the Ralston switchyard via 60-kV and 230-kV lines, referred to as the Middle Fork-Ralston transmission line, also owned and operated by PG&E. The Ralston switchyard connects to PG&E's 230-kV transmission line that extends to the Goldhill substation. The Oxbow switchyard is connected to PG&E's 60-kV transmission line that extends to the Foresthill/ Weimar/ Halsey Junction substation. PG&E's transmission lines that interconnect with the Middle Fork Project are part of the French Meadows Transmission Line Project (FERC No. 2479).

[12] The Ralston afterbay impoundment serves as the afterbay of the Ralston powerhouse and the forebay of the Oxbow powerhouse.

2.1.1.6 Project Recreation Facilities

PCWA maintains 21 developed recreation facilities for the project. These facilities are concentrated around Hell Hole reservoir, French Meadows reservoir, South Fork Long Canyon diversion pool, and Ralston afterbay. Developments at Hell Hole reservoir include: Big Meadows Campground, Hell Hole Campground, Upper Hell Hole Campground, Hell Hole vista, and Hell Hole boat ramp. Developments at French Meadows reservoir include: Ahart Campground, Coyote Group Campground, Poppy Campground, French Meadows Campground, Gates Group Campground, Lewis Campground, French Meadows picnic area and boat ramp, McGuire picnic area and beach, and French Meadows sanitation station. Developments at Ralston afterbay include Ralston picnic area and cartop boat ramp and Indian Bar rafting access. The Middle Meadows Group Campground is located near Long Canyon diversion dam. French Meadows North and South water systems provide potable water for recreation sites at French Meadows; Big Meadows and Middle Meadows also have water systems. See table 24 in section 3.3.5, *Recreation Resources*, for a listing of the amenities provided at these developed recreation facilities.

2.1.2 Project Safety

The project has been operating for more than 44 years under the existing license and during this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the project has been inspected and evaluated every 5 years by an independent consultant, and a consultant's safety report has been submitted for Commission review. As part of the relicensing process, the Commission staff would evaluate the continued adequacy of the project facilities under a new license. Special articles would be included in any license issued, as appropriate. Commission staff would continue to inspect the project during the new license term to assure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.3 Existing Project Boundary

The existing project boundary includes a total of 4,554 acres of land; 3,268 acres are lands of the United States managed by the Forest Service, and 1,286 acres are owned by PCWA or other private parties. The project boundary delineates buffer zones around the project reservoirs that are approximately as follows: Duncan Creek, 120 to 500 feet; French Meadow, 250 to 2,000 feet; Hell Hole, 200 to 2,000 feet; North Fork Long Canyon Creek, 0 to 250 feet; South Fork Long Canyon Creek, 150 to 200 feet; Middle Fork interbay, 200 feet; and Ralston afterbay, 100 to 650 feet. All project dams, powerhouses, and flow conduits are within the existing project boundary, as are most of the project recreation sites and flow gages. However, some project recreation sites,

ancillary facilities, access roads, and trails to project facilities are either partially or completely outside of the existing project boundary.

2.1.4 Existing Project Operation

The project is operated in a seasonal store and release mode. Typical annual operation of the project results in the capture of runoff, which is diverted to increase storage in the French Meadows and Hell Hole reservoirs during the winter and spring (filling period). Reservoir storage is later released during the summer, fall and early winter (release period). Storage and release of flows varies from year-to-year based on the timing and magnitude of spring runoff which is influenced by the amount of winter snow pack, temperature conditions, and precipitation.

During the filling period, flows through the project powerhouses are highly dependent on projected and actual runoff conditions. These flows are used to manage the runoff to maximize water storage while minimizing spills. In drier years, releases are minimized during the filling period to increase the volume of water in storage to meet upcoming summer consumptive use and peak power demands. In wetter years, releases during the filling period are increased to minimize spills from the reservoirs. In years when storage levels are expected to be adequate to meet consumptive demands and the chance of spilling is low, releases are adjusted through the filling season based on the volume of water in storage, projected runoff, and current and projected power demands. Because the water available from runoff varies significantly from one year to the next, the amount of water held in storage at the end of the filling period (July 1) also may vary significantly.

During the release period, after the reservoirs have reached their maximum capacity, monthly releases for generation are largely predictable for the remainder of the year. However, daily and hourly releases for generation, which respond to demand for electricity and electrical grid reliability, remain highly variable. During the release period, flows are managed to: (1) meet storage and flow-related license requirements; (2) meet consumptive water supply requirements; (3) optimize power generation to meet peak electrical demand; and (4) achieve end-of-year carryover target storage levels.

Decisions on the extent of the drawdown and the carryover target storage level are based on balancing competing needs including: (1) providing sufficient reservoir storage space to minimize potential spills from the reservoirs during the next filling period if the runoff is high (wet year); and (2) retaining enough water in storage to ensure that license requirements and consumptive demands can be met in the following year if the next filling period runoff is low (dry year).

Project operation is prioritized to first ensure consumptive water demand (deliveries) are met and second to maximize peak power generation. However, in all but dry years, water supply demands are met as a byproduct of power generation, because both consumptive water and electrical demands tend to coincide seasonally. In addition,

the project generally controls and releases far more water annually in most water years (except in dry years) than PCWA requires to meet the consumptive water demand.

The French Meadows powerhouse generates electricity when water is moved from French Meadows reservoir to Hell Hole reservoir. It is nearly always operated in block-loaded (set output for a set period of time) conditions with the duration of the block of operation set depending on the volume of water to be moved.

The Hell Hole powerhouse generates opportunistically from flow releases from Hell Hole dam. Project operations are not modified for power generation at Hell Hole powerhouse.

The Middle Fork and Ralston powerhouses generally run in tandem, using water transported from Hell Hole reservoir to Ralston afterbay. The two powerhouses produce about 90 percent of the project's annual generation. Occasionally, PCWA curtails the operations at the Middle Fork powerhouse to take advantage of accretion flows into the Middle Fork interbay. Although the Middle Fork interbay is located between the two powerhouses, the interbay has little ability to re-regulate flows because of its small storage capacity. If the flows through the Middle Fork and Ralston powerhouses are not matched, the Middle Fork interbay would either be drained or overtopped very quickly.

PCWA varies releases on a daily and hourly basis through the Middle Fork and Ralston powerhouses in response to changing electrical demands, grid needs, and water supply conditions. The powerhouses are often used to help maintain reliable operations of the transmission grid by fine-tuning the flow of electricity in the grid to balance supply and demand. When operated to provide grid regulation, flow rates through the Middle Fork and Ralston powerhouses vary quickly to meet constantly changing energy supply and demand conditions. The powerhouses are also usually set at an efficient operating level and run for a prescribed number of hours per day (block-loaded) depending upon hydrology.

The Oxbow powerhouse frequently runs in tandem with the Middle Fork and Ralston powerhouses. The discharge capacity of the Oxbow powerhouse is slightly higher than the Ralston powerhouse, which allows the Oxbow powerhouse to use water supplied by the Ralston powerhouse as well as inflow from the Middle Fork American and Rubicon Rivers. The Ralston afterbay also has sufficient operational storage capacity to allow the Oxbow powerhouse to operate independently of Middle Fork and Ralston powerhouses for several hours at a time, depending on generation level. This dependent operational flexibility is used to meet the ramping rate requirement downstream of the Oxbow powerhouse and to make releases for whitewater boating without requiring operation of the Middle Fork and Ralston powerhouses. Because the Ralston afterbay is used primarily as a regulating facility for the electric grid (voltage, frequency, etc. regulation), water surface elevations may fluctuate on a day-to-day or hour-to-hour basis. The Ralston afterbay does not follow a seasonal fill-and-release pattern like Hell Hole or French Meadows reservoirs.

Fluctuations of the Ralston afterbay occur daily throughout the year, but the daily pattern varies depending upon the season. Ralston afterbay water surface fluctuation patterns vary with water year type, electrical demand, and scheduled and emergency maintenance activities of project facilities. The largest fluctuations in water surface elevation at the Ralston afterbay typically occur when the source of inflow is predominately from Ralston powerhouse generation. Water levels in the Ralston afterbay also fluctuate during the spring, but fluctuations may not be as regular or as large, depending on water year type. During the winter, regular daily fluctuations are generally minimal, but fluctuations may occur over the course of days or weeks to allow for management of runoff resulting from winter storms. In the winter, the Ralston and Oxbow powerhouses are typically run more synchronously. In general, water surface elevations in Ralston afterbay remain relatively stable during the winter, although not at full pool, to allow the capture of runoff from winter storm events and to minimize reservoir spilling. If a large storm event is projected, Ralston afterbay may be drawn down substantially in advance to facilitate capture of high flows.

The total water available and the physical capacity of the project limit the timing and number of hours of generation in a given year. In drier years, when less water is available, generation is concentrated during the summer and early fall. In wetter years, generation occurs throughout the year. If the project powerhouses are operated at full flow, generation may be limited to an average of approximately 5 to 6 hours per day during a dry year, while in a wet year, the powerhouses may be operated at full flow for 17 hours or more per day.

PCWA currently coordinates with representatives from California Department of Parks and Recreation (California State Parks) and a designated commercial whitewater boating representative to schedule project operations during the summer and early fall (June through Labor Day) to accommodate whitewater recreation in the Middle Fork American River below the Oxbow powerhouse. Whitewater boating releases are scheduled on a voluntary basis such that they minimize effects to power generation and do not compromise consumptive water deliveries or maintenance activities. When sufficient water is available, whitewater recreation flows are provided by scheduling generation through the Oxbow powerhouse approximately two to three hours earlier than would otherwise occur to meet peak energy demand.

Flows are voluntarily reduced in the Middle Fork American River below the Oxbow powerhouse for two annual competitive long-distance trail events whose routes cross the river at Poverty Bar. During the races, project operations are modified to the extent possible, to reduce flow releases into the river and facilitate river crossings by race participants.

2.1.5 Existing Environmental Measures

The current environmental measures implemented by the applicant are listed below. License article numbers are provided where applicable, and voluntary measures are noted.

- Maintain minimum pool elevations at 5,259 feet for the Duncan Creek diversion pool, and maintain elevations at French Meadows and Hell Hole reservoirs depending on forecasted runoff and season (article 36).
- Maintain the following minimum instream flows: (1) Duncan Creek diversion dam – 4 or 8 cfs depending on forecasted runoff, or inflow, whichever is less; (2) French Meadows dam – 4 or 8 cfs depending on forecasted runoff; (3) Hell Hole dam – 6 to 20 cfs depending on forecasted runoff and season; (4) South Fork Long Canyon Creek diversion dam – 2.5 or 5 cfs depending on forecasted runoff, or inflow, whichever is less; (5) North Fork Long Canyon Creek diversion dam – 2 cfs or inflow, whichever is less; (6) Middle Fork interbay – 12 or 23 cfs depending on forecasted runoff, or inflow, whichever is less; and (7) Oxbow powerhouse – 75 cfs (article 37).
- Operate, maintain, and report on 11 stream and diversion, 6 reservoir, and 4 powerhouse gaging stations to monitor releases, flow diversions, and water storage at project facilities (article 6).
- Ensure that releases from Oxbow powerhouse do not cause vertical fluctuations greater than 3 feet per hour (article 37).
- Maintain the two radial gates on the French Meadows spillway in a fully open position from November 15 to April 1 (article 30).
- Operate and maintain the following project-related campgrounds: Ahart; Coyote Group; Poppy; French Meadows; Gates Group; Lewis; Big Meadows; Hell Hole; Upper Hell Hole; and Middle Meadows Group. Operate and maintain the following project-related day use areas and/or boat ramps: French Meadows; McGuire; Hell Hole; and Ralston. Operate and maintain the Hell Hole Vista and Indian Bar rafting access (article 46).
- Coordinate with California State Parks and commercial whitewater boating representatives to make whitewater flow releases from the Oxbow powerhouse from June through Labor Day (voluntary).
- Reduce flow releases from the Oxbow powerhouse to the extent feasible to facilitate river crossings during two annual competitive trail events (voluntary).

- Allow the public access to project waters and adjacent lands for recreational purposes, unless precluded due to public safety or facility security concerns (article 17).
- Maintain project-related roads cooperatively with the Forest Service (articles 18 and 19).
- Provide training to employees regarding identification and management of cultural resources and laws and related procedures for protecting potential cultural resources if they are discovered during routine operation and maintenance or construction of capital improvement projects (some aspects of this measure are voluntary, and others are required by regulations).

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

2.2.1.1 Duncan Creek Diversion

PCWA would retrofit the diversion as follows: (1) modify the existing intake structure into a self-cleaning, wedge-wire intake; (2) construct a buried conduit from the modified intake to the existing tunnel portal and seal the existing tunnel intake with stoplogs; (3) install a remote-controlled slide gate to control inflow to the tunnel; (4) raise the dam abutment by 3.5 feet to avoid overtopping during floods; (5) modify the instream flow outlet to maintain proposed increased instream flows, facilitate bedload transport, and establish first priority for water flowing into the wedge-wire intake; (6) modify the existing low-level outlet through the dam for dewatering the diversion pool in addition to dewatering the wedge-wire intake collection channel (7) implement security improvements; (8) install new communications uplinks; and (9) install a self-contained solar/thermal electric power supply system.

2.2.1.2 French Meadows Dam Outlet Works Modification

PCWA would modify the existing instream flow outlet at the dam by adding new flow meters to monitor the proposed increased instream flows.

2.2.1.3 Hell Hole Storage Capacity Expansion and Outlet Works Modification

To accommodate the Hell Hole development storage capacity expansion and outlet works modification, PCWA proposes to: (1) modify the existing 350-foot-long Hell Hole dam ogee spillway for the installation of 6-foot-high pneumatically operated steel spillway crest gates resulting in an increase in storage capacity of about 7,600 acre-feet; (2) construct a small concrete control building on the east abutment of the dam between the dam and spillway to provide power (propane powered emergency electric generator with an outdoor propane tank) for spillway crest gate operation; (3) install a short spur powerline to provide power for a proposed new control building; (4) construct a new

access road to the new spillway gates; and (5) modify the instream flow outlet by adding a new flow meter, valve operator, and discharge hood to facilitate proposed increased instream flows.

2.2.1.4 North and South Fork Long Canyon Diversion Modifications

PCWA proposes to modify the North Fork Long Canyon and South Fork Long Canyon diversions as follows: (1) construct new wedge-wire screen intakes on the upstream side of the existing ogee section of the diversion weirs; (2) construct new concrete chambers to connect the intake channels with the existing intakes to the existing buried discharges that convey the diverted flow to the top of the shafts that drop into the Hell Hole-Middle Fork tunnel; (3) increase the height of the weir abutments by 2.7 feet at the North Fork diversion and 3.5 feet at the South Fork diversion for adequate freeboard during floods; (4) install a remote-controlled slide gate to control tunnel inflow; (5) modify the existing low-level outlets through the dams for dewatering the impoundments and for discharging instream flows downstream of the weirs; (6) modify existing instream flow outlets to maintain increased instream flows, facilitate bedload transport, and establish first priority for water flowing into the wedge-wire intake; (7) implement security improvements; (8) install new communications uplinks; and (9) install a self-contained solar/thermal electric power supply system.

2.2.1.5 Middle Fork Interbay Dam Outlet Works Modification

PCWA proposes to modify the existing instream flow outlet at the dam by adding a new butterfly valve, fixed cone valve, and discharge hood to facilitate the proposed increased instream flows and facilitate bedload transport.

2.2.1.6 Proposed Flow Measurement Equipment

PCWA proposes installing new flow measurement equipment and adding two existing stream gages (Rubicon River above Ralston powerhouse and Rubicon River above Ellicott Bridge) as part of a new license, including the following:

- a new gage on the Duncan Creek diversion tunnel;
- new flow measurement equipment on the Middle Fork American River at the outlet of the French Meadows dam instream flow maintenance pipe and the low level outlet pipe;
- new flow measurement equipment on the Rubicon River at the outlet of the Hell Hole dam instream flow maintenance pipe and low level outlet pipe;
- a new gage on the Rubicon River at the Hell Hole spillway;
- a new gage on the North Fork Long Canyon Creek downstream of the diversion dam;

- a new gage on the South Fork Long Canyon Creek downstream of the diversion dam;
- a new gage on the Middle Fork American River downstream of the Middle Fork interbay dam;
- new flow measurement equipment on the Middle Fork American River at the outlet of the Ralston afterbay dam instream flow maintenance pipe;
- new flow measurement equipment on the Oxbow powerhouse penstock; and
- a new gage on the North Fork American River, located downstream of the Middle Fork American River confluence and above the American River Pumping Station.

2.2.1.7 Trails

The proposed project would include several new trails and one existing trail within the project boundary. The new trails would provide access to operate and maintain the following new stream flow gages: (1) North Fork Long Canyon Creek downstream of the diversion dam; (2) South Fork Long Canyon Creek downstream of the diversion dam; (3) Middle Fork American River downstream of the Middle Fork interbay dam; and (4) North Fork American River upstream of the American River Pumping Station. The project would also include the existing trail to the Rubicon River gage upstream of the Ralston powerhouse.

2.2.1.8 Recreation Facilities

The proposed project would include new recreational facilities and modifications to several existing recreational facilities. These new facilities and modifications would include:

- a new Duncan Creek diversion primitive recreation site;
- enhancements to the existing Ahart Campground;
- a reduction of the facilities at the existing Poppy Campground;
- enhancements to the existing French Meadows boat ramp;
- conversion of the existing McGuire picnic area and beach to the McGuire group campground;
- modifications to the McGuire boat ramp and associated parking;
- a reduction of the facilities at the existing Hell Hole Campground;
- permanent closure of the existing Upper Hell Hole Campground;
- enhancements to the existing Hell Hole boat ramp;

- a reduction of the facilities at the existing Ralston afterbay picnic area;
- a new boat ramp at the existing Ralston afterbay sediment removal access point; and
- enhancements at the Indian Bar rafting access and general parking.

2.2.2 Proposed Project Boundary

PCWA would expand the existing project boundary to include: (1) new project facilities constructed as part of the proposed project; (2) existing facilities that were not previously included within the project boundary but are necessary for operation and maintenance of the project (see section 2.1.3, *Existing Project Boundary*); and (3) the footprint of all project recreation facilities. Specifically, the project boundary would be expanded to include:

- Duncan Creek diversion intake road
- Trail to the gage below Duncan Creek diversion dam
- French Meadows campground water supply and road
- French Meadows reservoir north shore access road
- Gates campground and access road
- French Meadows North (Dolly Creek) water system
- Ahart campground
- French Meadows-Hell Hole tunnel portal road
- French Meadows powerhouse road and communication powerline
- Hell Hole dam spillway discharge channel road
- Hell Hole vista parking area, trail, and overlook
- Big Meadows campground and access road
- Big Meadows campground water supply and access road
- Hell Hole campground water supply
- Hell Hole campground and access road
- Southeast quarter of section 3 to accommodate storage increase at Hell Hole reservoir
- Middle Meadows group campground and access road
- Middle Meadows campground water supply and access road
- North Fork Long Canyon crossing sediment disposal area

- Middle Fork interbay dam road
- Middle Fork interbay sediment disposal area
- Passive microwave reflector station and access trail
- Middle Fork American River below interbay dam gage and access trail
- Middle Fork powerhouse, penstock, and butterfly valve house access road
- Spoil pile at Middle Fork penstock
- Brushy Canyon adit access road
- Junction Bar augmentation area
- Ralston-Oxbow tunnel intake to Ralston powerhouse communication line
- Ralston Ridge sediment disposal area
- Passive microwave reflector station above Ralston afterbay and access trail
- Reduce the project area to remove lands that are not necessary for operation and maintenance of the project.

The project boundary would be reduced to remove excess lands currently within the existing project boundary that PCWA believes are not necessary for operation and maintenance of the project (particularly around the project reservoirs). Areas where land within the project boundary would be reduced include:

- Duncan Creek-Middle Fork tunnel corridor
- French Meadows reservoir shoreline buffer
- French Meadows-Hell Hole tunnel corridor
- Hell Hole reservoir shoreline buffer
- Hell Hole-Middle Fork tunnel corridor
- Middle Fork interbay shoreline buffer
- Middle Fork-Ralston tunnel corridor
- Ralston afterbay shoreline buffer

PCWA estimates its proposed project area would encompass 4,150 acres of land, including 3,056 acres of lands of the United States (1,746 acres within the Tahoe National Forest, 1,306 acres within the Eldorado National Forest, and 4 acres of lands managed by the U.S. Bureau of Land Management). The remainder of the project area would be located on PCWA-owned land or private land.

2.2.3 Proposed Project Operation

PCWA proposes several modifications to project operations consistent with its proposed Instream Flow and Reservoir Minimum Pool measure. The measure would require:

- higher minimum instream flows in the bypassed reaches and the peaking reach (downstream of the Oxbow powerhouse);
- spring pulse flows in the bypassed reaches;
- downramping of spill flows from May through July below Hell Hole reservoir and French Meadows reservoir;
- modified ramping rates at the Oxbow powerhouse peaking reach;
- a cap on flow releases from Oxbow powerhouse (Saturday of Memorial Day weekend to Labor Day) in dry, critical, and extreme water years;
- consultation with representatives for the two annual trail races to identify and provide flows suitable for adequate peaking reach trail crossing conditions (when flows are controllable by the project);
- recreational flow releases in the peaking reach; and
- modified minimum reservoir pool requirements in Hell Hole reservoir and French Meadows reservoir.

PCWA also proposes to increase the available storage volume in Hell Hole reservoir by installing a new 6-foot-high Obermeyer spillway gate along the top of the existing dam crest and increasing the maximum storage elevation of the reservoir. PCWA states that this increase would allow the reservoir to store additional water during the spring and summer after the peak of the runoff period which can be used to increase annual energy generation in the fall and/or winter. In all but the driest years, PCWA indicates that the improvement would also allow the project to shift the timing of some generation from the spring runoff period to the summer peak energy demand period. Although the shift in timing of the generation would not increase total annual generation, PCWA states that it would increase the benefit of the project by increasing generation during the peak energy demand period.

These project modifications are discussed in more detail in the appropriate resource sections in sections 3 and 4 of this EIS.

2.2.4 Proposed Environmental Measures

PCWA proposes the following mitigation, protection, and enhancement measures.

Geology and Soils

- A Sediment Management Plan.

- A Geomorphology/Riparian Monitoring Plan.
- Develop an erosion and sedimentation control plan prior to construction activities.

Aquatic Resources

- Provide spring pulse flows to Duncan Creek, North Fork Long Canyon Creek, South Fork Long Canyon Creek, Middle Fork American River downstream of French Meadows and Middle Fork interbay dams, and the Rubicon River as shown in tables 3, 4, 5, and 6.
- Provide the minimum flows to the project bypassed reaches and the peaking reach shown in table 15.
- Provide the ramping rates shown in tables 16 and 17.
- Provide a minimum flow of from 75 to 150 cfs to the peaking reach for up to 30 days during the annual planned outage and for up to 48 hours during unplanned outages at Middle Fork and/or Ralston powerhouses.
- Release the whitewater boating flows shown in table 33.
- Operate the French Meadows and Hell Hole reservoirs with the minimum water surface elevations shown in table 30.
- Implement monitoring plans for: Water Quality; Fish Populations; Water Temperature; Mercury Bioaccumulation; and Benthic Macroinvertebrates.
- Develop and implement an entrainment study plan for Ralston and Oxbow powerhouses to provide information that would indicate whether or not protective measures are warranted at these two powerhouses.

Terrestrial Resources

- A Vegetation and Integrated Pest Management Plan (VIPMP).
- Implement monitoring plans for: Foothill Yellow-Legged Frog and Western Pond Turtle.
- A Bald Eagle Management Plan.

Recreation and Land Use

- A Recreation Plan.
- A Transportation System Management Plan.
- A Fire Prevention and Suppression Plan.

Cultural Resources

- An HPMP.

Aesthetic Resources

- A Visual Resource Management Plan.

Details of each of the proposed environmental measures are provided in section 3.3, *Proposed Action and Action Alternatives*.

2.2.5 Modifications to Applicant's Proposal—Mandatory Conditions

The following mandatory conditions have been provided by the Forest Service under section 4(e) and are evaluated in this EIS. We consider conditions 2 through 10, 12 through 14, and 16 through 21 to be administrative and therefore not analyzed in our EIS. The remaining conditions are resource-specific.

- Condition no. 1: Annual consultation with the Forest Service and other interested agencies regarding status of implementation of license condition, monitoring results, review of any non-routine maintenance, foreseeable changes to the project, discussion of needed protection for newly listed sensitive species, upcoming maintenance, and any planned pesticide use.
- Condition no. 11: Preparation of a biological evaluation prior to constructing new project features on National Forest System (NFS) lands that may affect Forest Service special-status species.
- Condition no. 15: Receipt of written approval from the Forest Service prior to applying any pesticides on NFS lands.
- Condition no. 22: Implement the minimum flows shown in table 43 of this EIS.
- Condition no. 23: Implement the pulse flows shown in tables 45 through 47 of this EIS.
- Condition no. 24: Implement the ramping rates shown in tables 16 and 17 of this EIS.
- Condition no. 25: Release the peaking reach minimum flows specified in table 43 during planned annual outages and concurrent unplanned outages at Middle Fork and Ralston powerhouses during May through September and peaking reach minimum flows shown in table 43 of this EIS when only Ralston powerhouse experiences an unplanned outage from June through September.
- Condition no. 26: Develop a spawning habitat improvement plan for the Middle Fork downstream of Ralston afterbay dam to be approved by the Commission.
- Condition no. 27: (a) Annually review the current list of special-status plants and wildlife and if new species are added, determine if it is likely to occur on NFS lands and if so, develop a study plan to assess the effects of

the project on the species; (b) if new occurrences of Forest Service special-status plants or wildlife are detected prior to or during project construction, operation, or maintenance, notify the Forest Service and, as appropriate, FWS and California Fish and Game, and implement appropriate protection measures; (c) any replacement of existing powerline poles would be conducted in accordance with Suggested Practices for Avian Protection on Power Lines: the State of the Art in 2006; (d) conduct a survey of newly installed project power poles to determine their consistency with the current avian protection guidelines and provide a summary of findings to the Forest Service, FWS, and California Fish and Game and replace non-compliant poles within 15 years of license issuance; and (e) implement the proposed Bald Eagle Management Plan.

- Condition no. 28: Implement the following monitoring plans filed with the final conditions: Fish Population; Foothill Yellow-legged Frog; Western Pond Turtle; Benthic Macroinvertebrate, Mercury Bioaccumulation; Geomorphology and Riparian; Water Quality; and Water Temperature. Develop, in consultation with the Forest Service and California Fish and Game, a bear management monitoring plan.
- Condition no. 29: Develop, in consultation with the Forest Service, California Fish and Game, and the Water Board, an entrainment study plan for the Ralston and Oxbow powerhouse intakes.
- Condition no. 30: Develop, in consultation with the Forest Service, California Fish and Game, and the Water Board a large woody debris (LWD) management plan.
- Condition no. 31: Each year prior to May 15, facilitate a meeting with the Forest Service, California Fish and Game, and the Water Board to discuss the results of implementing streamflow and reservoir-related conditions, results of monitoring, and other issues related to preserving and protecting the ecological values affected by the project. Make available to the agencies 2 weeks prior to the meeting an operations and maintenance plan for the year in which the meeting occurs.
- Condition no. 32: Implement the Streamflow and Reservoir Elevation Gaging Plan filed with the final conditions.
- Condition no. 33: Develop a plan to evaluate penstock and other drainage structure emergency and maintenance release point to determine if improvements can be made to minimize potential adverse water quality effects when the release points are used and if so, the protocols that would be used.
- Condition no. 34: Implement the Recreation Plan filed with the final conditions.

- Condition no. 35: Enter into a collection agreement to provide annual funding to the Forest Service to provide operation, maintenance, and administration in accordance with the Recreation Plan.
- Condition no. 36: Enter into a collection agreement with the Forest Service to provide funding on a one-time basis for design, construction, and installation of a toilet facility and information kiosk at the Cache Rock site on the peaking reach.
- Condition no. 37: Provide a shared purpose work station and storage facility to serve the Hell Hole recreation area; the size, location, and required improvements for this facility to be determined through agreement with the Forest Service.
- Condition no. 38: Implement the Alternative 1 minimum water surface elevations shown in table 50 and the reservoir level recreation objectives shown in table 31of this EIS.
- Condition no. 39: Implement the reservoir fish stocking program described in the Recreation Plan filed with the final conditions.
- Condition no. 40: Implement the whitewater boating flows shown in tables 48 and 49 of this EIS.
- Condition no. 41: Implement the Visual Resource Management Plan filed with the final conditions.
- Condition no. 42: Implement the HPMP filed on September 21, 2012, and with the final conditions.
- Condition no. 43: If prior to or during project-related, ground-disturbing activities cultural resources are reported or discovered, PCWA would immediately cease work, notify the Forest Service, and not resume work on ground-disturbing activities until it receives written approval from the Forest Service.
- Condition no. 44: Implement the Transportation System Management Plan filed with the final conditions.
- Condition no. 45: Implement the Fire Prevention and Suppression Plan filed with the final conditions.
- Condition no. 46: Develop an erosion and sediment control management plan that includes at a minimum: (a) the proposed Sediment Management Plan; (b) erosion control guidelines for existing project-affected areas; and (c) erosion control guidelines for new construction or non-routine maintenance.
- Condition no. 47: Implement the Alternative 1 VIPMP.

- Condition no. 48: Develop and implement an aquatic invasive species management plan.

2.3 ALTERNATIVE 1

On November 30, 2011, PCWA submitted a supplemental filing that includes a description and analysis of an alternative (Alternative 1) to its proposed action. The filing augmented information in the license application; however, PCWA indicated that this alternative did not replace its proposed action. PCWA developed Alternative 1 after submittal of its final license application and incorporates the following elements: (1) revised instream flow and reservoir minimum pool conditions shown in tables 3, 15, 34, 35, and 30 of this EIS; (2) a Streamflow and Reservoir Elevation Gaging Plan filed by PCWA on September 6, 2011; (3) additional recreation enhancements included in the Alternative 1 Recreation Plan consistent with the resource agencies' preliminary conditions and recommendations, which include incorporating existing and new trails into the project, constructing a new parking area at Ellicott Bridge, and assuming responsibility for two water systems; and (3) a revised VIPMP, Transportation System Management Plan, and draft final HPMP, based on consensus among PCWA and the resource agencies. PCWA indicated that it supports the conditions and recommendations included in Alternative 1 but stated that it did not replace its licensing proposal. Alternative 1 did not include all of the Forest Service preliminary 4(e) conditions. On December 3, 2012, the Forest Service filed final 4(e) conditions that replaced many of its preliminary conditions and includes many revised plans and flows compared to Alternative 1.

Appendix B contains a matrix provided by PCWA (letter from A. Fecko, Resource Planning Administrator, PCWA, to the Commission, filed on January 11, 2012) that shows the individual elements of Alternative 1 compared to the proposed action and agency preliminary conditions and recommendations.

2.4 STAFF ALTERNATIVE

Under the staff alternative, the project would also include the following revisions to the proposed project or additional measures:

Geologic and Soil Resources

- Develop and implement a plan to identify optimal water release locations when project flow conduits need to be drained and protocols that would be used to drain the conduits to minimize erosion and sedimentation.
- Develop and implement an erosion and sediment control management plan to protect project water and aquatic habitat from degradation.
- Develop and implement an LWD management plan for passage of LWD downstream of all project dams.

- If the sediment testing specified in the proposed Sediment Management Plan shows unacceptable levels of methylmercury, do not use that sediment for sediment augmentation.
- The Forest Service Geomorphology/Riparian Monitoring Plan.
- Release the pulse flows shown in tables 45 through 47.

Aquatic Resources

- Release the minimum flows shown in table 43.
- During the first two spill events when the Forest Service-specified downramping of spill flows occurs at French Meadows and Hell Hole dams, test the project's ability to manage spill flows on the declining limb of the spill event using the spillway, low-level outlet, and minimum flow outlet at French Meadows dam and the proposed new crest gates, modified low-level outlet, minimum flow outlet, and powerhouse at Hell Hole dam to provide the specified flow schedules. After the first two downramping events at French Meadows and Hell Hole dams, provide a testing report to the agencies and Commission documenting PCWA's ability to manage spill flows to provide the specified ramping rates and, if appropriate, include recommendations for ramping rate modifications.
- Release the peaking reach minimum flows specified in table 43 during planned annual outages and unplanned outages at Middle Fork and Ralston powerhouses during May through September and peaking reach minimum flows ranging shown in table 44 when the Ralston powerhouse experiences an unplanned outage from June through September.
- Release the whitewater boating flows shown in tables 48 and 49.
- Implement the minimum water surface elevations shown in table 50.
- Implement the following Forest Service monitoring plans: Water Quality; Water Temperature; Fish Populations; Benthic Macroinvertebrates.
- Implement the Forest Service Streamflow and Reservoir Elevation Gaging Plan with the exception of not installing and operating a new gage on the North Fork American River and two new gages on the lower end of the Rubicon River.
- Develop and implement a spawning habitat improvement plan for the Middle Fork downstream of Ralston afterbay dam.
- Monitor the status of, and notify the Commission in the event of likely restoration of, California Central Valley steelhead in the American River watershed, because passage upstream of Nimbus and Folsom dams may

occur during the term of a new license, which could result in this federally listed species gaining access to project-affected waters.

Terrestrial Resources

- Implement the Alternative 1 VIPMP.
- Expand the scope of the proposed preconstruction raptor nest surveys within 500 feet of construction activities to include observations of special-status wildlife.
- Implement the Forest Service Foothill Yellow-legged Frog and Western Pond Turtle monitoring plans.

Recreation and Land Use

- Revise the Forest Service Recreation Plan, which is similar to the Alternative 1 Recreation Plan but does not include a public access trail to the bypassed reach downstream of Middle Fork interbay dam and adds a publicly accessible catwalk around Middle Fork powerhouse. The revised plan should include:
  - provisions to replace the water system infrastructure and access roads associated with the following project recreational facilities: French Meadows North water system as necessary to provide water to Lewis campground; Gates group campground, Coyote group campground; McGuire picnic area; McGuire boat ramp; and French Meadows recreational vehicle (RV) dump station within 9 years;
  - clarification of PCWA's responsibility to operate and maintain the project recreation facilities without funding law enforcement;
  - provisions of recreation opportunity marketing materials (maps and brochures). PCWA would develop the maps and brochures, and provide an electronic copy to the agencies;
  - monitoring and reporting procedures for bear-related incidents and an evaluation of existing and potential new measures for reducing interactions between humans and bears at project recreation facilities;
  - provisions for posting on PCWA's project website adjustment factors regarding predicted timing and magnitude of peaking reach flows immediately upstream of the confluence of the North Fork American River that can be applied to real-time flow information from U.S. Geological Survey (USGS) gage no. 11433300 (Middle Fork American River near Foresthill) to provide visitors with information on whitewater boating and river crossing conditions;
  - provisions for inspecting signage at prominent points of public entry to the peaking reach for adequacy and assessing whether additional

signage is needed to warn the public about potentially hazardous conditions associated with fluctuating peaking reach flows;

- provisions for installing and maintaining permanent visual water level markers at Western States Trail river crossings, including interpretive information regarding the location of the markers in brochures, project websites, and on-site signage to enable visitors to assess conditions for crossing the river;
- provisions to revise and update recreation maps and brochures every 6 years;
- geographically organized descriptions of all project recreation facilities and a comprehensive description of all existing and proposed improvements and amenities at each project facility;
- correct errors in the text to make it consistent with all tabular information;
- expand the project boundary beyond those areas identified in PCWA's license application to include the entire length of Hell Hole trail between the dam and McKinstry trail (Forest Service trail no. 15E02); and
- update cross-references to plans or documents to reflect the most current plans or document (e.g., the Alternative 1 and Forest Service Recreation Plans both reference a Transportation System Management Plan that has since been updated by the Forest Service Transportation System Management Plan).

- The Forest Service Transportation System Management Plan, with visual condition assessments every 6 years instead of every 5 years to synchronize data collection and reporting with the FERC Form 80 filing schedule.
- The Forest Service Fire Prevention and Suppression Plan.
- Expand the project boundary as necessary to include areas proposed by PCWA and the entire length of Hell Hole trail between the dam and McKinstry trail (Forest Service trail no. 15E02).

Cultural Resources

- The final HPMP filed on September 21, 2012.

Aesthetic Resources

- The proposed Visual Resource Management Plan and conduct visual condition assessments every 6 years instead of every 12 years to synchronize data collection and reporting with the FERC Form 80 filing schedule and revise the plan every 12 years instead of every 5 years.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

We considered several alternatives to the applicant's proposal, but eliminated them from further analysis because they are not reasonable in the circumstances of this case. They are (1) issuing a non-power license; (2) federal government takeover of the project; and (3) retiring the project.

2.5.1 Issuing a Non-Power License

A non-power license is a temporary license that the Commission will terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this point, no agency has suggested a willingness or ability to do so. No party has sought a non-power license and we have no basis for concluding that the project should no longer be used to produce power. Thus, we do not consider issuing a non-power license a realistic alternative to relicensing in this circumstance.

2.5.2 Federal Government Takeover of the Project

Section 14 of the FPA provides that the United States shall have the right upon or after expiration of any license to take over a project, upon payment of the licensee's net investment therein.[13] However, Congress has exempted projects owned by states and municipalities from section 14 of the FPA.[14] Because PCWA is a municipality under the laws of the state of California, federal takeover pursuant to section 14 of the FPA is not applicable to the Middle Fork American River Project. Therefore, federal takeover is not a reasonable alternative.

2.5.3 Retiring the Project

Project retirement could be accomplished with or without dam removal. Either alterative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. Project reservoirs serve other important purposes, such as providing recreational opportunities, consumptive water supply, and flood control, regardless of whether power is produced. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate protection, mitigation and enhancement measures.

The second project retirement alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency with authority to assume regulatory control and supervision

[13] 16 U.S.C. § 807 (2006).

[14] 16 U.S.C. § 828b (2006).

of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we do not consider removal of the electric generating equipment to be a reasonable alternative.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and current conditions are first described. The existing condition is the baseline against which the environmental effects of the proposed action and 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 and alternatives. Staff conclusions and recommended measures are discussed in section 5.2, *Comprehensive Development and Recommended Alternative*.[15]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The American River Basin includes three watersheds, with each containing a primary fork of the American River including the North Fork, the Middle Fork, and the South Fork. It also includes an area surrounding Folsom reservoir, referred to as the Foothill Drain watershed. Together, the watersheds associated with these three forks and the Foothill Drain encompasses a 2,051-square-mile area. The Middle Fork drains a 616-square-mile area. The Middle Fork originates in the Granite Chief and Desolation wilderness areas and joins the North Fork American River about 21 miles upstream of Folsom reservoir dam. Downstream of Folsom reservoir, the lower American River is about 23 miles long and bisects the metropolitan Sacramento area, flowing into the Sacramento River near downtown Sacramento.

Major tributaries to the Middle Fork American River include the Rubicon River and Duncan Creek. Major tributaries of the Rubicon River include Long Canyon Creek and the South Fork Rubicon River. The downstream-most project development, Oxbow powerhouse, is at river mile (RM) 24, as measured from the confluence with the North Fork American River.

The Middle Fork American River watershed is situated in central California in the foothills and mountainous uplands of the western slope of the Sierra Nevada mountain range, primarily within the Tahoe National Forest and Eldorado National Forest. Air temperatures range from highs over 100 degrees Fahrenheit (°F) during the summer months to lows below freezing during the winter in the higher elevations. The Middle Fork American River watershed ranges in elevation from about 1,100 to 5,300 feet above mean sea level. The watershed is characterized by hot, dry summers and mild, wet winters with most of the precipitation falling between October and March. Precipitation falls as rain in the lower elevations and snow at elevations greater than about 5,000 feet. Elevations higher than about 6,000 feet are typically covered by snow until May. Years

[15] Unless otherwise indicated, our information is taken from the final application for license for this project (PCWA, 2011a).

tend to be at the extremes—either wet or dry—with high inter-annual variability, with few years receiving the "average" amount of precipitation. Mean annual precipitation and runoff in the watershed ranges from about 35 inches (308,500 acre-feet) in dry years to 94 inches (1,218,000 acre-feet) in wet years. Total project inflow (combined flows from Duncan Creek, Middle Fork American River, Rubicon River, and Long Canyon Creek) for the period of 1975 to 2007 averages approximately 379,015 acre-feet and ranged from a low of approximately 62,638 acre-feet to a high of more than 790,820 acre-feet per year.

The Middle Fork American River watershed is heavily forested, rural in nature, and sparsely populated. There are no residential or commercial developments in the immediate project vicinity. Land use within the project boundary is focused on hydropower generation and recreation. Land use outside the project boundary is managed mainly for recreation, timber harvest, grazing, natural resource protection, and, to a lesser extent, mining.

The Middle Fork American River downstream of the project bisects federal and private lands reserved for the Auburn Dam and Reservoir Project. Reclamation began construction of this project in 1967 but the project was halted in the 1980s. In 2008, the Water Board revoked Reclamation's water rights permits for the project. Reclamation is charged with managing the federal lands within this area and delegated this management responsibility to California State Parks. The land reserved for this project was incorporated into the state park system and is referred to as the Auburn State Recreation Area.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing National Environmental Policy Act (NEPA) (40 C.F.R. § 1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified water quantity, water temperature, and California Central Valley steelhead as having the potential to be cumulatively affected by the proposed project in combination with other past, present, and foreseeable future activities.

3.2.1 Geographic Scope

The geographic scope of analysis for cumulatively affected resources defines the physical limits or boundaries of the effects of the proposed action on the resources. Because the proposed action can affect resources differently, the geographic scope for

each resource may vary. The geographic scope for water quantity and water temperature is the North and Middle Fork American River watershed upstream of the high water mark of Folsom reservoir. Folsom reservoir has sufficient storage capacity (about 975,000 acre-feet) to control the timing, volume, and temperature of discharges from Folsom dam regardless of how PCWA operates the Middle Fork project. The geographic scope for our analysis of California Central Valley steelhead is the American River watershed upstream from its confluence with the Sacramento River to Pilot Creek on the Rubicon River (5 miles upstream of its confluence with the Middle Fork) and the Middle Fork, upstream of the confluence of the Rubicon River. Nimbus dam, a Reclamation project that re-regulates flows from Reclamation's upstream Folsom dam, currently blocks upstream migration of anadromous fish including steelhead. California Central Valley steelhead could be cumulatively affected based on any future reintroduction to the Middle Fork American River during the term of a new license.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS includes past, present, and future actions and their possible cumulative effects on each resource. Based on the license term, the temporal scope looks 30 to 50 years into the future, concentrating on the effect 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 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the specific site-specific and cumulative environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EIS. We have not identified any substantive issues related to socioeconomics associated with the proposed action, and, therefore, socioeconomics is not assessed in this EIS. We present our recommendations in section 5.2, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geologic and Soil Resources

3.3.1.1 Affected Environment

Geologic Setting

Geologic units in the project vicinity consist of metasedimentary rocks of the Shoo-Fly Complex, accreted terranes (Calaveras Complex, Clipper Gap, and Mariposa formations), volcanic and sedimentary deposits, and plutonic intrusions. A series of accreted terranes, separated by faults, occurs within the Foothills Suture Zone in the lower watershed. Magmatic intrusion of metamorphic rocks and accreted terranes

created gold-bearing veins that were mined in the region beginning in the mid-1800s. Volcanism buried much of the topography on the western slope of the northern Sierra Nevada with mudflows (lahars) of the Mehrten Formation. This volcanic activity was followed by a long period of erosion that eroded the overlying volcanics, forced development of a new drainage network, exposed the underlying granitics, and deposited placer gold in stream channels. Several million years ago, the Sierra Nevada Range was uplifted on its eastern margin and tilted westward, resulting in steep and deeply incised canyons on the western slope. The Sierra Nevada Range was subsequently glaciated several times.

Seismic Hazards

The Alquist-Priolo Act of 1972[16] requires identification of earthquake fault zones encompassing all "potentially and recently active" traces that show evidence of surface displacement during Quaternary time (last 1.6 million years). No active fault hazard zones (i.e., surface displacement within the last 11,000 years) have been identified in the project vicinity. The lower watershed within the project vicinity is situated in the Foothills Suture Zone that includes the Melones Fault Zone and the Bear Mountain Fault Zone. An area of faulting on the North Fork American River in the Melones Fault Zone shows Quaternary displacement, and several areas of the Bear Mountain Fault Zone exhibit late Quaternary displacement.

Mineral Resources

Gold, silver, chromium, tungsten, and aggregate are the principal mineral resources in the project vicinity. Most of the mineral resources mined within the watershed are associated with the Melones Fault Zone and the accreted terranes of the Foothills Suture Zone. Historical mining activity is concentrated around the area to the west and north of Ralston afterbay. Gold was produced from veins in the Western Metamorphic Belt and from placer deposits. Little mining has been conducted along the Rubicon River, and studies in the Rubicon Roadless Area indicate a low potential for mineral resources.

Soils

Soils surrounding the project facilities, reservoirs, and bypassed reaches generally consist of well-drained, sandy to silty loams forming steep slopes. Much of the area is rock outcrop with little soil development. Soils in the upper elevations are formed from weathered volcanic rocks, plutonic rocks, and rocks of the Shoo-Fly Complex. Soils in the foothills are formed from weathered slates, schists, serpentine rocks, and igneous

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[16] The Alquist-Priolo Earthquake Fault Zoning Act (California Geological Survey–Public Resources Code Division 2, Chapter 7.5) was signed into California law on December 22, 1972, to mitigate the hazard of surface faulting and prevent the construction of buildings used for human occupancy on the surface trace of active faults.

rocks. Some of the soil types in the project vicinity are highly erodible and many areas with steep slopes are prone to instability. Project reservoirs are generally surrounded by rock outcrops forming steep slopes. The banks of French Meadows and Hell Hole reservoirs consist primarily of granitic and volcanic rock and related soils. The banks of the Ralston afterbay and Middle Fork interbay consist of vertically oriented schists and slates and related soils.

Geomorphology

Stream Channel Characterization

Bypassed reaches in the project area are typically confined within narrow, fluvially dissected valleys. Floodplains are typically confined to less than the width of the bankfull channel by steep bedrock canyon walls. The upper half of Long Canyon Creek (RM 7.0 to 11.3), the North Fork and South Fork of Long Canyon creek, and the upper Rubicon River (from Hell Hole dam downstream about 5 miles) are located within wider valleys sculpted by glacial erosion. Stream channel gradients are typically steep (>2 percent). The majority of the bypassed reach lengths are mixed bedrock-alluvial channel types composed of bedrock and boulders arranged in steep, coarse-grained steps. Lower gradient and/or less confined reaches typically store finer-grained sediment (e.g., cobble and gravel). The 5.6-mile-long reach of the Rubicon River downstream from Hell Hole dam occurs in an alluvial valley (1 to 2 percent slope) near the downstream limit of glaciation. This reach aggraded about 7 feet with material from the 1964 failure of Hell Hole dam.

The Middle Fork American River downstream of Ralston afterbay is predominantly an alluvial channel with relatively low gradient (0.5 to 2 percent), boulder to cobble-sized substrate, pool-riffle bedforms (e.g., point bars and lateral bars), and few bedrock exposures. Bedforms are predominantly cobble in the first 12 miles below Ralston afterbay and predominantly gravel in the lower 12 miles. The majority of the peaking reach (the reach from the Oxbow powerhouse downstream to the high-water mark of Folsom reservoir) is an entrenched meandering channel type. A 1.2-mile-long section within the peaking reach known as Ruck-a-Chucky Rapids is a moderately steep and entrenched channel with large substrate debris constrictions (e.g., delivered to the channel by rockfalls) and no bars.

PCWA characterized LWD loading in accessible project bypassed reaches (PCWA, 2007a). Overall, the findings indicated that LWD was most prevalent in the upper river reaches downstream of diversions and dams (particularly the Middle Fork American River between French Meadows dam and Middle Fork interbay [87.86 pieces per mile], and the Rubicon River within the approximately 6-mile-reach immediately downstream of Hell Hole dam [24.01 pieces per mile]). The Middle Fork American River reach downstream of French Meadows dam is located in an area affected by the

Star Fire[17] and consequently had more individual pieces of debris than other river reaches. Overall, LWD was not present at many study sites, except for 2 to 5 miles downstream of Hell Hole dam where a moderate amount of LWD (<10 percent of the active cross-section channel area) was present and within the study site along South Fork Long Canyon Creek. LWD is present in these reaches because of recruitment of large trees along the channels. Taken as a whole, LWD in project-related bypassed reaches had little geomorphic function. However, where pieces were observed within the active channel, they provided localized geomorphic functions such as deflecting flow, storing sediment, protecting stream banks, and creating scour pools.

Sediment Supply and Sediment Transport Characteristics

The mixed bedrock-alluvial channel morphology in the bypassed reaches is typically controlled by large bed particle sizes recruited to the channel from mass-wasting along steep canyon walls. The primary sources of sediment are from hillslope processes (e.g., debris slides, debris flows, rock falls), erosion of stored alluvium (e.g., banks and terraces), and glacial deposits. These channels are typically supply-limited (i.e., they have the capacity to transport more sediment than is delivered) and store little alluvium on the bed or in bars.

The peaking reach is transitional between supply-limited and transport-limited. Large bar deposits occur throughout the reach. The primary sediment sources are from hillslope mass wasting and bank erosion processes, commonly on the outside of meander bends. Additional sediment sources include debris torrents and rockfalls. Channel bed elevations and geometry are stable.

The threshold flow required to initiate motion of gravel-sized particles (8 to 64 mm) and the frequency of threshold flow in each stream reach during the period of record (1975 through 2007) is summarized in table 2. In general, flows exceeded the threshold for at least 11 days in the bypassed and peaking reaches during wet water years. In all reaches, flows exceeded the threshold for only a few days (1 to 4 days) during above normal water years and infrequently (0 to 1 day) during below normal and dry water years.

The regulated 5-year recurrence interval flow (representative of the current high-flow regime) was used as an index in analyzing scour over the period of record (1975 through 2007). In general, scouring flows occurred for a total of 14 to 22 days in the bypassed and peaking reaches during wet water years. Channel conditions in project stream reaches are being maintained by the current high-flow regime.

[17] A large, catastrophic wildland fire, the Star Fire, burned across 17,500 acres of forest within the Eldorado and Tahoe National Forests and on private land in 2001.

Table 2. Average number of days gravel motion is initiated by water year type[a] (Source: PCWA, 2007a).

Site/Release Location	Gravel Initiation of Motion (cfs)[b]	Water Year Type	Existing Conditions[c]			
			Total # of Days	Average # of Days[d]	Event Year Average # of Days[e]	Number of Years[f]
Small streams						
Duncan Creek	149	Wet	128	13	13	10 / 10
		Above normal	14	2	4	4 / 6
		Below normal	3	1	2	2 / 6
		Dry	1	0	1	2 / 5
		Critical	0	0	0	1 / 6
		Total	**146**	**--**	**--**	**19 / 33**
North Fork Long Canyon Creek	29	Wet	401	40	45	9 / 10
		Above normal	5	1	2	3 / 6
		Below normal	6	1	2	4 / 6
		Dry	3	1	2	2 / 5
		Critical	1	0	1	1 / 6
		Total	**416**	**--**	**--**	**19 / 33**
South Fork Long Canyon Creek	40	Wet	490	49	54	9 / 10
		Above normal	13	2	7	2 / 6
		Below normal	7	1	2	4 / 6
		Dry	2	0	2	1 / 5
		Critical	1	0	1	1 / 6

Site/Release Location	Gravel Initiation of Motion (cfs)[b]	Water Year Type	Existing Conditions[c] Total # of Days	Average # of Days[d]	Event Year Average # of Days[e]	Number of Years[f]
		Total	**513**	**--**	**--**	**17 / 33**
Long Canyon Creek	197	Wet	278	28	28	10 / 10
		Above normal	20	3	4	5 / 6
		Below normal	4	1	4	1 / 6
		Dry	2	0	1	2 / 5
		Critical	0	0	0	0 / 6
		Total	**304**	**--**	**--**	**18 / 33**
Middle Fork American River below French Meadows dam						
MF44.7[e]	343	Wet	107	11	13	8 / 10
		Above normal	24	4	12	2 / 6
		Below normal	0	0	0	0 / 6
		Dry	0	0	0	0 / 5
		Critical	0	0	0	0 / 6
		Total	**131**	**--**	**--**	**10 / 33**
MF36.2	702	Wet	179	18	18	10 / 10
		Above normal	9	2	2	4 / 6
		Below normal	2	0	2	1 / 6
		Dry	2	0	1	2 / 5
		Critical	0	0	0	0 / 6

Site/Release Location	Gravel Initiation of Motion (cfs)[b]	Water Year Type	Existing Conditions[c]			
			Total # of Days	Average # of Days[d]	Event Year Average # of Days[e]	Number of Years[f]
		Total	**192**	**--**	**--**	**17 / 33**
Middle Fork American River below Middle Fork interbay dam						
MF26.2	532	Wet	493	49	49	10 / 10
		Above normal	15	3	3	6 / 6
		Below normal	0	0	0	0 / 6
		Dry	4	1	2	2 / 5
		Critical	0	0	0	0 / 6
		Total	**512**	**--**	**--**	**18 / 33**
Rubicon River below Hell Hole dam						
R25.7[e]	500	Wet	192	19	21	9 / 10
		Above normal	14	2	14	1 / 6
		Below normal	2	0	2	1 / 6
		Dry	0	0	0	0 / 5
		Critical	0	0	0	0 / 6
		Total	**208**	**--**	**--**	**11 / 33**

Site/Release Location	Gravel Initiation of Motion (cfs)[b]	Water Year Type	Existing Conditions[c]			
			Total # of Days	Average # of Days[d]	Event Year Average # of Days[e]	Number of Years[f]
R20.9	678	Wet	281	28	28	10 / 10
		Above normal	22	4	4	5 / 6
		Below normal	1	0	1	1 / 6
		Dry	1	0	1	1 / 5
		Critical	0	0	0	0 / 6
		Total	**305**	**--**	**--**	**17 / 33**
R3.5	2,198	Wet	201	20	20	10 / 10
		Above normal	22	4	4	6 / 6
		Below normal	1	0	1	1 / 6
		Dry	1	0	1	1 / 5
		Critical	0	0	0	0 / 6
		Total	**225**	**--**	**--**	**18 / 33**
Middle Fork American River below Ralston afterbay						
MF14.1	6,674	Wet	110	11	11	10 / 10
		Above normal	9	2	2	6 / 6
		Below normal	1	0	1	1 / 6
		Dry	1	0	1	1 / 5
		Critical	0	0	0	0 / 6
		Total	**121**	**--**	**--**	**18 / 33**

Site/Release Location	Gravel Initiation of Motion (cfs)[b]	Water Year Type	Existing Conditions[c]			
			Total # of Days	Average # of Days[d]	Event Year Average # of Days[e]	Number of Years[f]
MF4.8	6,797	Wet	110	11	11	10 / 10
		Above normal	9	2	2	6 / 6
		Below normal	1	0	1	1 / 6
		Dry	1	0	1	1 / 5
		Critical	0	0	0	0 / 6
		Total	**121**	**--**	**--**	**18 / 33**

[a] AQ–TSR, table G-1 (PCWA, 2011b).

[b] Flow required to initiate motion of 25% of the gravel substrate.

[c] Historical hydrology (1975–2007).

[d] Total number of event days / number of years in water year type.

[e] Total number of event days / number of years with events in water year type.

[f] Number of years with events / total number of years in water year type.

Fifty-eight bulk samples were collected in typical trout spawning habitat (i.e., pool tail out, pocket gravel, or riffles). All of the study sites contained grain sizes suitable for spawning trout material (8 to 64 mm diameter gravel). Eighteen of the 58 bulk samples contained more than 30 percent fines (< 6.4 mm size) prior to winnowing of fine sediments during spawning. After winnowing, the fine sediment content in the bulk samples at all of the study sites was within the established criteria to support successful trout reproduction.

PCWA characterized the amount of residual fine sediment in pools in the bypassed and peaking reaches in 2006 and 2007 using the V* index (Hilton and Lisle, 1993; Lisle and Hilton, 1999). The V* index quantifies the proportion of the residual pool volume that is filled with fine sediment. Excess fine sediment in pools can indicate insufficient magnitude or frequency of sediment transporting flows needed to maintain channel morphology and aquatic habitat. The V* analysis indicated little fine sediment storage. The V* values at all sampling sites in the bypassed and peaking reaches were less than 0.10, suggesting that there is adequate flow to maintain pool volume and transport fine sediment.

Sediment Capture and Management in Project Reservoirs and Diversion Pools

The large project reservoirs (French Meadows and Hell Hole) have captured sediment since the project began operations. About 29,523 cubic yards of sediment has accumulated in French Meadows reservoir since project operations began in 1967. Sand and medium-sized gravel particles comprised 59 percent of the total accumulated sediment volume. Medium and coarse gravel comprised 37 percent of the total volume. Average annual gravel load captured in French Meadows reservoir is about 251 cubic yards/year. About 443,500 cubic yards of sediment has accumulated in Hell Hole reservoir (1966 through 2007). Sand-sized particles comprised 72 percent of the total accumulated sediment volume. Medium and coarse gravel comprised about 12 percent of the total volume. Average annual gravel load captured in Hell Hole reservoir is 1,250 cubic yards/year. Sediment management activities do not occur at these reservoirs because sediment accumulation does not affect project operations or reservoir storage capacity (accumulated sediment occupies less than 0.09 percent of the original reservoir capacity).

Sediment has been routinely excavated from within the medium-sized project reservoirs (Middle Fork interbay and Ralston afterbay) following high-flow events. Sediment is typically removed during the low-flow period and/or during scheduled maintenance outages. At Middle Fork interbay, sediment was removed on average once every 6 years. The average volume of sediment removed per maintenance activity was 36,000 cubic yards (ranging from 16,000 to 68,000 cubic yards). The sediment removed was 56 percent sand, 16 percent fine gravel, 21 percent medium to coarse gravel, and 8 percent cobble and larger. An average of 6,210 cubic yards was removed per year, of which 21 percent was medium and coarse gravel. At Ralston afterbay, sediment removal occurred on average once every 4.5 years. The average volume of sediment removed per

maintenance activity was 48,700 cubic yards (ranging from 10,000 to 80,000 cubic yards). The sediment removed was about 32 percent sand, 8 percent fine gravel, 25 percent medium to coarse gravel, and 35 percent cobble and greater. In 2002, PCWA initiated a sediment management pilot project that involved placing about 45,000 cubic yards of coarse sediment from Ralston afterbay on Indian Bar, located within the floodplain of the Middle Fork American River near Oxbow powerhouse. The sediment was placed in a configuration that allowed mobilization into the Middle Fork American River during high-flows. A portion of the sediment excavated from reservoirs is hauled to approved sediment disposal sites. The designated disposal area for Middle Fork interbay is the Middle Fork interbay sediment disposal area located 2.8 miles from Middle Fork interbay on Middle Fork Interbay Dam and Powerhouse Road. The current designated disposal area for Ralston afterbay is the Ralston Ridge sediment disposal area located about 3 miles from Ralston afterbay via Forest Road 23.

The small project diversions (Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks) have low trap efficiencies, allowing most of the suspended sediment load (predominantly sand) to be transported over the dams during high-flow events. Bedload (coarse sand, gravel, and cobble) may also pass over the diversion dams during large storm events when the diversion pools are nearly filled with sediment. PCWA has routinely excavated sediment from the three small diversion pools. An average of 416 cubic yards/year, 622 cubic yards/year, and 374 cubic yards/year were removed from the Duncan Creek, South Fork Long Canyon Creek, and North Fork Long Canyon Creek diversion pools, respectively. In the Duncan Creek diversion pool, about 36 percent of the total volume removed was medium and coarse gravel (148 cubic yards/year). In South Fork Long Canyon diversion pool, about 62 percent of the total volume removed was medium and coarse gravel (386 cubic yards/year). The proportion of gravel removed from North Fork Long Canyon diversion pool was about 20 percent (75 cubic yards/year).

Shoreline Erosion in Project Reservoirs

Project reservoirs are surrounded predominantly by bedrock slopes that are resistant to erosion. The banks of French Meadows and Hell Hole reservoirs consist of predominantly granitic and volcanic rock, and the soils derived from weathering of these rocks. Hell Hole reservoir is located almost entirely within the Sierra Nevada batholith, which is dominated by massive and fractured bedrock with little soil development. About 8.5 miles of the 11-mile-long shoreline around Hell Hole reservoir is bedrock or boulder material that is highly resistant to erosion. Material subject to erosion along the remaining 2.5 miles of shoreline is predominantly decomposed granite composed of coarse sand. Shorelines around French Meadows reservoir, Ralston afterbay, and Middle Fork interbay are also primarily composed of bedrock and boulder substrates that are resistant to erosion.

Large Woody Debris Capture and Management in Project Reservoirs and Diversion Pools

LWD occurs in Hell Hole and French Meadows reservoirs, Duncan Creek diversion pool, North Fork Long Canyon diversion pool, Middle Fork interbay, and Ralston afterbay. Recruitment of LWD into project reservoirs and diversion pools comes from upstream sources transported downstream in the channel and from steep vegetated hillslopes surrounding the impoundment. Only a small amount of LWD (one to six pieces) has been observed in Duncan Creek and North Fork Long Canyon diversion pools and Middle Fork interbay. Larger amounts of LWD have been observed in Hell Hole reservoir (40 to 50 pieces) and French Meadows reservoir (150 to 250 pieces). LWD observed in these reservoirs was stored along the high water mark and along the back of the dam. No LWD was observed in the South Fork Long Canyon diversion pool or Ralston afterbay during PCWA's field studies. However, the Forest Service, California Fish and Game, and California State Parks, in their comments on the draft EIS, state that LWD accumulates in Ralston afterbay.

PCWA has conducted LWD management on an as-needed basis (typically every 5 years) at all reservoirs and diversion pools except French Meadows reservoir. Maintenance activities focus on removal of debris surrounding intake structures and along log booms to ensure proper functioning of the spillway and diversion inlets. The LWD removed from Hell Hole reservoir is typically burned on site. Woody debris in Middle Fork interbay and Ralston afterbay is flushed through the spillway gates. The density of LWD per mile upstream and downstream of the diversions and reservoirs was similar. LWD was most prevalent in the upper river reaches below the diversions and dams (particularly Middle Fork American and Rubicon Rivers) and decreased further downstream in the watershed (PCWA, 2009).

3.3.1.2 Environmental Effects

Activities associated with modifications of existing project facilities, construction of new project facilities, and operation and maintenance of the project can affect geology, soils, and geomorphology in the project area through processes involving erosion and sediment delivery, streamflow, and sediment supply and transport in bypassed reaches. Effects on geomorphology may include:

- erosion and sediment delivery from modification of existing or construction of new facilities and changes in reservoir water level fluctuations;
- changes in sediment stored in project reservoirs and sediment augmented to project reaches from sediment management activities; and
- changes in channel morphology and bed surface texture in the bypassed and peaking reaches from changes in project operations affecting supply and transport of sediment and wood.

To address these potential effects, PCWA proposes to implement erosion and sediment control measures, and implement a Sediment Management Plan, a program of pulse flows in bypassed reaches, and a Geomorphology/Riparian Monitoring Plan.

Protection of Soil Resources during Construction

Surface erosion and increased overland flow resulting from modification of existing project facilities or construction of new project facilities (including recreation facilities) could increase soil erosion and fine sediment delivery to project waterways. Fine sediment can adversely affect aquatic resources by increasing turbidity and degrading stream bed substrates used for spawning. Accumulation of fine sediment in gravel deposits can adversely affect trout spawning and incubation success and contribute to encroachment of riparian vegetation into the bankfull stream channel. Sediment mobilized by surface erosion and mass wasting may be transported to and retained in project reservoirs, increasing the need for sediment management activities.

PCWA proposes the following measures to minimize erosion and sediment delivery during construction (some measures are also applicable to operation and maintenance and therefore repeated in the following subsection):

- restricting activities to minimize erosion by conducting operations during periods of minimal runoff;
- implementing measures to minimize erosion and sedimentation from disturbed ground on incomplete projects;
- developing an erosion control plan prior to construction activities;
- establishing preventative measures to divert surface runoff around bare areas;
- constructing of drainage facilities to control erosion and/or sedimentation during earthwork;
- implementing measures to prevent or minimize erosion, including vegetative and/or mechanical measures to improve surface soil stability; and
- revegetating unstable or disturbed soil surfaces as soon as possible to minimize erosion potential.

The same measures to control erosion and sedimentation during construction activities are included in Alternative 1, consistent with Forest Service preliminary condition no. 45 (now Forest Service final condition no. 46). In addition, Alternative 1 calls for developing and filing with the Commission within 1 year of license issuance an erosion and sediment control management plan that would provide direction for treating project-related erosion and controlling project-related sedimentation during the term of a new license. At a minimum, the plan would include the following measures that pertain

to construction (some of these measures also pertain to operation and maintenance, and therefore are repeated in the following subsection):

- erosion control measures that incorporate current standards, follow Forest Service regulations and guidance (e.g., Tahoe and Eldorado National Forests land and resource management plans, road management objectives, and best management practices [BMPs]), are customized to site-specific conditions, and approved by the Forest Service;
- effectiveness monitoring of completed erosion control treatment measures after treatment to determine if further erosion control measures are needed. If erosion control measures are not effective, PCWA would implement additional erosion control measures approved by the Forest Service and continue monitoring until the site has stabilized;
- protocols for emergency erosion and sediment control; and
- development of erosion control guidelines for new construction or non-routine maintenance.

Our Analysis

The proposed erosion and sedimentation control measures provide general principles that, when applied to specific sites, should serve as effective control measures during construction associated with modification of existing and construction of new project facilities. However, the commitment to develop an erosion control plan prior to construction activities is ambiguous as to exactly when the plan would be developed and what specifically would be included in the plan.

The content of the Alternative 1 erosion and sediment control management plan is much more clearly specified and would provide for periodic effectiveness monitoring; identification of criteria and procedures for controlling erosion; and development of emergency response protocols to manage erosion and sedimentation. The Alternative 1 approach would provide for prevention of erosion and sedimentation associated with project infrastructure and future project actions. Finally, the Alternative 1 approach would provide controls necessary to protect water quality and aquatic and riparian habitat from the effects of project-related erosion and sedimentation. Establishing a specific time frame for plan development (1 year from license issuance) would enable all potential ground-disturbing activities that may be included in a new license to be addressed on a site-specific basis in the plan. Implementation of the measures specified in Alternative 1 would be protective of soil resources and ensure that any effects due to project-related construction over the term of a new license would be minor and short-term. PCWA should only be responsible for addressing project-related erosion, and Forest Service final condition no. 46 affirms this responsibility.

Protection of Soil Resources during Operation and Maintenance

Surface erosion and increased overland flow resulting from sediment removal, augmentation, and disposal; vegetation management; and other project operation and maintenance activities could increase soil erosion and fine sediment delivery to project waterways. As discussed in the previous subsection, fine sediment can adversely affect aquatic resources by increasing turbidity and degrading stream bed substrates used for spawning. Accumulation of fine sediment in gravel deposits can adversely affect trout spawning and incubation success and contribute to encroachment of riparian vegetation into the bankfull stream channel. Sediment mobilized by surface erosion and mass wasting may be transported to and retained in project reservoirs, increasing the need for sediment management activities.

PCWA proposes the following measures to minimize erosion and sediment delivery:

- restricting activities to minimize erosion by conducting operations during periods of minimal runoff;
- implementing measures to minimize erosion and sedimentation from disturbed ground on incomplete projects;
- establishing preventative measures to divert surface runoff around bare areas;
- implementing measures to prevent or minimize erosion, including vegetative and/or mechanical measures to improve surface soil stability; and
- revegetating unstable or disturbed soil surfaces as soon as possible to minimize erosion potential.

The same measures to control erosion and sedimentation during project operation and maintenance are included in Alternative 1, consistent with Forest Service preliminary condition no. 45 (now final condition no. 46). In addition, Alternative 1 calls for developing and filing with the Commission within 1 year of license issuance an erosion and sediment control management plan that would provide direction for treating project-related erosion and controlling project-related sedimentation during the term of a new license. This plan would also include measures to control erosion during construction, discussed in the previous subsection. At a minimum, the plan would include:

- methods for initial and periodic inventory and monitoring of the entire project area and project-affected Forest Service lands to identify erosion sites and to assess whether these sites are project-related;
- periodic monitoring and inventory at project-related sites, including recording effectiveness of erosion treatment measures, and identification of new erosion sites for the term of the new license;

- criteria for ranking and treating project-related erosion sites including a risk rating and hazard assessment for scheduling erosion treatment measures and monitoring at each site;
- erosion control measures that incorporate current standards, follow Forest Service regulations and guidance (e.g., Tahoe and Eldorado National Forests land and resource management plans), road management objectives, and BMPs, are customized to site-specific conditions, and approved by the Forest Service;
- development and implementation of a schedule for treatment of project-related erosion sites, including a list of sites requiring immediate treatment;
- effectiveness monitoring of completed erosion control treatment measures after treatment to determine if further erosion control measures are needed. If erosion control measures are not effective, PCWA would implement additional erosion control measures approved by the Forest Service and continue monitoring until the site has stabilized;
- protocols for emergency erosion and sediment control;
- a process for documenting and reporting inventory and monitoring results including periodic plan review and revision. Documentation would include a Forest Service-compatible GIS database for maps keyed to a narrative description of detailed, site-specific, erosion treatment measures and sediment monitoring results; and
- development of erosion control guidelines for new construction or non-routine maintenance.

Our Analysis

The proposed erosion and sedimentation control measures that would be implemented during project operation and maintenance provide general principles that, when applied to specific sites, should serve as effective control measures. However, these measures would not provide the specifics regarding what would be done during particular operation and maintenance activities.

The content of the Alternative 1 erosion and sediment control management plan is much more clearly specified and would provide for periodic monitoring, inventory, and prioritized treatment of project-related erosion sites; identification of criteria and procedures for controlling erosion; development of emergency response protocols to manage erosion and sedimentation; and annual mechanisms for reporting and agency review of procedures and actions. The Alternative 1 approach would provide treatment for existing erosion sites and prevention of erosion and sedimentation associated with future project actions. It would also ensure consultation with appropriate agencies in developing the plan and subsequent periodic annual review by these agencies of the plan and actions taken. Finally, the Alternative 1 approach would provide controls necessary

to protect water quality and aquatic and riparian habitat from the effects of project-related erosion and sedimentation. Establishing a specific time frame for plan development (1 year from license issuance) would enable all potential ground-disturbing activities that may be included in a new license to be addressed on a site-specific basis in the plan. Implementation of the measures specified in Alternative 1 would be protective of soil resources and ensure that any effects due to project-related construction over the term of a new license would be minor and short-term. PCWA should only be responsible for addressing project-related erosion, and Forest Service final condition no. 46 affirms this responsibility.

Sediment Management

Sediment management is necessary at the project's three small diversion pools and two medium reservoirs to maintain and protect project reliability including: preserving full diversion capabilities, preventing damage to the turbines caused by coarse sediment entering the tunnels, preventing sediment accumulation in the tailraces of powerhouses, and maintaining minimum instream flow releases. Sediment management activities can also directly and indirectly affect water quality (including erosion, sedimentation, and possible introduction of hazardous chemicals) and biological resources (including riparian habitats, sensitive plants, and wildlife) through dewatering of reservoirs to facilitate sediment removal, equipment access, vegetation removal, mechanical sediment removal, placement (e.g., for disposal or augmentation), grading, release of fine sediment during operations, and surface erosion of sediment following placement.

PCWA proposes a Sediment Management Plan developed in consultation with relicensing participants. The Sediment Management Plan defines routine sediment management activities that would be carried out at three small diversion pools and two medium reservoirs during the term of the new license. The Sediment Management Plan outlines periodic sediment removal by heavy equipment in small and medium-sized reservoirs. The Sediment Management Plan also outlines infrastructure modifications (e.g., retrofitting existing structures with self-cleaning, wedge-wire screen intakes) to allow sediment transport past small diversion facilities during high-flow events.

A portion of gravel and small cobble removed from medium-sized reservoirs during periodic sediment management activities would be placed within the high water channel at approved sites in the Middle Fork American River to augment the supply of coarse sediment in downstream reaches. Sediment used for augmentation would be sorted to a range of particle sizes suitable for spawning: the percentage finer than 1 millimeter (mm) would be less than 14 percent, and the percentage finer than 6.4 mm would be less than 30 percent. Particles with a median grain size greater than 178 mm (7 inches) would be removed to ensure that the augmentation material is capable of being mobilized during moderate to high-flow events. Augmentation into the Middle Fork American River downstream of Middle Fork interbay would be accomplished by indirect placement. Augmentation material would be dumped from the Middle Fork interbay dam and Powerhouse Road (just downstream of the north dam abutment), allowing it to

accumulate in the river channel where it would be entrained and dispersed by fluvial transport to downstream depositional areas. Augmentation downstream of Ralston afterbay dam would occur at the existing Indian Bar sediment augmentation area and a new augmentation area at Junction Bar, downstream of Indian Bar (figure 3).

The Sediment Management Plan includes interim and contingency sediment management activities; specifications for sediment removal, disposal, and in-channel placement; as well as measures for avoiding and protecting biological resources, monitoring (including turbidity at all sediment management sites, pool sediment conditions after augmentation events, methylmercury monitoring in Ralston afterbay and downstream of the Ralston afterbay dam, and hardhead monitoring in Ralston afterbay), reporting, and agency consultation. Alternative 1 also includes the proposed Sediment Management Plan. In its August 5, 2011, letter transmitting its preliminary 4(e) conditions, the Forest Service stated that it considers the Sediment Management Plan to be approved.

Our Analysis

PCWA's proposed Sediment Management Plan would improve project reliability, reduce project facility maintenance, increase natural delivery and transport of sediment downstream of project diversions, and enhance aquatic and riparian habitat downstream of project diversions and medium size reservoirs. Sediment removal in small and medium-sized reservoirs would require partial or complete dewatering of the reservoir impoundments, which could affect aquatic organisms and their habitat as well as terrestrial species that rely on these reservoirs for foraging. Section 3.3.2, *Aquatic Resources*, contains a discussion of the potential effects of sediment management on aquatic species, and section 3.3.3, *Terrestrial Resources*, describes potential effects on terrestrial species. Sediment removal and augmentation activities also can release methylmercury produced under anoxic conditions in reservoirs. Section 3.3.2.2, *Aquatic Resources*, discusses potential effects of methylmercury.

The proposed action would improve coarse sediment supply to reaches downstream of diversions and within the peaking reach, as discussed in more detail in the following section. The Sediment Management Plan includes specifications for sediment removal, disposal, and in-channel placement necessary to protect water quality and aquatic and riparian habitat. The Sediment Management Plan also includes the necessary monitoring of water quality, sediment transport, channel geomorphology, and fisheries to evaluate the effectiveness of the measures.

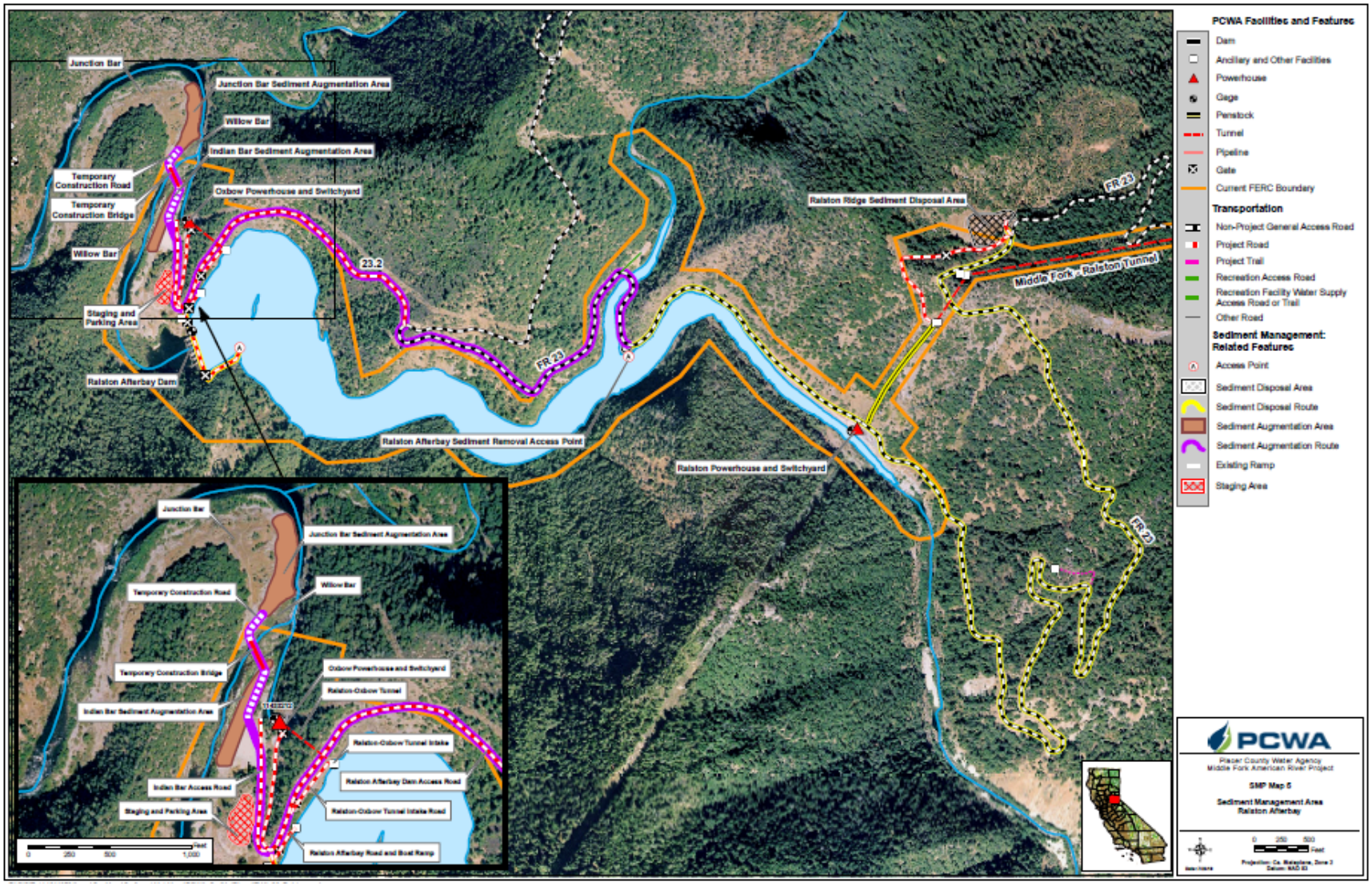

Figure 3. Ralston afterbay sediment augmentation (Source: PCWA, 2011a).

Channel Responses to Altered Flow Conditions

Peak flows in natural rivers provide important geomorphic and ecological functions, such as bed mobilization, floodplain inundation, and fish migration. Project dams and reservoirs trap coarse sediment delivered from upstream sources, limiting available gravel and coarse sediment that would otherwise support and enhance aquatic habitat in the Middle Fork American River. A reduction in coarse sediment supply due to sediment trapping in reservoirs with little coincident decrease in scouring flows can reduce mobile sediment storage and coarsen the channel bed surface, resulting in fewer and less suitable deposits for salmonid spawning. Conversely, continued sediment loading from tributary inputs in the absence of infrequent high flows that scour the channel bed can result in fine sediment accumulation in pools and spawning gravel deposits. Sediment accumulation may degrade aquatic and riparian habitat. Smaller cross-sectional areas and aggradation (berm development) can also result in riparian encroachment. The existing license does not specify pulse flows although high spring flows equal to or greater than the proposed pulse flows historically occurred as a result of reservoir spills and tributary accretion.

PCWA proposes new pulse flows that would affect channel morphology and bed surface textures in the bypassed reaches. The pulse flows are designed to initiate gravel mobility, scour the channel bed, and facilitate cottonwood and willow regeneration in the bypassed reaches during wet and above normal water year types (PCWA, 2007b). No pulse flows are proposed in the Middle Fork American River downstream of Ralston afterbay dam and in the peaking reach because natural high-flow events from unregulated river inflows (e.g., North Fork of Middle Fork American River and North Fork American River) and accretion in the reach provide the same functions as managed pulse flows in these two reaches.

Alternative 1 specifies a schedule of pulse flows for each reach based on water year type, downramping rates of pulse flows, compliance points, test periods, and reporting requirements. Alternative 1 is similar to PCWA's proposal for pulse flows, except that:

- during wet water years, the pulse flow under Alternative 1 would begin on May 15, and PCWA's proposed pulse flow would begin on May 1;
- Alternative 1 includes additional details regarding the time of day to begin pulse flows and testing the ability to release the pulse flows during the first two pulse flow events; and
- Alternative 1 specifies that, within 1 year of license issuance, PCWA must develop and implement a feasibility study to identify the maximum pulse flow between 200 and 600 cfs that can safely and reliably be released from the existing low-level outlet at Hell Hole dam.

In final 4(e) condition no. 23, the timing and magnitude of the pulse flow releases for Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek

are the same as for Alternative 1 (Forest Service, 2012a). Table 3 presents the Forest Service pulse flow schedule for these reaches.

For the reach of the Middle Fork River below the French Meadows dam, the pulse flow releases in the final condition were kept the same as under Alternative 1 for wet and above normal water years if the water years occur in the first two years of project operation under a new license (Forest Service, 2012a). After year 2 under a new license, the requirement would shift from a set minimum flow to a target flow equal to the mean daily flow that is within ±10 percent of the pulse flow used in years 1 and 2. Table 4 presents the Forest Service pulse flow schedule for this reach. The mean daily flow would be based on the 24-hour average of the 15-minute incremental flows recorded at the gaging station. According to the Forest Service, the reason for this change was to reduce the possibility of stranding aquatic biota if PCWA were to release substantially more flow than the minimum standard and then rapidly scale back the flow, resulting in possible stranding.[18] Setting upper and lower bounds (±10 percent) around a daily average would better ensure that such rapid decreases in flow would not occur on a regular basis. The timing of the changes in pulse flow releases would be the same as for the Alternative 1 pulse flows.

For the Rubicon River below Hell Hole dam, the pulse flows were changed in the final 4(e) conditions from a scheduled fixed minimum flow to a target mean daily flow of ±10 percent, similar to the pulse flow scenarios below French Meadows dam (Forest Service, 2012a). Table 5 presents the Forest Service schedule of pulse flow releases to this reach.

For the bypassed reach downstream of the Middle Fork interbay dam, the pulse flow in the final condition would be set equal to ±10 percent of the inflow to the Middle Fork interbay, excluding inflows from the Middle Fork powerhouse that discharge into the interbay (Forest Service, 2012a). All of this flow would pass from the interbay into the bypassed reach below the interbay dam. Inflows equal to the discharge from the Middle Fork powerhouse would pass into the Middle Fork-Ralston tunnel and through the Ralston powerhouse. Table 6 presents the Forest Service pulse flow schedule for the reach below interbay dam. The Forest Service indicated that the release schedule for the reach is intended to better protect existing habitat for foothill yellow-legged frog in the reach than what would be provided under the proposed or Alternative 1 pulse flows (FERC, 2013). The timing of the changes in pulse flow releases would be the same as for the Alternative 1 pulse flows.

[18] Notes of January 9, 2013, teleconference among FERC, PCWA, and Forest Service staff (FERC, 2013).

Table 3. Proposed, Alternative 1, and final 4(e) condition (in parentheses when different from proposed) pulse flow schedule for wet and above normal water years in Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek below diversion dams (Source: PCWA, 2011a,b; Forest Service, 2012a, as modified by staff).

	Water Year Type		
Location	**Wet**	**Above Normal**	**Action**
Duncan Creek below Duncan diversion dam	May 1 (May 15)	May 7	Release a minimum of 150 cfs or inflow, whichever is less
	May 2 (May 16)	May 8	Close diversion completely
	May 11 (May 25)	May 10	Release a minimum of 190 cfs or inflow, whichever is less (can reopen diversion)
	May 13 (May 27)	May 12	Reduce the flow to a minimum of 130 cfs or inflow, whichever is less
	May 16 (May 30)	May 15	Reduce the flow to a minimum of 90 cfs or inflow, whichever is less
	May 19 (June 2)	May 18	Reduce the flow to a minimum of 45 cfs or inflow, whichever is less
	May 23 (June 6)	May 22	Release the minimum instream flow requirement
North Fork Long Canyon Creek below North Fork Long Canyon diversion dam	May 1 (May 15)	May 1	Release a minimum of 50 cfs or inflow, whichever is less
	May 2 (May 16)	May 2	Close diversion completely
	May 11 (May 25)	May 4	Release a minimum of 35 cfs or inflow, whichever is less (can reopen diversion)
	May 13 (May 27)	May 6	Reduce the flow to a minimum of 21 cfs or inflow, whichever is less
	May 16 (May 30)	May 9	Release the minimum instream flow requirement
South Fork Long Canyon Creek below South Fork Long Canyon diversion dam	May 1 (May 15)	May 1	Release a minimum of 100 cfs or inflow, whichever is less
	May 2 (May 16)	May 2	Close diversion completely
	May 11 (May 25)	May 4	Release a minimum of 70 cfs or inflow, whichever is less (can reopen diversion)
	May 13 (May 27)	May 6	Reduce the flow to a minimum of 35 cfs or inflow, whichever is less
	May 16 (May 30)	May 9	Release the minimum instream flow requirement

Table 4. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Middle Fork American River below French Meadows dam (Source: PCWA, 2011a,b; Forest Service, 2012a, as modified by staff).

	Water Year Type			
	Wet	**Above Normal**	**Water Year Restrictions**	**Flow Release**
Proposed	May 1	May 7	Water year occurs in any year	Increase flows from the minimum instream flow release to a minimum of 200 cfs
Alternative 1	May 15	May 7		
Final 4(e)	May 15	May 7	Water year occurs in year 1 or 2 of any new license	
Final 4(e)	May 15	May 7	Water year occurs after year 2 of any new license	Increase flows from the minimum instream flow release to a target man daily flow of 200 cfs ± 10%
Proposed	May 2	May 8	Water year occurs in any year of any new license	Increase flows to a minimum of 400 cfs
Alternative 1	May 16	May 8		
Final 4(e)	May 16	May 8	Water year occurs in year 1 or 2 of any new license	
Final 4(e)	May 16	May 8	Water year occurs after year 2 of any new license	Increase flows to a target mean daily flow of 400 cfs ± 10%
Proposed	May 10	May 10	Water year occurs in any year of any new license	Reduce the flows to a minimum of 275 cfs
Alternative 1	May 24	May 10		
Final 4(e)	May 24	May 10	Water year occurs in year 1 or 2 of any new license	
Final 4(e)	May 24	May 10	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 275 cfs ± 10%
Proposed	May 12	May 12	Water year occurs in any year of any new license	Reduce flows to a minimum of 190 cfs
Alternative 1	May 26	May 12		
Final 4(e)	May 26	May 12	Water year occurs in year 1 or 2 of	

	Water Year Type			
	Wet	**Above Normal**	**Water Year Restrictions**	**Flow Release**
			any new license	
Final 4(e)	May 26	May 12	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 190 cfs ± 10%
Proposed	May 15	May 15	Water year occurs in any year of any new license	Reduce flows to a minimum of 115 cfs
Alternative 1	May 29	May 15		
Final 4(e)	May 29	May 15	Water year occurs in year 1 or 2 of any new license	
Final 4(e)	May 29	May 15	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 115 cfs ± 10%
Proposed	May 18	May 18	Water year occurs in any year of any new license	Reduce flows to a minimum of 65 cfs
Alternative 1	June 1	May 18		
Final 4(e)	June 1	May 18	Water year occurs in year 1 or 2 of any new license	
Final 4(e)	June 1	May 18	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 65 cfs ± 10%
Proposed	May 22	May 22	Water year occurs in any year of any new license	Reduce flows to the minimum instream flow requirement
Alternative 1 and Final 4(e)	June 5	May 22		

Table 5. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Rubicon River below Hell Hole dam (Source: PCWA, 2011a,b; Forest Service, 2012a, as modified by staff).

	Water Year Type		
	Wet	**Above Normal**	**Flow Release**
Proposed	May 1	May 1	Increase flows from the minimum instream flow release to a minimum of 200 cfs
Alternative 1	May 15	May 1	
Final 4(e)	May 15	May 1	Increase flows from the minimum instream flow release to a target mean daily flow of 200 cfs ± 10%
Proposed	June 7	May 16	Reduce the flows to a minimum of 150 cfs
Alternative 1	June 21	May 16	
Final 4(e)	June 21	May 16	Reduce the flows to a target mean daily flow of 150 cfs ± 10%
Proposed	June 9	May 18	Reduce the flows to a minimum of 90 cfs
Alternative 1	June 23	May 18	
Final 4(e)	June 23	May 18	Reduce the flows to a target mean daily flow of 90 cfs ± 10%
Proposed	June 12	May 21	Reduce flows to the minimum instream flow requirement
Alternative 1 and Final 4(e)	June 26	May 21	

Table 6. Proposed, Alternative 1, and final 4(e) condition pulse flow schedule for wet and above normal water years for the Middle Fork American River below Middle Fork interbay dam (Source: PCWA, 2011a,b; Forest Service, 2012a, as modified by staff).

	Water Year Type		
	Wet	**Above Normal**	**Flow Release**
Proposed	May 1	May 7	Increase flows from the minimum instream flow release to a minimum of 200 cfs
Alternative 1	May 15	May 7	
Final 4(e)	May 15	May 7	Allow Middle Fork American River inflow (± 10% average daily flow), excluding discharge from Middle Fork powerhouse, to pass into bypassed reach below interbay dam
Proposed	May 2	May 8	Increase flows to a minimum of 450 cfs
Alternative 1	May 16	May 8	
Final 4(e)	May 16	May 8	Allow Middle Fork American River inflow (± 10% average daily flow), excluding discharge from Middle Fork powerhouse, to pass into bypassed reach below interbay dam
Proposed	May 10	May 10	Reduce the flows to a minimum of 360 cfs
Alternative 1	May 24	May 10	
Final 4(e)	May 24	May 10	Allow Middle Fork American River inflow (± 10% average daily flow), excluding discharge from Middle Fork powerhouse, to pass into bypassed reach below interbay dam
Proposed	May 12	May 12	Reduce flows to a minimum of 260 cfs
Alternative 1	May 26	May 12	
Final 4(e)	May 26	May 12	Allow Middle Fork American River inflow (± 10% average daily flow), excluding discharge from Middle Fork powerhouse, to pass into bypassed reach below interbay dam

	Water Year Type		
	Wet	**Above Normal**	**Flow Release**
Proposed	May 15	May 15	Reduce flows to a minimum of 155 cfs
Alternative 1	May 29	May 15	
Final 4(e)	May 29	May 15	Allow Middle Fork American River inflow (± 10% average daily flow), excluding discharge from Middle Fork powerhouse, to pass into bypassed reach below interbay dam
Proposed	May 18	May 18	Reduce flows to the minimum instream flow requirement
Alternative 1	June 1	May 18	
Final 4(e)	June 1	May 18	If average daily inflows are greater than 155 cfs on June 1 (wet year only) or May 18 (above normal year only), allow inflows (±10%), excluding discharge from the Middle Fork powerhouse, to pass into the bypassed reach below interbay dam until the average daily inflow is less than or equal 155 cfs for 3 consecutive days

The timing of pulse flow implementation following issuance of a new license and the compliance points for measuring pulse flows (table 7) are outlined in PCWA's proposed and the Forest Service Flow and Reservoir Monitoring Plans (discussed in detail in section 3.3.2.2, *Aquatic Resources*). PCWA also proposes to develop and implement a feasibility study within one year of license issuance that identifies the maximum pulse flow between 200 and 600 cfs that can safely and reliably be released from the existing low-level outlet at Hell Hole dam.

Table 7. Proposed, Alternative 1, and final 4(e) condition (in parenthesis when different from Alternative 1) implementation schedule of pulse flows and flow measurement locations (Source: PCWA, 2011a,b; Forest Service, 2012a, as modified by staff).

	Beginning Year following License Issuance		
Project Location	**Proposed Action**	**Alternative 1 and final 4(e)**	**Measurement Location**
Duncan Creek below Duncan diversion dam	Year 4	Year 4	USGS gage no. 11427750 and a new gage on Duncan Creek diversion tunnel
Middle Fork American River below French Meadows dam	Year 3	Year 1[a]	USGS gage no. 11427500 beginning in year 1 after license issuance and a new gage at French Meadows dam in year 3 after license issuance
Middle Fork American River below Middle Fork interbay dam	Year 3	Year 3	A new gage in the Middle Fork American River below interbay dam (and USGS gage no. 11427760 upstream of Middle Fork interbay)
Rubicon River below Hell Hole reservoir dam	Year 6	Year 6	New gages in the Rubicon River at Hell Hole dam spillway, on the instream flow pipe, and on the low-level outlet
North Fork Long Canyon Creek below North Fork Long Canyon diversion dam	Year 5	Year 5	USGS gage no. 11433080 and a new gage below the North Fork Long Canyon diversion dam
South Fork Long Canyon Creek below South Fork Long Canyon diversion dam	Year 5	Year 5	USGS gage no. 11433060 and a new gage on South Fork Long Canyon Creek below the diversion dam

Note: USGS – U.S. Geological Survey

[a] Year 1 begins 30 days after license issuance.

Our Analysis

PCWA's proposal would increase the number of years that pulse flows would occur in May, when high flow events from rainfall combined with snowmelt often occur, by 71 to 300 percent (11 to 16 years during the period of record) compared with existing conditions (4 to 7 years during the period of record), depending on the reach. This analysis includes the reservoir spill flows and stream flows that exceed diversion capacity in May. The proposed pulse flow events would return some of the moderate flow events that were missing under existing project operations (PCWA, 2011b). In the Middle Fork American River and Rubicon River, the proposed action would maintain a frequency of gravel mobility and scour that historically occurred under existing conditions. The frequency of high flows (number of days and years) that would scour and initiate gravel motion in the small bypassed streams (Duncan, North Fork Long Canyon, South Fork Long Canyon, and Long Canyon Creeks) is less under the proposed action compared with historical conditions, but is greater than would occur in the future under existing conditions with expected increased demands on available water supplies.

Most of the bypassed channel reaches (65 to 70 percent of the total length) are relatively stable and have a relatively low potential to adjust in response to alterations in flow and sediment supply or transport. Low response potential is due in part to exposure of bedrock and boulders in the channel bed and banks, channel entrenchment within resistant valley walls and valley bottom material, and high unregulated transport capacity relative to unregulated sediment supply. The exceptions are South Fork Long Canyon Creek, which has a moderate response potential along about 61 percent of the reach, and North Fork Long Canyon Creek, which has a high response potential along about 84 percent of the reach. For all of the bypassed reaches, the most likely channel responses to changes in flow and sediment regimes is a coarsening of bed surface particle size and a reduction in the frequency and size of mobile coarse sediment deposits (e.g., spawning gravel patches).

The peaking reach is predominately alluvial and exhibits more potential for channel adjustment in response to sediment augmentation and altered flows than the bypassed reaches. About 95 percent of the reach is highly responsive due to the presence of finer-grained alluvial bedforms. Lateral shifts in channel planform occur infrequently. Other types of adjustments that could occur include changes in width, depth, and slope, and sediment storage (channel bars and mobile coarse sediment patches).

The proposed action would increase sediment supply to the reaches downstream of the small diversions and improve sediment supply to the reaches downstream of the medium dams. The increase in sediment supply under the proposed action would provide long-term channel geomorphology and aquatic and riparian ecosystem benefits to the small bypassed streams. Proposed spring pulse flows prescribed for all bypassed reaches in May of wet and above normal water years, combined with more natural recession rates would improve the dynamics of riparian vegetation recruitment similar to what might occur in a similarly sized stream under unregulated conditions. The frequency of gravel

bed mobilization and scour under the proposed action is sufficient to maintain the channel geometry and minimize fine sediment accumulation in pools and spawning gravels.

Alternative 1 specifies that, during wet water years, pulse flows would begin on May 15 instead of May 1. This later initiation of pulse flows would still occur prior to foothill yellow-legged frog breeding and would be protective of foothill yellow-legged frog populations. The pulse flows would also occur prior to rainbow trout fry emergence in the bypassed reaches (similar to natural conditions). However, the magnitude of the pulse flows is designed to mobilize, but not scour, gravels. Consequently, trout redds should be protected.

The additional details regarding the time of day when pulse flows would be released would provide more user friendly whitewater boating opportunities than releasing flows at unspecified times. The Alternative 1 provision to conduct a feasibility study regarding the maximum pulse flow that can safely be released from Hell Hole dam would provide a reasonable balance between providing the environmental benefits of pulse flows and ensuring the safe operation of the dam is not compromised. Alternative 1pulse flows would benefit the aquatic ecosystem by maintaining channel geometry and minimizing fine sediment accumulation in pools and spawning gravels, as well as provide additional time for trout fry emergence.

The final 4(e) pulse flow schedule is a refinement of the Alternative 1 pulse flow requirements, attempting to resolve some concerns about the Alternative 1 requirements. The primary difference between the pulse flows proposed in Alternative 1 and specified in the final 4(e) pulse flow schedule is the use of a target mean daily flow based on a 24-hour average of 15-minute interval data gathered at the gaging station(s) for reaches downstream of French Meadows, Middle Fork interbay, and Hell Hole dams. The timing schedule for the final 4(e) condition is the same as for Alternative 1. With a set minimum flow during pulse flow releases, as would be the case under the proposed and Alternative 1 actions, PCWA would be free to release substantially higher flows within the designated time frames and then ramp back the flows to the specified minimum flow and still be in compliance with the pulse flow measure. This could result in stranding of aquatic biota, and an atypical, variable flow regime in the affected reaches that would not reflect a spring high-flow event in an unregulated watershed. By establishing upper and lower boundaries of 10 percent around an average daily target flow, the potential for extreme flow fluctuations during pulse flow releases is reduced. Flows within a 24-hour period could still potentially vary from the minimum flow specified in a new license to flows much higher than the designated target flow as long as the daily average is within the specified band around the target flow. However, PCWA pointed out during the January 9, 2013, clarification teleconference (FERC, 2013) that there would be no incentive for varying Middle Fork American River flow-releases from French Meadows dam within a day, and the outlet valve would likely be set once a day, thus minimizing release fluctuations within a day in the reaches downstream of French Meadows and Middle Fork interbay dams. The potential for relatively high flow fluctuations within a

day would still exist downstream of Hell Hole dam, but provisions for reporting flows, discussed in section 3.3.2.2, *Aquatic Resources*, would enable verification that daily flow releases during scheduled pulse flow events is not excessive. We find that the pulse flow refinements in the final conditions reasonably address concerns about downramping of flows that would protect habitat for the foothill yellow-legged frog that exists downstream of the Middle Fork interbay dam and minimize stranding potential of aquatic biota downstream of French Meadows, Middle Fork interbay, and Hell Hole dams. The pulse flows specified in the final 4(e) pulse flow schedule would result in somewhat better habitat protection than Alternative 1.

Large Woody Debris

LWD can provide habitat structure in streams and affect sediment storage and channel morphology through its effects on the distribution of flow and water velocity, sediment mobilization, and transport. LWD can provide cover and holding habitat for fish, serve as substrate for growth of epibenthic algae and invertebrates, and affect sediment deposition and scouring. Loss of LWD can result in reduced complexity of aquatic habitat and reduced carrying capacity for aquatic biota. Pre-application studies showed little or no woody debris accumulation in the small diversion pools, Middle Fork interbay, and Ralston afterbay. Larger amounts of LWD were observed in French Meadows and Hell Hole reservoirs.

PCWA proposes no specific measures that address LWD. Forest Service condition no. 29 specifies that PCWA develop an LWD management plan within 1 year of license issuance that describes existing location of LWD collection by project facilities, options for moving LWD downstream of project facilities within the river corridor, and suitable location where LWD could be placed within the active channel to be mobilized by 2- to 5-year high flow events. This condition is not included in Alternative 1.

Our Analysis

Studies conducted by PCWA indicate that bypassed reaches immediately downstream of project diversions and dams have the following amounts of LWD: Duncan Creek, 11.43 pieces per mile; Middle Fork American River, 87.86 pieces per mile; Rubicon River, 24.01 pieces per mile; South Fork Long Canyon Creek, 36.02 pieces per mile; and North Fork Long Canyon Creek 24.53 pieces per mile (PCWA, 2007b).

Currently PCWA takes steps to remove LWD from all project impoundments except French Meadows reservoir on an as-needed basis. LWD removed from Hell Hole reservoir is typically burned on site. Woody debris that accumulates in Middle Fork interbay and Ralston afterbay is currently flushed through the spillway gates, typically every 5 years. Thus LWD is already made available to the reaches downstream of these two dams.

In the small bypassed streams, the infrastructure modifications of the small diversions (described previously) would allow woody debris, which is trapped within the diversion pools under existing conditions, to be transported downstream under the proposed action. However, pre-application studies indicated little or no LWD in the small diversion pools, so any positive effect of the proposed project on habitat downstream of the diversion dams would be small. As part of the Sediment Management Plan, post-construction effectiveness monitoring would be conducted at the small diversions to document the ability of structures to pass LWD. If the proposed diversion dam modifications are not effective in passing woody debris downstream, other options identified in an LWD management plan could be considered.

Our analysis indicates that changes in LWD management seem to be clearly warranted at Hell Hole reservoir and dam. Identifying alternatives to the practice of burning LWD removed from the reservoir onsite would have the benefit of reducing air emissions associated with burning and could result in a minor enhancement of aquatic habitat. The LWD management plan specified by the Forest Service would enable options for moving LWD downstream of Hell Hole dam to be identified and potential locations where LWD could be placed in the active river channel. This information would provide a basis for determining if placement of LWD in the active Rubicon River channel is warranted and feasible given the amount of LWD that is already present in the reach immediately downstream of the dam.

Under existing conditions, at many bypassed reach study sites downstream of project dams, PCWA's studies indicate there was no LWD. LWD at those few sites that had moderate amounts of LWD (the reach 2 to 5 miles downstream of Hell Hole dam and the reach downstream of South Branch Long Canyon Creek) were supplied by recruitment of large trees from along the channels. Due to its lack of abundance, LWD in project bypassed reaches had little geomorphic function and contributed little to the quality of aquatic habitat except at localized sites. Therefore, if there are reasonable and feasible options for delivering LWD from all project impoundments to downstream bypassed reaches, aquatic habitat would likely be enhanced.

Developing the specified Forest Service plan would enable specific protocols for disposing of LWD to be established and implemented upon Commission approval. Including in a plan assessments of the need and feasibility of LWD downstream transport options at all project dams would ensure that potential environmental benefits of enhanced geomorphic processes and associated aquatic habitat are worth potential environmental effects associated with downstream LWD placement.

Such effects could include, but not be limited to, disturbances associated with the need to construct new or improved existing access roads, effects of the presence of heavy equipment needed to place LWD in the downstream active channels on NFS resources, and creation of downstream boating hazards or diminished recreational opportunities with increased LWD delivery. LWD delivery options could include, but not be limited to,

increasing the frequency of downstream LWD flushing at Middle Fork interbay and Ralston afterbay dams and whether mechanical placement of LWD downstream of the three small diversion dams is feasible if the proposed modifications are not effective in passing LWD (as discussed previously).

The Forest Service specifies that the LWD management plan describe the location of LWD collection by project facilities. PCWA describes the existing locations of LWD collection by project facilities in its geomorphology technical study report (PCWA, 2009). Transferring this information into an LWD management plan would provide background information and support the rationale for any potential changes to woody debris management.

Monitoring the Response of Project-Affected Stream Reaches to Altered Flows and Sediment Management

PCWA proposes to implement its Geomorphology and Riparian Monitoring Plan to enable documentation of the effects of its proposed sediment management and altered flow regimes in project-affected reaches on channel and shoreline habitat. The objectives of this plan are to monitor channel conditions and riparian vegetation communities at 10 sites in the bypassed and peaking reaches. Monitoring would include photo documentation, survey of channel cross sections, measurements of fine sediment in pools, and riparian vegetation mapping. Data from the monitoring would be used to evaluate the effectiveness of sediment augmentation and pulse flow measures and identify the need for potential adjustments to both.

The Forest Service final condition no. 28 includes a Geomorphology and Riparian Monitoring Plan that differs from PCWA's proposed plan in several key respects. The final Forest Service plan defines two types of monitoring, general purpose and special purpose. General purpose monitoring sites include the 10 sites identified in PCWA's plan, as well as two additional sites downstream of Middle Fork interbay and downstream of Ralston afterbay. Monitoring at general purpose sites includes the methods identified in PCWA's plan, as well as an additional component to characterize channel bed and bank stability using the Rosgen modified Pfankuch procedure (Pfankuch, 1975). This protocol has been used by the Forest Service to characterize stream channel stability for over 35 years. The Forest Service plan specifies conducting general purpose monitoring once every 5 years beginning in year 2 following license issuance (years 2, 7, 13, 18, etc.) and in years following the first three large winter/spring flow events, while PCWA's plan specifies monitoring in years 2, 3, 7, 8, 13, 14, and thereafter for 2 consecutive years during every 10-year period for the term of the license.

The final Forest Service plan also includes three special purpose monitoring sites located downstream of the Duncan Creek, North Long Canyon Creek, and South Long Canyon Creek diversion dams where channel conditions would be affected by both pulse flows and sediment management activities (i.e., sediment pass-through and augmentation). Special purpose monitoring includes channel cross-section surveys and

substrate facies mapping to characterize changes in channel shape and bed surface texture resulting from flow and sediment management activities. Special purpose monitoring under the final Forest Service plan would be conducted at the same time as the first three general purpose monitoring events.

Our Analysis

PCWA's proposed Geomorphology and Riparian Monitoring Plan would document changes in fine sediment stored in pools, changes in channel morphology at monitoring cross sections, and changes in riparian vegetation composition and age class resulting from spill flows, tributary flow and sediment inputs, as well as project-affected flow and sediment supply resulting from pulse flow releases and coarse sediment augmentation. Geomorphic monitoring data would be integrated with riparian monitoring data and photopoint imagery to evaluate the potential effects of project operation on aquatic habitat conditions and riparian vegetation.

The final Forest Service condition no. 28, which specifies both general purpose and special purpose monitoring, would meet the same objectives as PCWA's proposed plan, but would provide additional information regarding channel bed and bank stability and would more thoroughly characterize changes in channel form and bed surface texture under a new license in reaches where flow, LWD, and sediment management activities are most likely to influence channel conditions. These additional monitoring components would allow more comprehensive evaluation of the potential effects of project operations on aquatic habitat and riparian vegetation.

Minimizing Potential Erosion and Slope Instability During Flow Conduit Dewatering

Project-related flow conduits (i.e., penstocks, surge tanks, and tunnels) must periodically be dewatered for inspection and maintenance. The Ralston to Oxbow powerhouse tunnel is inspected on an annual basis during the fall drawdown of Ralston afterbay. Other project flow conduits are not routinely inspected, but a removable tunnel section on the French Meadows to Hell Hole tunnel, two removable tunnel sections on the Hell Hole to Middle Fork tunnel, and a single removable tunnel section on the Middle Fork to Ralston tunnel enable inspections and maintenance to occur if needed. No information is available regarding how tunnels are dewatered and whether this water flows directly into stream channels or overland. The process of dewatering has the potential to increase slope instability, erosion, and sedimentation.

The Forest Service expressed concern that several project features are located on hillslopes and other unstable areas that could have adverse effects if there should be a release of water from project features onto these areas. To address this concern, Forest Service preliminary condition no. 32 (now final condition no. 33) specifies that, within 1 year of license issuance, PCWA develop, in consultation with the Forest Service, Water Board, and California Fish and Game, a plan to evaluate penstock and other drainage structure emergency and maintenance release points to determine if improvements can be

made to minimize potential adverse water quality effects when the release points are used. The Forest Service supports the need for this plan by pointing out that a previous leak in a project surge tank shaft may have contributed to a landslide that affected a road and communication line. This measure is not included in Alternative 1.

Our Analysis

It is uncertain whether there currently exist alternative release points that could be used to minimize potential effects when project flow conduits need to be drained. If there are, some release points may be better than others. The Forest Service's specified plan would identify whether or not options for dewatering release points are available for each project flow conduit and, if so, enable an assessment of site specific conditions associated with each option so that a proactive protocol of prioritizing release points can be developed to minimize the potential for increased slope instability or adverse effects on water quality.

Reservoir Shoreline Erosion

Under both the proposed action and Alternative 1, changes in reservoir water surface elevations and modification of the small stream diversions have the potential to affect shoreline erosion. Under existing conditions, proposed action, and Alternative 1, the normal operating water surface elevations at French Meadows reservoir would be very similar, and the overall potential for shoreline erosion would remain low. At Hell Hole reservoir, the proposed increase in storage capacity under the proposed action and Alternative 1 have the potential to increase shoreline erosion caused by wave action between elevation 4,630 feet (current maximum normal operating water surface elevation) and elevation 4,636 feet. Normal operating reservoir water surface elevations would not change at Middle Fork interbay and Ralston afterbay under the proposed action and Alternative 1 compared with existing conditions. Therefore, there would be no change in shoreline erosion at these two reservoirs. Under the proposed action and Alternative 1, the small diversion dams would be modified into self-cleaning, stream-bottom intakes and sediment would be transported downstream during high flows. The crest of the sloped wedge-wire screen would be 1.3 to 3.1 feet higher than the existing dam, depending on the facility, which could result in increased shoreline erosion.

Our Analysis

The zone between elevation 4,630 and 4,636 feet around Hell Hole reservoir would be inundated more frequently compared with existing conditions and potential susceptible to erosion from wave action (we discuss the changes in frequency of inundation of this zone in section 3.3.3.2, *Terrestrial Resources*). The majority of the shoreline around Hell Hole reservoir, however, is resistant to erosion because of the presence of rock outcrops, boulder-sized materials, and little soil development. The proposed modifications at the small diversion dams, although not susceptible to shoreline erosion from wave action due to small size, could result in increased erosion because of the increased prevailing water surface elevation. The existing diversion pools would

aggrade with sediment to near the top of the wedge-wire screen, and the resulting diversion pools would be shallower and more riverine until sediment is manually removed. This cycle of operation and manual sediment removal occurs under existing conditions on average once every 3 to 7 years, and we expect that with more efficient downstream transport of sediment at the modified small diversion dams, the frequency of manual removal may decrease, resulting in less short-term disruption of aquatic habitat during removal operations. The area footprint of the new diversion pools would remain similar to the existing diversion pools, but the water surface of the new diversion pools would be 1.3 to 3.1 feet higher. The diversion pool shorelines would eventually reach a new equilibrium at which point additional erosion would not be expected to occur.

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

Water Storage

The project includes two large reservoirs for water storage (Hell Hole and French Meadows), two medium-sized reservoirs (Middle Fork interbay and Ralston afterbay), and three small diversion pools (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon Creek) (see figures 1 and 2). Table 8 contains information on water storage characteristics of the project impoundments. French Meadows and Hell Hole reservoirs and Duncan Creek diversion pool have minimum pool requirements under the existing license (table 9).

French Meadows reservoir has a gross storage capacity of 134,993 acre-feet and an active storage capacity of 127,358 acre-feet. Hell Hole reservoir has 207,590 acre-feet of gross storage and an active storage capacity of 205,057 acre-feet. PCWA manages water storage in French Meadows and Hell Hole reservoirs to be at the lowest by the early winter to provide adequate carryover storage and to manage spring runoff (figures 4 and 5). During spring runoff, operating flows are adjusted to store as much water as possible without spilling the reservoirs. After the reservoirs have reached their maximum capacity in late spring or summer, water is managed first to meet instream flow requirements, then to meet consumptive water supply requirements, and finally to optimize power generation.

Table 8. Key characteristics of project impoundments related to water storage (Source: PCWA, 2011a).

	Elevation (feet)				Surface Area (acres)		Storage Capacity (acre-feet)
Impoundment	**Dam Crest**	**Streambed**	**Maximum Operating Water Surface**	**Minimum Operating Water Surface**	**Maximum Operating Water Surface**	**Minimum Operating Water Surface**	**Gross**
French Meadows reservoir	5,273	5,040	5,262	5,125	1,408	434	134,993
Hell Hole reservoir	4,650	4,240	4,630	4,340	1,253	185	207,590
Middle Fork interbay	2,536	2,465	2,529	2,502	7	3	175
Ralston afterbay	1,189	1,100	na	na	na	na	2,782
Duncan Creek diversion pool	5,275	5,243	na	na	na	na	20
North Fork Long Canyon diversion pool	4,720	4,710	na	na	na	na	na
South Fork Long Canyon diversion pool	4,650	4,623	na	na	na	na	na

Note: na – not applicable.

Table 9. Minimum pool requirements (Source: PCWA, 2007b, as modified by staff).

Facility	License Requirement		
French Meadows reservoir		*Minimum Pool (acre-feet)*	
	Forecast/Folsom reservoir[a]	June–Sept	Oct–May
	> 2,000,000 acre-feet	60,000	50,000
	1,200,000–2,000,000 acre-feet	60,000	25,000
	< 1,200,000 acre-feet	28,000	8,700
	The spillway gates (Tainter gates) must remain open from Nov. 15 to April 1 of each year.		
Hell Hole reservoir		*Minimum Pool (acre-feet)*	
	Forecast/Folsom reservoir[a]	June–Sept	Oct–May
	> 2,000,000 acre-feet	70,000	50,000
	1,200,000–2,000,000 acre-feet	70,000	25,000
	< 1,200,000 acre-feet	26,000	5,500
Duncan Creek diversion pool	Maintain water surface elevation at 5,259 feet.		

[a] Forecast/Folsom reservoir = California Department of Water Resources (DWR) current year forecast of unimpeded run-off of the American River to Folsom reservoir.

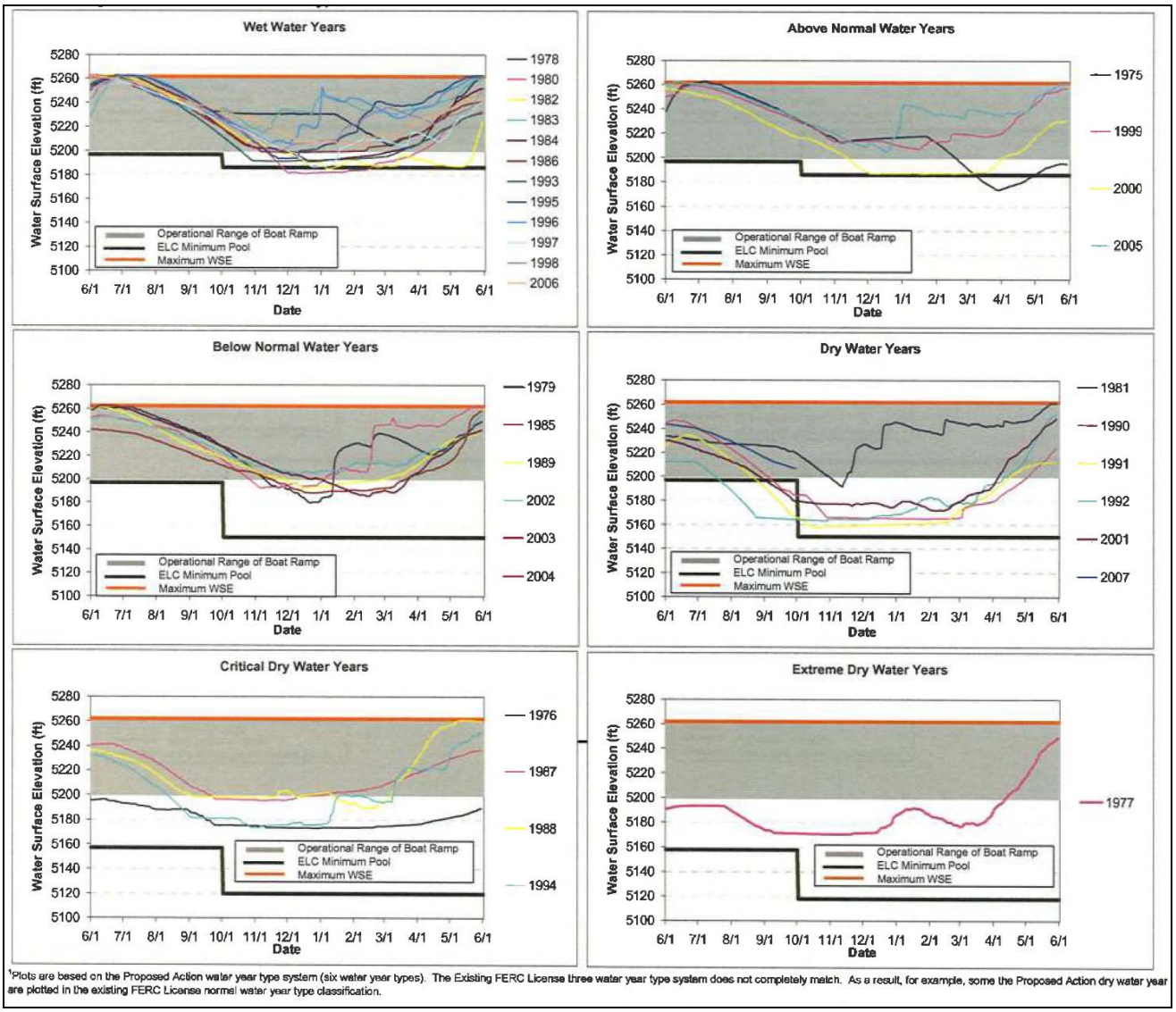

Figure 4. French Meadows reservoir water surface elevation in relation to the French Meadows boat ramp operational range and minimum pool elevations by forecasted water year (Source: PCWA, 2011a).

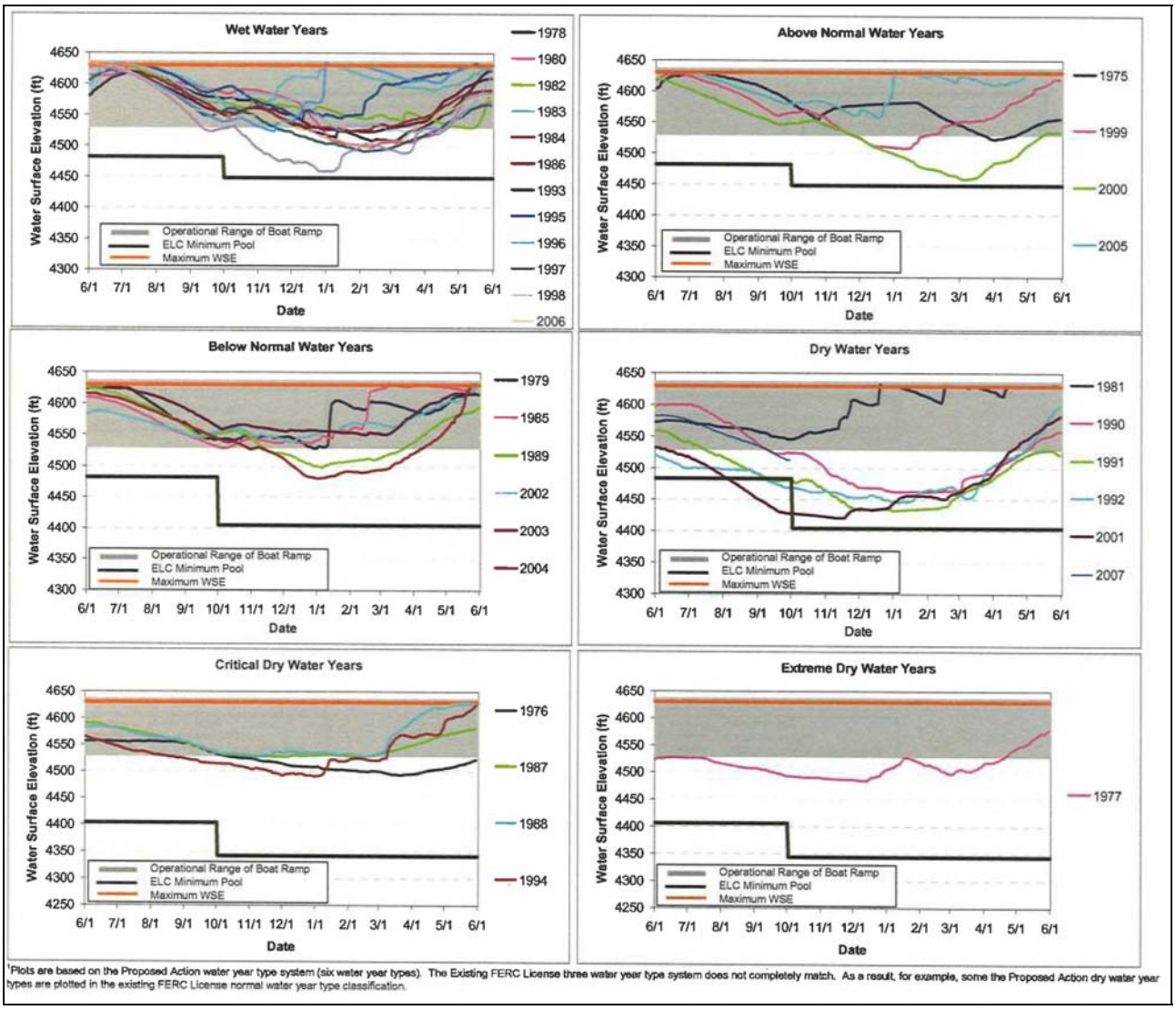

Figure 5. Hell Hole reservoir water surface elevation in relationship to the Hell Hole Boat ramp operational range and minimum pool elevations by forecasted water year (Source: PCWA, 2011a).

Middle Fork Interbay dam is a 70.5-foot-high, 233-foot-long concrete gravity structure with a crest elevation of 2,536 feet. The dam impounds the Middle Fork American River forming Middle Fork interbay. The reservoir has a maximum operating surface area of about 7 acres, and has 175 acre-feet of gross storage and 173 acre-feet of active storage capacity. Middle Fork interbay is typically held at full capacity. Ralston afterbay dam is an 89-foot-high, 560-foot-long concrete gravity structure with a crest elevation of 1,189 feet. The dam is located just below the confluence of the Middle Fork American and the Rubicon Rivers. The dam impounds the Middle Fork American River and forms the Ralston afterbay. Ralston afterbay has 2,782 acre-feet of gross storage capacity and an active storage capacity of 1,804 acre-feet (at 1,179 feet water surface elevation).

PCWA uses Ralston afterbay and Middle Fork interbay primarily as powerhouse forebays and afterbays, and not as storage reservoirs. Middle Fork interbay water surface elevations typically remain near full pool. Ralston afterbay water surface elevations typically remain within 8 feet of full pool. Ralston afterbay water surface elevation typically fluctuates daily in the summer and early fall due to peaking operations of the project and whitewater boating releases. Both Middle Fork interbay and Ralston afterbay are lowered annually during the fall, for about 3 to 6 weeks, for maintenance. The project also includes three small dams and associated diversion pools on Duncan Creek and the North Fork and South Fork of Long Canyon Creek (see figure 1). The Duncan Creek diversion dam forms the Duncan Creek diversion pool, with about 20 acre-feet of gross storage. The North Fork Long Canyon diversion dam forms a small diversion pool with less than 1 acre-foot of storage on North Fork Long Canyon Creek. The width of the dam crest acts as an uncontrolled spillway with a 3,000 cfs discharge capacity. The South Fork Long Canyon dam forms a diversion pool with less than 1 acre-foot of storage on South Fork Long Canyon Creek.

Bypassed and Peaking Reaches

The Middle Fork American and Rubicon Rivers have large river bypassed reaches. Flows in the large river bypassed reaches are typically reduced and more stable during the winter and spring season under regulated conditions compared to what it would be under unregulated conditions because water is diverted from the reaches into storage for consumptive delivery and power generation (table 10). Controlled flow releases from French Meadows dam can come from an 8-inch-diameter pipe with an estimated maximum discharge capacity of 8 cfs and a low level 72-inch-diameter discharge pipe with a 60-inch ring-jet valve with a maximum release capacity of 1,430 cfs at full reservoir volume. Controlled flow releases from Hell Hole dam can come from a 20-inch-diameter pipe fitted with a 12-inch hollow-cone valve with an estimated maximum discharge capacity of 20 cfs and a 48-inch-diameter pipe with a hollow-cone valve for low-level discharges of up to 852 cfs at full reservoir volume. However, PCWA limits discharges from this pipe to prevent spray on the powerhouse and erosion of the powerhouse access road. High flows during storm events and during the spring runoff

Table 10. Hydrology for selected sites (hydrology nodes) in waters associated with the Middle Fork Project (Source: PCWA, 2011a, as modified by staff).

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Small Bypass Streams												
Duncan Creek—Top of Reach (804.805)												
20%	2.2	7.5	14.0	16.0	16.0	18.0	17.0	20.0	12.0	6.3	1.9	1.3
50%	1.0	2.6	7.2	11.0	12.0	14.0	13.0	11.0	8.7	2.6	1.0	0.8
80%	0.6	1.3	3.4	4.6	6.0	11.0	9.3	8.4	4.4	1.2	0.5	0.5
Average	2.1	8.2	19.7	24.9	25.2	20.0	16.4	29.3	14.6	4.2	1.4	1.1
Max	196.0	674.0	1,730.0	2,560.0	2,020.0	1,070.0	651.0	834.0	252.0	105.0	9.2	12.0
Min	0.1	0.3	0.7	0.8	0.9	3.0	4.1	3.4	1.2	0.1	0.1	0.1
Duncan Creek—Bottom of Reach (805.806)												
20%	7.2	18.4	44.7	88.9	103.6	127.1	115.6	121.4	37.2	17.9	8.0	6.0
50%	4.6	7.5	17.0	38.1	53.5	75.9	68.0	41.1	21.8	9.6	5.1	4.2
80%	2.9	4.7	8.0	10.2	20.7	42.9	38.3	22.0	10.9	4.8	3.0	2.4
Average	6.6	20.0	49.6	74.0	87.2	96.8	84.7	77.6	32.5	12.2	5.8	4.7
Max	307.1	788.4	2,141.0	3,185.2	3,165.1	1,191.1	717.4	1,086.7	272.3	117.6	19.2	37.1
Min	0.6	0.9	2.6	3.6	3.7	7.3	8.1	8.0	4.1	1.4	0.4	0.5
North Fork Long Canyon Creek—Top of Reach (817.819)												
20%	0.5	2.2	5.9	8.5	8.7	10.5	5.6	5.5	3.9	1.4	0.5	0.4
50%	0.3	0.8	2.4	3.1	3.5	3.5	3.1	3.2	2.1	0.7	0.3	0.3

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
80%	0.2	0.4	1.0	1.4	2.0	2.6	2.0	2.0	0.9	0.4	0.2	0.1
Average	0.5	3.1	8.8	10.6	10.7	9.1	8.7	8.0	3.1	1.1	0.4	0.3
Max	29.9	184.1	765.5	692.3	572.3	242.8	216.8	212.7	30.8	13.4	2.0	5.2
Min	0.0	0.1	0.0	0.3	0.3	0.7	0.6	0.9	0.2	0.1	0.0	0.0
South Fork Long Canyon Creek—Top of Reach (820.822)												
20%	0.9	5.0	8.7	11.2	13.2	13.2	6.7	6.7	5.9	2.4	1.0	0.7
50%	0.6	1.4	4.9	5.3	6.1	6.3	5.9	5.9	5.0	1.2	0.6	0.5
80%	0.3	0.7	1.7	2.3	4.1	5.0	5.0	5.0	1.9	0.7	0.3	0.2
Average	0.9	5.0	14.7	17.2	18.6	15.2	14.9	13.6	5.3	1.9	0.7	0.5
Max	52.5	323.2	1,344.2	1,215.6	1,005.0	426.4	380.7	373.5	54.1	23.6	5.0	9.1
Min	0.1	0.1	0.4	0.5	0.6	1.3	1.0	1.5	0.3	0.1	0.0	0.0
Long Canyon Creek—Top of Reach (825.828)												
20%	2.3	11.9	31.5	59.3	64.0	78.0	70.0	61.1	15.0	6.3	2.5	1.8
50%	1.5	3.5	12.4	20.0	23.0	30.0	29.0	19.6	9.3	3.2	1.6	1.2
80%	0.8	1.8	4.4	6.1	10.0	16.0	14.5	11.0	4.5	1.8	0.8	0.6
Average	2.3	14.0	44.3	59.9	61.9	60.9	57.3	45.9	13.5	4.6	1.7	1.3
Max	138.0	849.0	3,531.0	3,193.2	2,640.0	1,120.0	1,000.0	981.1	142.0	62.0	6.9	24.0
Min	0.2	0.5	1.1	1.2	1.6	3.3	2.7	3.6	0.8	0.3	0.1	0.1
Long Canyon Creek—Bottom of Reach (830.842)												
20%	10.3	24.5	71.8	166.9	221.0	262.1	231.9	183.0	57.4	21.6	11.7	8.5

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
50%	7.0	11.2	27.6	62.5	81.0	118.6	105.6	58.5	28.4	12.4	6.9	5.3
80%	3.0	6.9	11.7	15.1	33.3	60.8	44.7	28.8	12.2	5.5	2.6	2.1
Average	8.4	28.1	101.3	141.6	188.0	185.9	170.3	117.3	42.3	15.9	7.6	5.8
Max	261.0	1,251.4	7,547.0	5,002.2	8,972.1	2,771.6	2,357.5	2,038.7	386.8	207.6	25.3	54.1
Min	0.3	1.3	2.8	3.1	3.6	8.0	4.7	6.9	2.3	0.3	0.1	0.2
Large Bypass Rivers												
Rubicon River—Below Hell Hole Reservoir (540.832)												
20%	30.6	23.0	22.0	17.0	20.0	21.0	21.0	25.0	25.0	23.0	23.0	23.0
50%	22.0	22.0	15.0	13.0	14.0	15.0	15.0	21.0	22.0	22.0	22.0	22.0
80%	10.0	14.0	12.0	12.0	12.0	12.0	13.0	14.0	20.0	18.0	11.0	11.0
Average	23.8	19.6	25.9	65.0	20.9	30.5	20.7	105.0	107.4	43.3	18.6	21.1
Max	69.0	55.0	4,350.0	17,100.0	1,190.0	6,650.0	557.0	8,720.0	1,950.0	1,350.0	31.0	66.0
Min	4.3	6.5	5.6	5.9	6.1	5.9	7.7	7.7	0.3	6.5	6.5	5.9
Rubicon River—Below South Fork Rubicon River (834.836)												
20%	52.0	45.0	71.5	147.2	187.8	225.4	203.5	186.9	85.7	55.4	47.2	47.2
50%	43.7	38.5	41.0	57.5	83.9	120.8	107.0	73.8	58.3	43.2	37.7	39.0
80%	28.6	31.8	30.7	31.0	42.0	68.1	55.9	46.2	39.1	33.1	28.7	26.9
Average	43.5	57.7	118.3	206.6	181.8	185.9	150.7	208.8	159.0	68.1	37.1	38.8
Max	570.8	3,354.5	9,413.1	27,559.9	11,308.5	10,627.9	2,662.3	12,194.1	2,349.8	1,512.7	63.2	188.2
Min	9.2	10.8	13.0	15.4	15.1	15.2	13.3	14.8	12.2	8.8	8.3	8.3

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Rubicon River—Above Ralston Afterbay (842.815+815ACC)												
20%	78.0	93.2	220.1	567.4	777.1	934.1	822.2	716.4	234.1	111.3	78.3	72.2
50%	65.5	67.1	97.4	193.6	290.0	447.0	392.5	195.0	122.5	75.0	56.0	54.3
80%	42.0	49.7	58.9	64.9	115.0	204.8	160.0	104.1	65.0	47.0	39.2	37.0
Average	65.6	115.3	345.3	543.6	669.8	666.0	588.3	489.1	260.5	107.5	58.2	55.6
Max	1,060.0	5,400.1	26,427.4	40,451.5	35,600.2	14,812.7	8,270.5	13,459.0	3,230.1	1,790.1	131.2	289.0
Min	11.0	14.0	20.0	25.0	23.0	31.0	22.0	28.3	17.0	9.9	8.9	9.0
Middle Fork American River—Below French Meadows Reservoir (530.802)												
20%	9.9	10.0	11.0	13.0	14.0	15.6	14.0	17.0	12.0	10.0	10.0	9.9
50%	9.1	9.5	9.8	10.0	10.0	12.0	11.0	9.9	9.7	9.5	9.2	9.3
80%	7.7	7.7	8.2	8.7	8.6	9.5	9.3	8.5	7.7	7.6	7.7	7.7
Average	9.1	9.4	11.2	20.2	19.5	23.8	17.7	61.6	36.3	15.1	8.6	9.8
Max	75.0	71.0	164.0	3,280.0	993.0	2,380.0	531.0	3,430.0	690.0	521.0	11.0	152.0
Min	2.7	2.8	2.8	4.1	4.4	4.1	3.9	2.7	3.1	2.8	2.7	2.6
Middle Fork American River—Above Middle Fork Interbay (806.810+810ACC)												
20%	25.5	45.6	108.8	222.8	260.5	331.2	297.4	342.4	101.7	47.4	27.5	23.0
50%	19.6	24.1	41.7	91.1	133.5	190.5	172.0	104.0	52.0	29.7	20.7	19.3
80%	15.1	18.6	24.3	28.2	51.6	105.9	93.3	53.7	30.4	19.2	14.9	13.6
Average	23.1	49.2	110.3	175.3	208.9	246.7	215.5	216.8	98.3	40.2	21.7	20.1
Max	604.6	1,071.1	2,985.4	7,801.0	5,238.7	3,231.7	1,169.0	3,604.5	953.9	575.7	53.8	117.7

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Min	7.6	8.6	13.1	10.0	15.5	18.8	18.5	18.7	12.3	7.5	6.1	5.8
Middle Fork American River—Below Middle Fork Interbay (810.812)												
20%	24.0	24.0	25.0	26.8	34.9	124.7	136.4	94.8	64.1	24.0	24.0	24.0
50%	20.0	23.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	23.0	20.0
80%	15.0	18.0	19.0	19.0	23.0	23.0	23.0	23.0	21.0	20.0	15.0	15.0
Average	20.4	24.5	62.5	92.8	127.8	118.0	98.0	124.8	76.1	30.7	20.4	20.1
Max	180.2	601.6	2,885.9	7,616.1	4,993.0	3,261.7	1,373.1	3,931.4	881.1	615.2	48.0	119.0
Min	4.8	6.3	8.5	6.9	11.0	11.0	11.0	7.6	7.8	5.7	5.5	5.5
Middle Fork American River—Above Ralston Afterbay (813.845)												
20%	51.1	61.8	88.4	142.9	203.0	281.5	237.2	177.3	104.8	47.1	38.6	35.5
50%	35.3	38.1	45.3	51.7	89.8	106.3	87.8	74.2	47.0	37.0	31.3	29.5
80%	22.7	28.4	36.3	36.7	42.4	68.1	42.3	43.7	33.9	27.0	19.9	18.9
Average	40.1	59.3	131.2	171.5	242.2	218.1	190.6	185.1	104.8	46.1	30.5	29.2
Max	375.8	1,764.6	6,253.2	10,952.8	10,409.8	3,521.2	2,656.6	4,144.6	924.9	644.4	72.5	131.5
Min	8.7	8.7	12.1	13.2	17.7	22.7	12.5	14.5	13.0	6.7	6.2	6.4
Middle Fork American River Peaking Reach												
Middle Fork American River—Below Ralston Afterbay (855.857)												
20%	742.0	843.2	1,220.0	1,966.0	2,378.0	2,780.0	2,282.0	2,160.0	1,390.0	1,000.0	983.6	830.2
50%	187.0	572.0	613.0	777.0	1,200.0	1,560.0	1,350.0	1,190.0	798.0	741.0	746.0	600.0
80%	94.0	187.8	209.0	287.0	450.4	635.4	466.6	324.0	430.6	480.8	487.8	244.4

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Average	389.4	676.9	1,137.9	1,532.3	1,852.7	1,900.6	1,620.7	1,481.1	1,021.3	758.0	711.6	572.2
Max	2,910.0	15,500.0	35,700.0	64,500.0	46,400.0	23,200.0	19,500.0	23,500.0	4,430.0	3,640.0	1,230.0	1,260.0
Min	41.0	51.0	54.0	75.0	79.0	79.0	69.0	76.0	50.0	64.0	65.0	65.0
Middle Fork American River—Above Otter Creek (860.863)												
20%	749.5	850.7	1,231.5	1,996.9	2,406.1	2,823.7	2,326.6	2,202.5	1,418.6	1,015.5	990.4	837.6
50%	194.0	581.0	622.5	790.6	1,215.1	1,589.7	1,380.3	1,218.5	811.7	747.4	752.9	605.6
80%	100.2	196.0	217.5	295.2	460.9	653.3	490.3	342.8	439.6	486.5	493.5	249.6
Average	396.4	688.5	1,158.1	1,557.5	1,882.8	1,933.6	1,655.2	1,518.8	1,043.0	767.8	718.1	578.4
Max	2,996.6	15,794.0	36,242.7	65,335.7	47,434.6	23,560.3	19,822.3	23,741.4	4,503.3	3,697.9	1,245.0	1,270.5
Min	46.9	56.1	59.6	81.5	84.7	85.9	77.4	84.3	59.7	69.3	70.4	70.6
Middle Fork American River—Above North Fork American River Confluence (866.868)												
20%	758.8	862.5	1,247.1	2,030.0	2,446.8	2,879.7	2,375.7	2,256.6	1,464.4	1,033.2	999.8	847.5
50%	202.8	593.3	636.4	811.7	1,239.2	1,627.3	1,430.9	1,273.1	836.3	758.8	761.8	614.5
80%	108.9	208.9	228.8	307.8	475.3	675.1	524.7	370.1	452.2	495.0	502.6	257.5
Average	406.4	704.9	1,186.3	1,592.9	1,924.4	1,980.1	1,704.4	1,574.0	1,075.1	782.2	727.7	587.5
Max	3,121.3	16,198.7	37,036.2	66,484.9	48,809.5	24,099.4	20,257.0	24,101.3	4,613.1	3,785.0	1,267.3	1,285.4
Min	55.5	63.7	67.8	89.8	93.2	95.6	90.1	96.7	74.1	77.2	78.4	78.8

season are typically captured in French Meadows or Hell Hole reservoirs. Currently, high flows in the upper end of these river reaches generally only occur when the reservoirs are spilling. Spills primarily occur in the wettest years. Substantial accretion inflow occurs along the Rubicon River between Hell Hole dam and Ralston afterbay and along the Middle Fork American River between French Meadows dam and Middle Fork interbay.

Duncan Creek, North and South Fork Long Canyon Creeks, and Long Canyon Creek are small stream bypassed reaches. During the winter and spring season, a portion of the flow in the small stream bypassed reaches is diverted for storage and power generation during most water year types (see figure 2). Flows in the small stream bypassed reaches during this time period are typically lower and more stable than flows would be under unregulated flows, except during winter storms or during spring runoff when flows often exceed the capacity of the diversion facilities (see table 10). Controlled releases from the Duncan Creek diversion dam can come from a 10-inch diameter pipe with a maximum capacity of about 8 cfs and a 60-inch-diameter pipe with a maximum capacity of 310 cfs. Controlled releases from the North Fork Long Canyon Creek diversion dam can come from a 12-inch diameter pipe with a maximum capacity of 2 cfs and a 36-inch-diameter pipe with a maximum capacity of 100 cfs. Controlled releases from the South Fork Long Canyon Creek diversion dam can come from a 12-inch diameter pipe with a maximum capacity of about 5 cfs and a 36-inch-diameter pipe with a maximum capacity of 140 cfs. During winter and spring, accretion occurs along the Long Canyon Creek (downstream of North and South Fork diversions) and in the Duncan Creek bypassed reaches and creates relatively natural shaped hydrographs in the lower portions of the reaches. The diversions are not operated during the late summer and fall (typically August through November) due to low inflow and minimum instream flow requirements (table 11). Therefore, all inflows to the diversion pools are passed downstream into the bypassed reaches.

Table 11. Minimum stream maintenance flow requirements (Source: PCWA, 2007b, table Supporting Document B-9, as modified by staff).

Facility	**License Requirement**	
Duncan Creek diversion dam	*Forecast/Folsom reservoir*[a]	*Release (cfs)*
	> 1,000,000 acre-feet	Lesser of 8 or natural flow
	< 1,000,000 acre-feet	Lesser of 4 or natural flow
French Meadows dam	Beginning of operations to March 17, 1981:	
	Forecast/Folsom reservoir[a]	*Release (cfs)*
	> 1,000,000 acre-feet	8 at all times *except that total releases shall not exceed 5,800 acre-feet*
	< 1,000,000 acre-feet	4 at all times *except that total releases shall not exceed 2,900 acre-feet*
	March 18, 1981, and thereafter: no limitation of total release	

Facility	License Requirement	
Hell Hole dam	Beginning of operations to March 17, 1981:	
	Forecast/Folsom reservoir[a]	*Release (cfs)*
	> 1,000,000 acre-feet	20 June 1–July 25 15 July 26–August 5 10 August 6–Oct 31 14 Nov 1–Jan 31 20 Feb 1–May 31 *except that total releases shall not exceed 11,000 acre-feet*
	< 1,000,000 acre-feet	8 June 1–Dec 1 6 Jan 1–March 25 8 March 26–May 31 *except that total releases shall not exceed 5,500 acre-feet*
	March 18, 1981, and thereafter:	
	Forecast/Folsom reservoir[a]	*Release (cfs)*
	> 1,000,000 acre-feet	20 May 15–Dec 14 10 Dec 15–May 14 *No limitation of total release*
	< 1,000,000 acre-feet	*Release (cfs)* 10 June 1–Oct 14 6 Oct 15–May 31 *No limitation of total release*
South Fork Long Canyon diversion dam	*Forecast/Folsom reservoir*[a]	*Release (cfs)*
	> 1,000,000 acre-feet	Lesser of 5 or natural flow
	< 1,000,000 acre-feet	Lesser of 2.5 or natural flow
North Fork Long Canyon diversion dam	Releases to maintain streamflow of 2 cfs or the natural inflow, whichever is less, shall be made at all times	
Middle Fork interbay	*Forecast/Folsom reservoir*[a]	*Release (cfs)*
	> 1,000,000 acre-feet	Lesser of 23 or natural flow
	< 1,000,000 acre-feet	Lesser of 12 or natural flow
Oxbow powerhouse	Releases at Oxbow powerhouse shall be 75 cfs at all times as measured downstream of the confluence with the North Fork of the Middle Fork. Such releases shall not cause vertical fluctuations (measured in representative section) greater than 3 feet per hour.	

[a] Forecast/Folsom reservoir = California DWR current year forecast of unimpeded run-off of the American River to Folsom reservoir.

Controlled flow releases from the Middle Fork interbay dam to the Middle Fork American River can come from a 20-inch-diameter pipe with a maximum capacity of 23 cfs and a 60-inch-diameter pipe with a maximum capacity of 890 cfs. Controlled flow releases from the Ralston afterbay dam to the Middle Fork American River can come from a 30-inch-diameter pipe with a ring-jet valve that has a maximum capacity of 155 cfs at full reservoir volume and a 72-inch-diameter low-level discharge pipe with a maximum capacity of 1,132 cfs at full reservoir volume. The reach from the base of the dam to the confluence with the Oxbow powerhouse tailrace is about 0.48-mile long.

The peaking reach from Oxbow powerhouse downstream to the high-water mark of Folsom reservoir includes two river segments: (1) the Middle Fork American River from Oxbow powerhouse to the confluence of the North Fork American River and (2) the North Fork American River from the confluence of the Middle Fork American River to the high-water mark of Folsom reservoir. Oxbow powerhouse is typically operated to follow daily power demand and provide whitewater boating flows and is not operated 24 hours per day (except in the wettest of water years and/or seasons of the year) leading to inter- and intra-daily flow fluctuations in the reach. Except during high-flow times, releases from the Oxbow powerhouse cause daily fluctuations in flows in the peaking reach of up to about 900 cfs (about 75 to 1,025 cfs). During winter and spring, flows in the peaking reach can exceed 3,000 cfs due to natural runoff (see table 10). Considerable accretion occurs along the peaking reach, particularly during the winter, from the North Fork of the Middle Fork American River, Volcano Creek, Otter Creek, Canyon Creek, and North Fork American River watersheds. In summer, flows in the peaking reach often consist of a daily peaking event starting from a low nighttime base flow (e.g., 100 to 200 cfs) released from the Oxbow powerhouse followed by a morning up-ramp (about 250 to 450 cfs/hour) to a high peak flow of about 1,000 cfs and then an evening down-ramp (about 250 to 450 cfs/hour) back to the base flow. Each ramping period lasts for about 2 hours. Flows in the upper end of the peaking reach are held relatively steady (close to the 75 cfs minimum instream flow requirement) during a 3- to 6-week period in the fall during maintenance of the Oxbow powerhouse. The total river stage change for typical summer peaking events ranges from about 1 to 2.3 feet (average 1.8 feet), depending on location. The duration of the peak is generally shortened, and the downramps are slower with increasing distance downstream due to channel storage.

Powerhouse Flows

During the filling period (winter and spring), flows through the project powerhouses are highly dependent on projected and actual runoff conditions. During the release period (from the end of the spring runoff period until storm runoff begins again in the late fall or winter), after the reservoirs have reached their maximum storage capacity (the timing of which can vary greatly based on the type of water year), monthly releases for generation are largely predictable (table 12). Daily and hourly releases for generation, which respond to demand for electricity and electrical grid reliability, remain highly variable.

Table 12. Hydrology for project powerhouses (hydrology nodes) at the Middle Fork Project (Source: PCWA, 2011a, as modified by staff).

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
French Meadows Powerhouse (530.540)												
20%	329.7	299.4	243.8	245.3	328.3	342.3	326.4	328.9	326.4	321.5	322.3	318.1
50%	220.9	25.3	0.0	0.0	83.7	111.9	0.0	0.0	197.2	229.2	234.7	209.0
80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	149.8	174.0	0.0
Average	190.5	128.1	98.0	92.4	139.7	152.9	123.4	126.4	179.9	222.2	229.8	195.2
Max	404.3	390.4	377.0	397.7	394.3	398.4	400.8	391.2	389.3	388.3	363.2	364.9
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Fork Powerhouse (823.810)												
20%	573.4	586.4	671.0	516.5	779.3	825.0	830.4	897.6	892.8	811.6	827.6	675.9
50%	52.7	391.4	265.9	221.8	335.5	340.0	260.6	406.2	553.3	563.7	609.5	451.6
80%	0.0	26.4	6.0	0.0	8.8	0.0	0.0	0.0	232.7	344.3	380.0	125.2
Average	259.0	358.1	343.2	289.3	389.9	409.3	378.6	446.7	540.9	547.1	577.2	439.8
Max	989.8	933.0	978.4	964.6	963.4	985.7	954.7	982.5	980.8	949.8	947.8	952.8
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Exceedances and Summary Statistics	Flow (cfs) for years 1975–2007											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Ralston Powerhouse (810.815)												
20%	590.9	602.3	738.8	642.6	889.7	908.2	909.8	910.4	909.0	816.8	817.8	673.4
50%	55.3	437.0	322.9	284.5	441.2	572.2	451.1	577.5	582.8	590.8	607.0	479.6
80%	0.0	44.2	24.5	23.7	40.8	71.9	61.3	47.7	254.1	372.9	408.1	129.6
Average	267.1	389.5	382.9	356.1	447.0	501.3	464.0	517.8	561.7	560.2	582.7	448.2
Max	971.0	917.3	931.0	924.7	930.2	929.9	929.7	930.1	930.2	1,118.3	929.9	925.0
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oxbow Powerhouse (845.847)												
20%	0.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	963.3	792.7
50%	0.0	899.8	635.9	430.8	738.4	1,000.0	1,000.0	1,000.0	750.2	764.1	728.2	424.1
80%	0.0	282.1	202.7	146.0	196.1	355.0	295.7	202.9	362.3	458.8	435.3	278.1
Average	80.8	706.1	615.6	542.0	632.9	727.3	720.4	663.4	708.7	730.6	696.3	509.2
Max	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Min	0.0	0.0	75.0	75.0	75.0	80.0	75.0	78.1	75.0	121.0	112.8	94.9

Note: No data are available for Hell Hole powerhouse.

Water Rights and Consumptive Use

PCWA has five water rights permits and one water rights license related to the project. The water rights permits allow for the diversion and storage of water for consumptive use, power production, and incidental recreation. Table 13 summarizes key provisions of the permits relevant to project operation. PCWA holds the water rights to fully use the capacity of project facilities and to meet current and reasonably foreseeable future consumptive water demand in Placer County.

Table 13. Summary of project area water rights permits (Source: PCWA, 2011a, as modified by staff).

Permit/ License No.	Type of Use	Source	Direct Diversion		Off-stream Storage	
13855	Power/ Incidental Recreation	Duncan Creek to French Meadows reservoir	150 cfs	Jan 1–Dec 31	25,000 acre-feet 400 cfs max	Nov 1–Jul 1
		Middle Fork American at French Meadows reservoir	290 cfs	Jan 1–Dec 31	95,000 acre-feet	Nov 1–Jul 1
		Rubicon River at Hell Hole reservoir	657 cfs	Jan 1–Dec 31	129,000 acre-feet	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole reservoir or Middle Fork power plant	400 cfs	Jan 1–Dec 31		
		North Fork Long Canyon to Hell Hole reservoir or Middle Fork power plant	100 cfs	Jan 1–Dec 31		
		Middle Fork American River at Middle Fork interbay	1,000 cfs	Jan 1–Dec 31		
		Middle Fork American River at Ralston afterbay	1,225 cfs	Jan 1–Dec 31		

Permit/ License No.	Type of Use	Source	Direct Diversion		Off-stream Storage	
13856	Irrigation, and Incidental Domestic, Recreational, Municipal, and Industrial	Duncan Creek to French Meadows reservoir			25,000 acre-feet 400 cfs max	Nov 1–Jul 1
		Middle Fork American to French Meadows reservoir			95,000 acre-feet	Nov 1–Jul 1
		Rubicon River to Hell Hole reservoir	657 cfs	Jan 1–Dec 31	129,000 acre-feet	Nov 1–Jul 1
13857	Power/ Incidental Recreation	Duncan Creek	50 cfs	Jan 1–Dec 31		
		Middle Fork American River to French Meadows reservoir	110 cfs	Jan 1–Dec 31	10,000 acre-feet	Nov 1–Jul 1
		Rubicon River at Hell Hole reservoir	155 cfs	Jan 1–Dec 31	36,000 acre-feet	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole reservoir			13,000 acre-feet 830 cfs max	Nov 1–Jul 1
		North Fork Long Canyon to Hell Hole reservoir			7,000 acre-feet 830 cfs max	Nov 1–Jul 1
		Middle Fork American River to Ralston afterbay	705 cfs	Jan 1–Dec 31		
13858	Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	North Fork American River	800 cfs	Nov 1–Jul 1		

Permit/ License No.	Type of Use	Source	Direct Diversion		Off-stream Storage	
		Middle Fork American River to French Meadows dam			10,000 acre-feet	Nov 1–Jul 1
		Rubicon River at Hell Hole reservoir			36,000 acre-feet	Nov 1–Jul 1
		South Fork Long Canyon to Hell Hole reservoir			13,000 acre-feet 830 cfs max	Nov 1–Jul 1
		North Fork Long Canyon to Hell Hole reservoir			7,000 acre-feet 830 cfs max	Nov 1–Jul 1
13855, 13856, 13857, and 13858	Power/ Incidental Recreation Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	To French Meadows reservoir			Maximum 133,700 acre-feet	
		To Hell Hole reservoir			Maximum 208,400 acre-feet	
20754[a]/ 12644[b]	Power/ Incidental Recreation	Hell Hole reservoir	40 cfs[b]	All year		
		Hell Hole reservoir	40 cfs[b]	All year		
		Hell Hole reservoir	Maximum 17,640 acre-feet/year			

[a] Also known as Permit 20750.

[b] Permit 20754 and License 12644 are additive.

On January 10, 1963, the Water Board issued permit numbers 13855, 13856, 13857, and 13858 to PCWA for the project. These four permits provide for direct diversion and off-stream storage of waters from Duncan Creek, Middle Fork American

River, Rubicon River, and the North and South Forks of Long Canyon Creek. These permits were issued for two types of beneficial use: (1) power and incidental recreation; and (2) irrigation and incidental domestic, recreational, municipal, and industrial. Permit No. 18380 was issued to PCWA for diversions to the Hell Hole powerhouse. This permit was reissued as License No. 12644 on May 17, 1990. PCWA also received Permit No. 20754 on August 18, 1994, to allow for the diversion of additional water for operation of the Hell Hole powerhouse. These permits and license also require:

- protection of water quality and aquatic species;
- public access to project lands and water;
- minimum pool and minimum instream flow requirements (see tables 9 and 11); and
- minimum instream flows of 75 cfs below PCWA's American River pump station.

Water Quality

In the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (basin plan), the Central Valley Regional Water Quality Control Board designates existing and potential beneficial uses and water quality objectives for the Middle Fork American River and its tributaries (Central Valley Regional Water Quality Control Board, 2011). Existing designated beneficial uses of surface waters in project-affected waters include municipal and domestic water supply, irrigation and stock watering, contact and non-contact recreation, power production, cold freshwater habitat, coldwater spawning, and wildlife habitat. Potential designated beneficial uses of project waters includes warm freshwater habitat. Table 14 shows the basin plan water quality objectives to support these designated beneficial uses.

Table 14. Water quality objectives to support designated beneficial uses in the project area (Source: Central Valley Regional Water Quality Control Board, 2011).

Water Quality Objective	Description
Water Temperature	The natural receiving water temperature of interstate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in water temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 5°F above natural receiving-water temperature.
Bacteria	Fecal coliform concentration: less than a geometric average of 200 per 100 milliliters water on five samples collected in any 30-day period and less than 400 per 100 milliliters on 10 percent of all samples taken in a 30-day period.

Water Quality Objective	Description
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Although certain trace element levels have been applied to particular water bodies, no portion of the project affected area is cited within the basin plan. In addition, waters designated for municipal or domestic use must comply with portions of title 22 of the California Code of Regulation which are incorporated by reference into the basin plan.
Iron	0.3 mg/L[a]
Manganese	0.05 mg/L[a]
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
DO	Monthly median of the average daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. Minimum level of 7 milligrams per liter.
Floating Material	Water shall be free of floating material in amounts that cause nuisance or adversely affect beneficial uses.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses.
pH	The pH of surface waters will remain between 6.5 to 8.5.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.

Water Quality Objective	Description
Tastes and Odor	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes and odors to domestic or municipal water supplies, fish flesh, or other edible products of aquatic origin, or substances that cause nuisance or otherwise adversely affect beneficial uses.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
Turbidity	In terms of changes in turbidity (nephelometric turbidity units [NTU]) in the receiving water body: where natural turbidity is less than 1 NTU, controllable factors shall not cause downstream turbidity to exceed 2 NTU; where natural turbidity is between 1 and 5 NTU, increases shall not exceed 1 NTU; where 5 to 50 NTU, increases shall not exceed 20 percent; where 50 to 100 NTU, increases shall not exceed 10 NTU; and where natural turbidity is greater than 100 NTU, increase shall not exceed 10 percent.

[a] The criteria listed are secondary maximum concentration levels for California drinking water quality objectives that do not necessarily indicate a toxic amount of contaminant. Rather, these standards dictate water quality objectives designed to preserve taste, odor, or appearance of drinking water.

The Central Valley Regional Water Board's *Clean Water Act Section 305(b) and 303(d) Integrated Report for the Central Valley Region* includes the North Fork American River, Hell Hole reservoir, and Oxbow reservoir (Ralston afterbay) on the 303(d) list of impaired waters for mercury. On October 11, 2011, the U.S. Environmental Protection Agency (EPA) issued its final decision regarding waterbodies and pollutants proposed to be added to the current 303(b) list, and the three referenced waterbodies are included on that list (Water Board, 2012). The source of mercury in Hell Hole reservoir is listed as unknown, but the likely source for the other two waterbodies is listed as resource extraction.

Physical and water chemistry conditions in the streams and rivers associated with the project are of high quality, with low concentrations of mineral constituents and other substances generally conforming to regulatory water quality objectives and standards. Historical data show that generally all of the constituents analyzed in project-affected waters (within and downstream of project impoundments) complied with current

regulatory standards, with the exception of periodic exceedances of water quality objectives for pH. Reclamation took 222 pH measurements in the peaking reach of the Middle Fork American River and the North Fork American River and 7 were not within basin plan objectives. Of these, three measurements in the peaking reach were below the 6.5 minimum criteria, ranging from 5.9 to 6.4, and two in the North Fork American River were below the minimum criteria at 5.8 and 6.4. In addition, two values measured in the peaking reach were above the 8.5 maximum criteria at 8.6 and 9.2. Water quality sampling associated with the Upper American River Project in Rubicon and South Rubicon river reaches upstream of project impoundments found some pH values outside the basin plan criteria range, with the majority of such values being less than 6.5.

Mean daily summer water temperatures along the length of most of the reaches range from 45 to 68°F and are generally consistent with the basin plan beneficial uses for coldwater freshwater habitat and habitat for reproduction and early development of fish, with two of the river reaches (the downstream reach of the Rubicon river and the Middle Fork American River downstream of Middle Fork interbay) exhibiting transition zones from coldwater to warmer water habitat during the summer. These transition zones result from natural warming of the water along the length of the river reaches and are consistent with the beneficial uses designated for these streams in the basin plan.

In project reservoirs (French Meadow, Hell Hole, Middle Fork interbay, and Ralston afterbay), all *in-situ* measurements, general water quality parameters, and fecal coliform sampling met basin plan water quality objectives or were within typical concentrations for narrative water quality objectives with the exception of dissolved oxygen (DO) in French Meadows and Hell Hole reservoirs. During the 2005 through 2008 sampling period, DO profiles in French Meadows and Hell Hole reservoirs showed levels typically greater than the 7 mg/L water quality objective in the upper portion of the water column, with lower levels that periodically do not meet basin plan objectives in the hypolimnion nearer the reservoir bottom. Figures 6 and 7 show the temperature and DO sampled near the dams in French Meadows and Hell Hole reservoirs. DO within Ralston afterbay near the dam exceeds the 7 mg/L minimum water quality objective from top to bottom (figure 8).

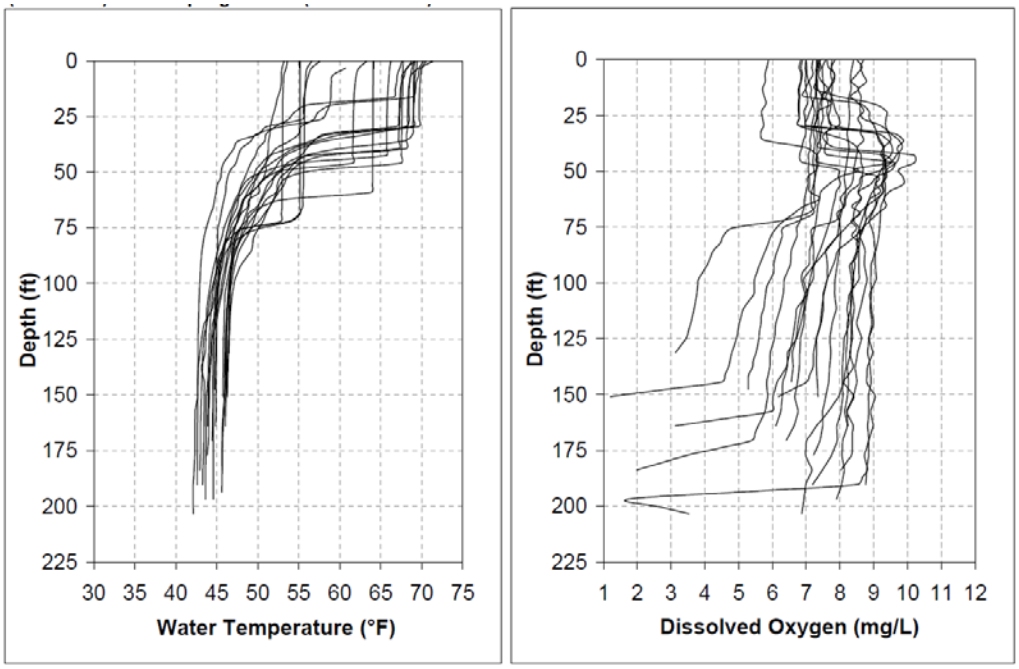

Figure 6. French Meadows water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October) (Source: PCWA, 2011a).

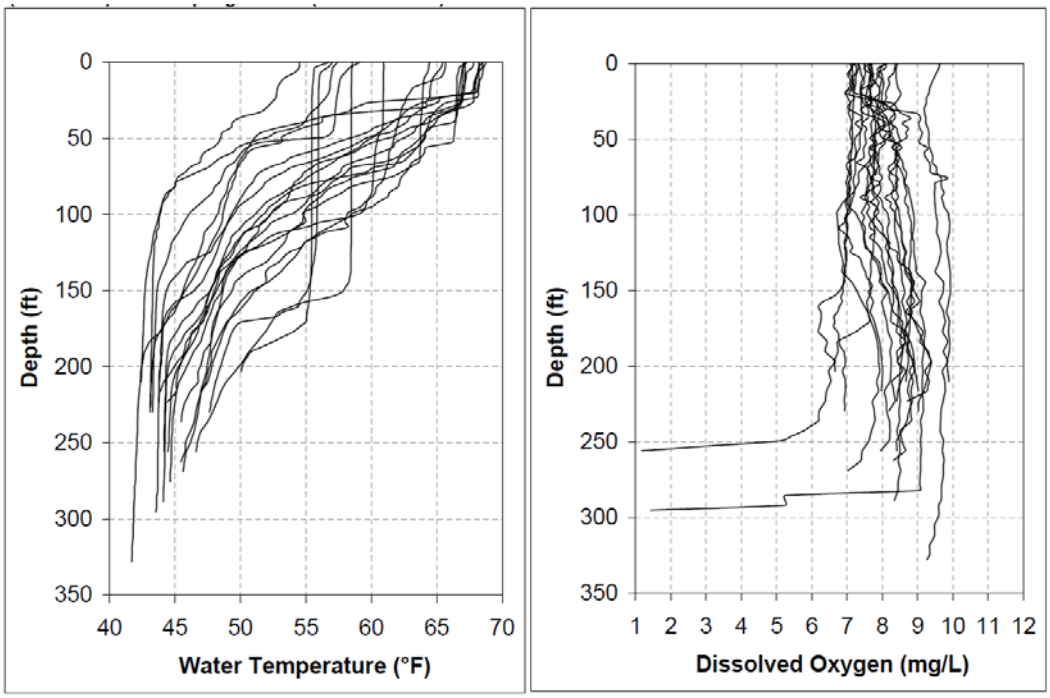

Figure 7. Hell Hole reservoir water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October) (Source: PCWA, 2011a).

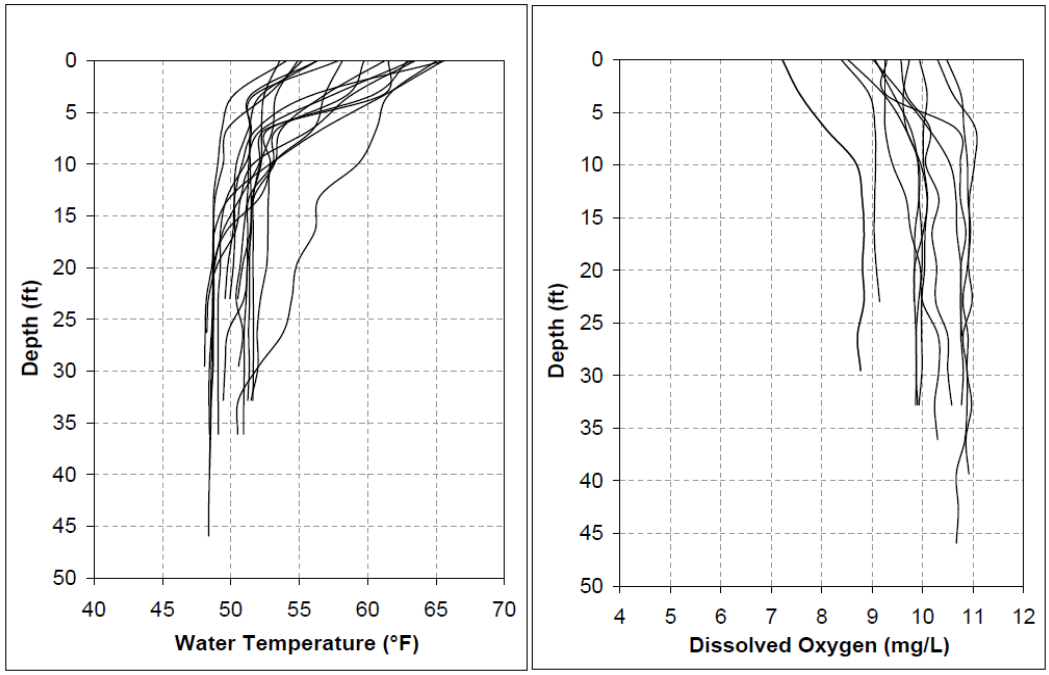

Figure 8. Ralston afterbay water temperature and dissolved oxygen profiles at site RA1 for all years (2005–2008) and sampling months (June–October) (Source: PCWA, 2011a).

Water quality in the bypassed and peaking reaches associated with the project met the basin plan objectives, or was within the expected ranges for narrative water quality criteria, with a few exceptions. Exceptions in the bypassed reaches are as follows:

- *In situ* sampling conducted in spring 2007 in Duncan Creek just upstream of its confluence with the Middle Fork American River and Middle Fork American River just upstream and downstream of the confluence of Duncan Creek showed anomalously low DO of 6.3 mg/L and 6.2 and 6.3 mg/L, respectively. Samples collected farther upstream and downstream of these sampling sites showed DO above the basin plan criteria minimum level of 7.0 mg/L. PCWA believed the values were incorrect and attributed them to either instrument malfunction or sampling error. All other sampling locations had DO values between 7.1 and 11.7 during spring 2007 and fall 2007 sampling events.
- Sampling of seepage water through French Meadows dam (sampled from leakage channels) had high concentrations of manganese (4.04, 3.61, and 3.86 mg/L) and iron (20.4, 16.0, and 19.4 mg/L) and low pH (5.3, 5.6, and 5.5) and DO (1.1, 5.2, and 2.9 mg/L). All of these values are not within basin plan water quality objectives. Samples collected 800 feet downstream showed concentrations that were within the ranges of relevant water quality objectives due to dilution by instream flow releases and accretions downstream from the leakage channels.

- One-time fecal coliform sampling conducted at North Fork Long Canyon Creek below the diversion (RM 2.9) exceeded the basin plan water quality objective for fecal coliform during the fall 2007 sampling event (300/100 mL). No follow-up sampling was conducted.[19]
- Alkalinity concentrations were lower than 20 mg/L at numerous locations in the project vicinity due to naturally low concentrations in the granitic watershed. The EPA standard for the protection of freshwater aquatic life is that alkalinity as $CaCO_3$ should be at or above 20 mg/L except where natural concentrations are less

PCWA conducted a screening level assessment of methylmercury concentration in fish tissues, with a total of 154 sport fish and crayfish captured and analyzed from sampling between 2007 and 2009 at French Meadows reservoir, Hell Hole reservoir, Middle Fork interbay, Ralston afterbay, and the Middle Fork American River at Otter Creek. Methylmercury concentrations in the sampled fish and crayfish were compared to the California's Office of Environmental Health Hazard Assessment (OEHHA) screening guidelines for methylmercury of 0.08 milligrams per kilogram (mg/kg). Methylmercury concentrations in at least one fish or crayfish from each location exceeded the OEHHA screening value of 0.08 mg/kg. In addition, about 55 percent of the fish analyzed from all the sample sites combined had methylmercury concentrations that exceeded the screening value. The highest concentrations (up to 2.31 mg/kg) were measured in fish from Hell Hole reservoir, where the largest fish were caught, and 75 percent of the sampled fish weighed between 1 and 5 pounds. For crayfish, 15 of the 24 crayfish analyzed from Hell Hole and French Meadows reservoirs exceeded the screening value of 0.08 mg/kg, with the highest concentrations also associated with Hell Hole reservoir (up to 0.264 mg/kg).

Aquatic Biological Communities

The project's eight river reaches, four reservoirs, and three small diversion pools (see figure 1) provide habitat for a variety of aquatic invertebrates and fish communities. Riparian habitat, wetlands, amphibians, and reptiles are addressed in section 3.3.3, *Terrestrial Resources*. Special-status aquatic species are described separately at the end of this affected environment subsection.

The streams and rivers associated with the project support diverse communities of benthic macroinvertebrates. The status and health of benthic macroinvertebrate communities were measured at 21 representative study sites and overall there was no observable difference in the index of biotic integrity or the individual benthic macroinvertebrate metrics at the study sites related to project operations or facilities, except at the study sites at the top of the peaking reach immediately below Ralston

[19] Compliance with applicable basin plan objectives is to be based on a minimum of five samples at a specific location within a period of 30 days; therefore, this value technically did not exceed the basin plan objective.

afterbay dam and immediately below Oxbow powerhouse. At these sites, there were fewer EPT (taxa found in the orders: Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]) that are intolerant of disturbance, more high-tolerance individuals, and lower taxa richness compared with the adjacent sites on bypassed reaches (Rubicon and Middle Fork American Rivers) and comparison sites (North Fork American and North Fork of the Middle Fork American Rivers).

During PCWA's surveys for special-status mussel and aquatic snail species, the non-native signal crayfish was documented and a number of other common aquatic mollusk species were found in the study area including: (1) four bivalves—the freshwater mussel (*Margaritifera falcata*) and three peaclams (*Pisidium casertanum*, *Pisidium walkeri*, and an unidentified *Pisidium* spp.); and (2) five gastropods—*Ferrissia rivularis*, *Fossaria obrussa*, *Juga* (*Oreobasis*) *nigrina*, *Menetus opercularis*, and *Physella gyrina*. The peaclams and most of the aquatic gastropods identified in the study area are common native species that occur throughout most of North America.

Fisheries

No migratory fish species are present in the project vicinity. Three native anadromous species (steelhead, Pacific lamprey, and Chinook salmon) historically migrated into the Middle Fork American River watershed. Both steelhead and Chinook salmon reportedly ascended the Middle Fork American River past the Rubicon River confluence and the Rubicon River as far as the Pilot Creek confluence (about 5 miles upstream of the Middle Fork American River confluence) (Yoshiyama et al., 2001; Lindley et al., 2006).[20] Impassable dams on the lower American River, including Nimbus and Folsom dams completed in 1955 and 1956, respectively, by Reclamation, prevent anadromous fish passage into the project's bypassed and peaking reaches.

Potential fish passage barriers (natural barriers, project infrastructure barriers, and other man-made barriers) were mapped along project-affected rivers and streams to determine their potential effects on fish distribution. Many natural and man-made fish barriers unrelated to the project (e.g., Tunnel Chute) are present throughout the peaking and bypassed reaches (figure 9). Barriers to upstream movement are numerous in nearly all river reaches; little opportunity exists for fish to move long distances upstream in the bypassed reaches due to the presence of barriers. Project facilities (four large dams, three small diversion structures, one tunnel stream crossing, one road crossing, and three gage weirs) create additional barriers to upstream fish movement. However, because these barriers are located in reaches already containing natural barriers, the project facilities have little effect on habitat access or upstream distribution above and beyond that found under pre-dam conditions. Barriers, especially project facilities, may also limit

[20] Resident rainbow trout is a catchall designation for hundreds of nonanadromous wild rainbow trout populations that exist throughout California that are either derived naturally from steelhead or, more likely, are of mixed hatchery and native origin (Moyle, 2002).

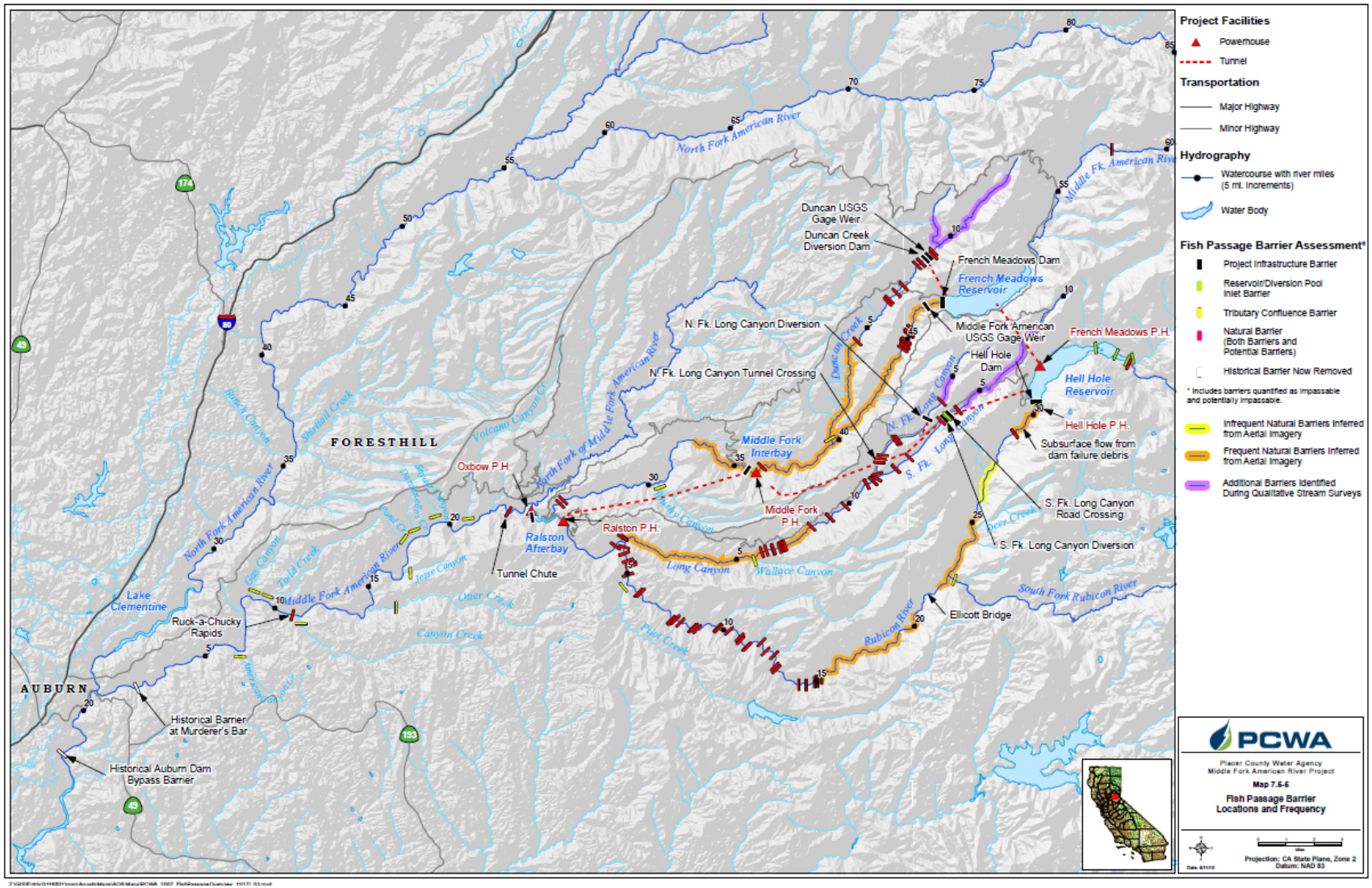

Figure 9. Fish passage barrier locations and frequency (Source: PCWA, 2010b).

downstream movement by fish in the project area. However, because the distribution of resident fish in a watershed is largely regulated by upstream passage rather than downstream passage, the description of fish distribution and passage herein is focused on constraints to upstream movement.

Natural barriers in the tributaries to the project streams limit the ability of fish to use these streams. Sixteen of the eighteen surveyed tributaries to project-affected reaches had natural barriers near their mouth that prevented upstream access by fish (see figure 9). Two tributaries to the peaking reach provide accessible habitat for fish: North Fork of the Middle Fork American River and the downstream-most 1.5 miles of Otter Creek.

All major inlets to reservoirs and diversion pools are free from natural or reservoir-created fish passage barriers except the Hell Hole reservoir inlet and the South Fork Long Canyon Creek diversion inlet (see figure 9). At the inlet to Hell Hole reservoir, there are five natural channel barriers in the Rubicon River below the Hell Hole reservoir high water mark (i.e., river barriers when the reservoir was not at full pool). There are also three natural impassable barriers in the Rubicon River just upstream of the reservoir (above the high water mark) that preclude upstream passage in the river regardless of reservoir elevation. There is also a potential natural stream barrier on Five Lakes Creek about 13 to 14 feet below the Hell Hole reservoir high water mark. The South Fork Long Canyon diversion pool creates a gravel delta at the inlet. When the diversion pool is full, fish passage out of the diversion pool is possible. When the diversion pool is not full, a critical riffle is exposed on the gravel delta that creates a potential barrier to upstream movement from out of the diversion pool area into the stream. However, this only occurs when the diversion is not diverting (e.g., during the summer and fall) and, at that time, there is only a small shallow pool in the bottom of the diversion pool area.

Riverine Fish

Fish populations were surveyed during 2007–2009 at sites on the bypassed reaches, peaking reach, and upstream of project diversions and dams to identify the spatial distribution, condition, and abundance of fish species and determine the upstream distribution of trout, hardhead, and Sacramento pikeminnow. The information herein is based on the 2007–2009 survey results.

Species distribution in the study area reflects fragmentation imposed by water temperature and fish barriers. Trout are the most widely distributed of the 15 species of fish observed at the study sites. Average water temperatures recorded in August indicate that temperatures remain within the range suitable for trout in most of the bypassed reaches and the peaking reach (e.g., average monthly water temperature <70°F). Rainbow trout were present in all sampling locations except the Middle Fork American River at RM 4.8. Brown trout were present in all sampling locations except the Middle Fork American River at RM 4.8, the Rubicon River RM 0.0 to 0.5, Long Canyon Creek at RM 9.0, and the North and South forks of Long Canyon Creek. The condition

(i.e., nutritional state) of rainbow trout collected in rivers and streams was evaluated using Fulton's condition factor, a commonly used indicator based on the length-weight relationship (Ricker, 1975). Mean rainbow trout condition factors were 1.08 in 2007 and 1.1 in 2008, indicating that trout were in good condition compared with other streams and rivers in California, including the Sierra Nevada. Typical mean condition factors for wild rainbow trout in California range from approximately 0.80 to 1.20 (California Fish and Game, 1993, 1996, 1998; Ebasco Environmental, 1993; Hanson and Bajjaliya, 2005; NID and PG&E, 2009), although condition is dependent on the time of sampling.

Minnow species (hardhead, Sacramento pikeminnow, and California roach), which typically inhabit warmer water than trout, are less abundant than trout and patchily distributed. Hardhead is a special-status species and is discussed later in this section under *Special-Status Aquatic Species*. In the Rubicon River, a series of natural barriers along several miles of river (RMs 3.4 to 8.2) appears to limit the upstream distribution of Sacramento pikeminnow (7.6 miles upstream of Ralston afterbay). California roach were found in the Rubicon River as far upstream as RM 14.3. In the Middle Fork American River, pikeminnows and roach were only observed from Ralston afterbay upstream 0.5 mile to the large natural barrier complex. No minnows of any species were found in the Middle Fork American River upstream of the barrier.

Sacramento sucker and sculpin (species not identified) are the most widely distributed species other than trout. They were found together in the same sampling locations including sites in the peaking reach, the lower portion of the Rubicon River, and the Middle Fork American River immediately upstream of Ralston afterbay.

The highest river fish diversity (6 to 8 species) was found in the warmer sections of river; the Middle Fork American River and Rubicon River sampling sites just upstream of Ralston afterbay. The lowest diversity was found in the higher elevations (colder water) streams. Trout were the only species found in the Middle Fork American River upstream of Middle Fork interbay and in Duncan Creek (rainbow trout and brown trout) and in North and South forks of Long Canyon Creek (rainbow trout only).

Emergence and Spawning Timing

The timing of trout fry emergence in streams was monitored in 2007 and 2009. In 2007, young-of-the-year (YOY) sampling was conducted in the bypassed and peaking reaches. In 2009, sampling was limited to trout emergence upstream of the small diversions (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek).

In 2007, rainbow trout YOY were observed by the end of June at all of the qualitative sampling sites, suggesting that spawning occurred in April and May in the higher elevation streams and perhaps as early as March in low elevation tributaries. The earliest rainbow trout YOY (and brown trout YOY) were found during the first sampling date, May 11, 2007, in Gas Canyon Creek, a tributary to the peaking reach. Rainbow trout YOY were found in the Middle Fork American River and Rubicon River just

upstream of Ralston afterbay and in North Fork Long Canyon Creek upstream of the diversion on June 5 through 7, 2007. Brown trout fry were found in the Middle Fork American River just upstream of Ralston afterbay at the same time. Approximately 3 weeks later (June 26), rainbow trout YOY were captured in Duncan Creek and South Fork Long Canyon upstream of the diversions. Rainbow trout eggs hatch and emerge in 5 to 7 weeks (at 10 to 15°C). The fry observation dates coupled with the water temperature data collected suggest that rainbow trout spawning occurred approximately in April and May in Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creeks. Rainbow trout in Gas Canyon Creek likely spawned in March.

In 2009, YOY rainbow trout were first observed upstream of the small diversion structures on June 23 in North Fork Long Canyon Creek and about 2 weeks later (July 6) in Duncan Creek and South Fork Long Canyon Creek. Estimated spawning dates were developed using measured water temperature and back calculating 630 degree-days (i.e., time within the gravel before emerging). In Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek the estimated spawning dates in 2009 were May 3, April 23, and May 11, respectively.

Small Sacramento pikeminnow (0.9 to 1.1 inches) were captured in the Middle Fork American and Rubicon Rivers upstream of Ralston afterbay in the early June sampling (June 5 through 7, 2007). Sacramento pikeminnow likely spawned in April and May consistent with the existing literature (Moyle, 2002). Sacramento sucker were observed actively spawning in the Rubicon River immediately upstream of Ralston afterbay on May 11, 2007. Sacramento sucker YOY were first captured about 2 months later (July 16) in the Middle Fork American River immediately upstream of Ralston afterbay.

Fish in Reservoirs and Diversion Pools

In French Meadows reservoir, brown trout, rainbow trout, tui chub, and kokanee salmon were captured. Brown trout were common (gill netting catch per unit effort [CPUE] was typically >0.1 fish per net hour) and there were fewer rainbow trout (>0.03 fish per net hour) captured. Only one kokanee salmon and one tui chub were caught during surveys. The kokanee was likely an anomaly because no known kokanee stocking has occurred in this reservoir. Most of the rainbow and brown trout captured were between 9 and 20 inches in length, with a few larger fish up to 29 inches. In French Meadows reservoir, primarily rainbow trout have been stocked at an average of 9,906 catchable fish per year (2001 through 2009).

Hell Hole reservoir had the greatest fish species diversity of the two reservoirs with six species total, including brown trout, rainbow trout, lake trout, kokanee salmon, tui chub, and Sacramento sucker. Brown trout were common (>0.1 fish per net hour) and there were few rainbow trout captured. Sacramento sucker was the most abundant species in Hell Hole reservoir (>0.5 fish per net hour), and kokanee salmon were common (>0.06 fish per net hour). Most of the rainbow and brown trout captured were

between 7 and 22 inches in length. Kokanee salmon ranged from about 12 to 17 inches in length. In Hell Hole reservoir, lake trout were historically stocked and currently are self-sustaining. Currently, kokanee salmon and brown trout are stocked annually. Between 2001 and 2009, an average of 24,566 kokanee fingerlings per year and 5,542 catchable brown trout per year were stocked in Hell Hole reservoir.

Gill netting CPUE for all species combined in Ralston afterbay was 0.56 to 0.86 fish per hour. Ralston afterbay contained rainbow trout, brown trout, hardhead, Sacramento sucker, and Sacramento pikeminnow. Sacramento sucker was the most abundant species captured; 77 percent of the fish captured during the combined gill net sampling (including 2007) were large Sacramento sucker (13 to 22 inches). Hardhead constituted 3 percent of the catch. The remainder of the fish captured included rainbow trout (8 percent), brown trout (8 percent) and Sacramento pikeminnow (3 percent).

In Middle Fork interbay, only rainbow and brown trout were captured. Abundance was similar for both species. The combined trout gillnet catch was 0.15 fish per hour.

In the North and South Fork Long Canyon creek diversion pools, rainbow trout are present, and both rainbow and brown trout are present in the Duncan Creek diversion pool. Very low numbers of fish were observed (<15) in each of the diversion pools.

Special-Status Aquatic Species

Special-status species include those protected by the state of California as endangered or threatened, California species of special concern, California fully protected species, California Fish and Game special animal, or a Forest Service sensitive species.

The only special-status aquatic invertebrates known to occur or that have the potential to occur where suitable habitat exists in the project area are the following three Forest Service sensitive species: California floater (a mussel); Great Basin rams-horn (a snail); and scalloped juga (a snail). No live specimens or shells were documented during a targeted relicensing study to determine the presence of these species.

The only special-status fish species in the vicinity of the project is hardhead; it is considered by the Forest Service as a sensitive species. Hardhead were only found in a few locations and in 2007–2009 were present at relatively low abundance in the bypassed and peaking reaches. In both the Middle Fork American and Rubicon Rivers, the number of hardhead relative to other minnow species was low. The majority of the hardhead were found in Ralston afterbay and immediately upstream in the Middle Fork American (0.5 mile of river) and Rubicon (5.4 miles of river) Rivers. Hardhead were also found in two isolated locations in the peaking reach downstream of Ralston afterbay, including a pool in Otter Creek at its confluence with the Middle Fork American River at RM 14.1 and a small in-channel dredging pool in the Middle Fork American River at RM 23.5 (upstream of Tunnel Chute) (see figure 9).

Data from previous fish surveys indicate that hardhead may also have at least historically been present in project stream reaches where they were not found during the intensive 2007–2009 fish population sampling. Such reaches include the mainstem Middle Fork American River between French Meadows reservoir and the Middle Fork interbay, and in the Rubicon River downstream of the dam to the Middle Fork American River (California Fish and Game, 1979; Forest Service, 2003).

During quantitative sampling in 2007 and 2008, a total of 127 hardhead were captured at the river and reservoir sampling sites. Nearly 90 percent (111) of these hardhead were small fish less than 6 inches, and more than 95 percent (121) were from Ralston afterbay (112 from electrofishing, 9 from gill netting). The remainder were captured in the Middle Fork American River upstream of Ralston afterbay. During qualitative sampling in 2007, 78 hardhead were captured or observed in the Middle Fork American and Rubicon Rivers just upstream of Ralston afterbay. Most of these fish were small; the largest was 5.4 inches.

Moyle (2002) states that hardhead mainly spawn in April and May, but spawning may extend into August. YOY data collected by PCWA were inconclusive for determining the hardhead spawning date but PCWA assumed that hardhead spawn from early April into the summer.

Central Valley Steelhead Distinct Population Segment

The California Central Valley Steelhead Distinct Population Segment is federally listed as threatened and critical habitat extends downstream from Nimbus dam on the American River. Naturally spawned steelhead in the lower American River belong to the Northern Sierra Nevada Diversity Group of the Central Valley Steelhead Distinct Population Segment, listed as threatened under the ESA in 2006 (71 Federal Register [FR] 834 [*January 5, 2006*]). Critical habitat includes the American River downstream of Nimbus dam (70 FR 52488; *September 2, 2005*). The American River population is classified at high risk of extinction; increasing demands for water and the potential effects of climate change are likely to increase this risk (NMFS, 2009a).

The California Central Valley Steelhead Distinct Population Segment does not currently occur in project-affected waters. Historically, steelhead and Chinook salmon are reported to have migrated up the Middle Fork American River past the mouth of the Rubicon River and in the Rubicon River upstream to the mouth of Pilot Creek. Extensive stocking of out-of-basin rainbow trout has taken place in the project area and began as early as the 1800s. At one point, native resident rainbow trout in the upper Middle Fork American River basin would have been genetically related to the anadromous steelhead in the basin, but subsequent interbreeding with introduced out-of-basin stocks makes it unlikely that a significant genetic legacy remains in resident populations.

NMFS' Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and California State Water Project (NMFS, 2009b) contains a Reasonable and Prudent Alternative that includes reintroducing Central

Valley Steelhead into the upper American River watershed. NMFS' Public *Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead* (draft recovery plan), also includes a conceptual scenario for reintroducing steelhead to the North Fork American River, Middle Fork American River, and South Fork American River (NMFS, 2009b).

On July 29, 2011, NMFS submitted comments, preliminary prescriptions under section 18 of the FPA, and recommendations for terms and conditions under sections 10(j) and 10(a) of the FPA on the final license application for the Middle Fork American River Hydroelectric Project pertaining to this potential future condition (NMFS, 2011). Because passage above Nimbus and Folsom dams would bring steelhead into contact with the project-affected reaches and facilities of the Middle Fork Project, NMFS requests that additional measures be incorporated as conditions of the new license. Once steelhead are introduced to waters upstream of the dams, NMFS will request an opening of the project license, in accordance with their authority under the FPA, to prescribe fishways and make recommendations for additional terms and conditions for the protection of listed anadromous fish and their habitat.

3.3.2.2 Environmental Effects

Protecting Water Quality during Construction

Modification of existing project facilities and construction of new project facilities could potentially adversely affect water quality. Potential construction-related effects on water quality include increased erosion and sedimentation into adjacent rivers, streams, and reservoirs; discharge of pollutants (e.g., fuels, lubricants, and other hazardous materials) and other contaminants (e.g., human waste and petroleum products) into adjacent rivers, streams, and reservoirs and groundwater; and contamination of water supply systems. In addition, grading, vegetation removal, and other ground-disturbing activities could increase the susceptibility of the project areas to increased erosion and sedimentation.

Protection measures are incorporated into the applicable BMPs and other protection measures identified in the proposed erosion and sedimentation control measures and the Alternative 1 erosion and sedimentation control plan (discussed in section 3.3.1.2, *Geologic and Soil Resources*), the three filed Recreation (PCWA's proposed, Alternative 1, and the Forest Service's), and PCWA's supplemental filing supporting Alternative 1, *Appendix A* (PCWA, 2011b). In addition to the previously discussed erosion and sedimentation control measures, protective measures for the proposed project and Alternative 1 would include: establishment of contingency plans prior to project activities addressing potential hazardous spills; establishing designated equipment refueling and maintenance areas; required cleaning and inspection of equipment prior to entering NFS lands to ensure it is in proper functioning condition; and required compliance with all applicable local, state, and federal standards associated with

handling and disposal of hazardous materials. Measures to protect water quality during construction of facilities related to sediment management at the three small diversion dams as well as at all facilities where sediment management occurs as part of project maintenance are also included in PCWA's Sediment Management Plan, which is included in the proposed action and Alternative 1 and discussed in the following subsection. The proposed, Alternative 1, and final Forest Service condition Water Quality Monitoring Plans all call for the development of site-specific water quality monitoring before and after project-related construction activities.

Our Analysis

The proposed and Alternative 1 measures to protect water quality during project-related construction represent current BMPs and would ensure that project waters are protected. Water quality monitoring provisions before, during, and after construction activities would ensure protective measures are functioning as planned and identify the need for remedial actions. Implementation of these protective measures would ensure that any construction effects on water quality are either prevented or would be temporary and minor.

Protecting Water Quality during Sediment Management

Sediment management is performed at the project's three small diversion pools (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon) and two medium-sized reservoirs (Middle Fork interbay and Ralston afterbay) to maintain and protect system reliability and is discussed in more detail in section 3.3.1.2, *Geologic and Soil Resources*. Under existing conditions, sediment has routinely been excavated on an as-needed basis (generally after episodic high-flow events) from the three small diversion pools. PCWA proposes to modify the infrastructures at the three small diversion pools to allow bedload and suspended load to be naturally transported past the diversion facilities during high-flow events. This would reduce and potentially eliminate sediment removal activities at the small diversion pools. Interim and contingency sediment management activities may be conducted at the small diversion pools prior to and following completion of the diversion dam modifications.

The proposed action also includes new sediment augmentation activities downstream of Middle Fork interbay and Ralston afterbay. At these locations, it is infeasible to modify the infrastructure to allow bedload material to pass downstream, so active sediment removal by heavy equipment would be periodically necessary to maintain safe and reliable project operations. During sediment removal activities at these two medium reservoirs, a portion of the removed material (preferentially selected within the preferred spawning particle size requirements of aquatic resources) would be placed in the new sediment augmentation areas below Middle Fork interbay and Ralston afterbay. At high flows, the material would be mobilized and transported downstream to enhance aquatic resources. During placement of the material at the sediment augmentation areas, erosion and sedimentation could temporarily increase turbidity levels

in the adjacent water bodies. In addition, the accidental release of hazardous materials from heavy equipment used during these activities could degrade water quality.

The proposed Sediment Management Plan contains specific Forest Service BMPs and avoidance and protection measures to protect water quality during sediment management activities, including:

- Restricting sediment management activities to the dry season when rain and runoff are unlikely to occur, to minimize erosion;
- Restrictions on the use of equipment to avoid soil compaction and excessive rutting and to avoid wetted areas to minimize erosion;
- Construction of drainage facilities or other erosion and sedimentation control measures in conjunction with earthwork;
- Erosion control measures including planting stabilizing vegetation and mechanical measures (straw waddles, riprap, silt fencing, etc.);
- Creation of a Spill Prevention, Contamination, and Counter Measures Plan to guide response to spills and discovery of hazardous materials;
- Implementation of measures to prevent pollutants from being discharged into rivers, streams, or other impoundments;
- Controlling in-channel excavation to minimize the in-channel disturbances and associated sediment production; and
- Carefully planning the diversion of stream flows around construction sites to minimize downstream fine sediment delivery and to modify the channels to a natural grade, condition, and alignment as soon as possible.

In addition, PCWA proposes the following water quality protection measures for sediment augmentation downstream of Middle Fork interbay:

- Prior to placing sediment in the augmentation areas, the instream flow release from Middle Fork interbay would be temporary diverted into a bypass pipe that extends to a location downstream of the augmentation areas. The intent is to reduce initial mobilization of fine sediment during placement of the material.
- A silt screen would be placed downstream of the sediment augmentation areas to capture fine sediment. Fish present in the area between the dam and silt screen would be removed and placed downstream prior to implementation of these activities.

The proposed Sediment Management Plan also includes several types of monitoring, including turbidity monitoring at the three small diversions and two medium reservoirs, methylmercury monitoring in the sediment and water column at and

downstream of Ralston afterbay, and sediment transport and channel sediment condition monitoring associated with the augmentation areas.

Alternative 1 includes the same proposed Sediment Management Plan, including the same Forest Service BMPs and avoidance and protection measures.

Our Analysis

Proposed project infrastructure modifications at the three small diversions would reduce and potentially eliminate the need for future sediment management activities. This would reduce future suspended sediment increases that would result from periodic sediment removal events. During modification of the infrastructure at the diversion dams, erosion and sedimentation could temporarily increase turbidity levels in the adjacent water bodies. In addition, the accidental release of hazardous materials from heavy equipment used during these activities could degrade water quality.

The Forest Service BMPs, avoidance and protection measures, diversion of instream flow and silt screen placement downstream of the Middle Fork interbay augmentation sites prior to placing sediment as specified in the proposed Sediment Management Plan would protect water quality during sediment management activities to the extent possible. Provisions in the plan for water quality monitoring would confirm the effectiveness of implemented water quality protective measures during sediment management activities and identify the need for additional protective measures. However, although the plan includes provisions for monitoring methylmercury in sediment prior to sediment removal activities at Ralston afterbay, there is no caveat included that would prevent use of this sediment for augmentation purposes if unacceptable levels of methylmercury should be detected.

Protecting Water Quality during Vegetation and Pest Management

Use of herbicides, surfactants, rodenticides, fungicides, and manual techniques as part of routine vegetation and pest management could potentially degrade water quality if used adjacent to surface waters. PCWA proposes to implement its VIPMP, which is discussed in detail in section 3.3.3.2, *Terrestrial Resources*. The plan includes Forest Service BMPs and the following measures to protect water quality:

- Restrictions on the use of herbicides, surfactants, rodenticides, and fungicides within protective buffers around reservoirs, streams, and bypassed and peaking reaches.
- Restrictions on the use of herbicides, surfactants, rodenticides, and fungicides during periods of forecasted weather outside of the label requirements.
- Restrictions on the use of mechanical equipment on steep slopes and within riparian conservation areas to reduce gully and sheet erosion.

- Limiting the use of mechanical equipment in wetlands, springs, and meadows to limit turbidity and sediment production.
- Proper care, cleaning, and disposal of all pesticide and surfactant containers, contaminated water, and equipment.
- Use of herbicide formulations that EPA considers safe for aquatic areas.
- Required supervision of pesticide application by a licensed pest control advisor and restrictive application and disposal methods.
- Implementation of a Water Quality Monitoring Plan specific to the VIPMP to evaluate the effectiveness of these protective measures.

The proposed VIPMP Water Quality Monitoring Plan would characterize the presence or absence of herbicides in perennial streams and special aquatic sites (i.e., project reservoirs and diversion pools) adjacent to areas where herbicides are applied, including both pre-and post-treatment sampling. Sampling results would be used, in consultation with the Forest Service, Water Board, and California Fish and Game, to determine the effectiveness of protective measures and whether pesticides have been applied safely, restricted to intended target areas, and did not result in unexpected non-target effects. Following this consultation, the monitoring results report would be filed with the Commission. Monitoring locations would be monitored for 3 consecutive years concurrent with the first application period and repeated for an additional 2 years. If the results for years 1–3 do not detect any harmful levels of pesticides, no further monitoring would occur unless new pesticides are identified and authorized for use at the project. If harmful levels of pesticides are detected, PCWA and the agencies listed in the monitoring plan would modify the VIPMP regarding pesticide application and resume the 3-year monitoring cycle. Water quality monitoring would continue until no harmful levels of pesticides are detected at a sampling site for 3 consecutive years.

The Alternative 1 VIPMP is similar to the proposed action. In general, the proposed buffer zones from waterbodies are more expansive than in the proposed plan and more detail is provided regarding the specific application methods. Its Water Quality Monitoring Plan for pesticide application would change the requirements to meet the criteria for a determination of "no harmful effects for 3 consecutive years." Storm runoff sampling data also would be collected for a minimum of 2 years, as well as pre-treatment and post-treatment data for 3 years (or more).

Our Analysis

The Forest Service BMPs and avoidance and protection measures in both the PCWA's and the Alternative 1 VIPMPs would minimize the potential for inappropriate introduction of herbicides, surfactants, rodenticides, and fungicides into waterbodies in the project area such that water quality would not be adversely affected. The proposed VIPMP Water Quality Monitoring Plan and the Alternative 1 plan would both adequately monitor the water in and around areas of pesticide use to determine the effectiveness of

protective measures and whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects. The more detailed descriptions and, in most cases, broader buffer zones specified in the Alternative 1 VIPMP and inclusion of additional requirements for a determination of no harmful effects in the Alternative 1 plan would ensure that the monitoring program continues for enough time to adequately assess the effects of the vegetation and pest management program.

Monitoring Methylmercury Concentrations of Sportfish in Project Waters

Hell Hole reservoir, Ralston afterbay, and the North Fork American River are on the current 303(b) list of impaired waters for mercury (Water Board, 2012). The source of mercury in Hell Hole reservoir is listed as unknown, but the likely source for the other two waterbodies is listed as resource extraction. PCWA documented during relicensing studies elevated levels of methylmercury in fish tissue in French Meadows reservoir, Hell Hole reservoir, Middle Fork interbay, Ralston afterbay, and the Middle Fork American River at Otter Creek, as well as in crayfish in Hell Hole and French Meadows reservoirs. The source of the methylmercury in the Middle Fork American River watershed is likely not related to project operations or facilities. PCWA proposes to implement a Mercury Bioaccumulation Monitoring Plan that would provide data characterizing methylmercury concentrations in the muscle tissue of sportfish from French Meadows reservoir, Hell Hole reservoir, Ralston afterbay, and the Middle Fork American River near Otter Creek. Monitoring would be conducted every 5 years for the term of the license beginning 3 years after the license is issued. Methylmercury concentrations would be compared with OEHHA and/or EPA screening value guidelines for methylmercury (Cal/EPA, 2005; Klasing and Brodberg, 2006).

Forest Service 4(e) condition no. 28 includes a revised Mercury Bioaccumulation Monitoring Plan that includes minor text changes that clarify text in the proposed plan.

Our Analysis

Elevated methylmercury levels in fish tissue have been reported throughout the Sierra Nevada region and have often been linked to historical mining activities, although they may also be attributable to natural causes, including geologic and atmospheric conditions. We do not expect any changes to project operations made as part of the proposed action or Alternative 1 to have any effect on methylmercury levels in fish in the project area. Methylmercury concentrations in fish tissue are likely to remain high in the future. Implementation of the proposed Mercury Bioaccumulation Monitoring Plan would track levels of methylmercury in sportfish and provide information to appropriate agencies on whether issuing health advisories for anglers at project waters is warranted. However, PCWA does not propose any substantive changes to project reservoir levels. Therefore, we do not expect any changes in methylmercury concentration levels in sportfish as a result of project operations.

Minimum Instream Flows

Various flow elements associated with hydroelectric project facilities and operations (e.g., minimum flow, pulse flows, ramping rates) can affect the aquatic and riparian environment. Reduced flow and less seasonal variation in flow associated with operation of project reservoirs and diversions may affect aquatic biota and aquatic habitat, as well as users affected by instream flows (e.g., recreational visitors, addressed in section 3.3.5, *Recreation and Land Use*, and power generation, addressed in section 4, *Developmental Analysis*). Flows that support optimal conditions, however, can differ significantly among these resources and users.

PCWA's proposed instream minimum flow regime for project bypassed reaches and the peaking reach is shown in table 15. Alternative 1 minimum flows are similar to the proposed minimum flows and are consistent with Forest Service condition no. 22, with the exception of the peaking reach minimum flows (which are generally from 15 to 100 cfs higher than comparable months and water years under the proposed minimum flow regime) and minor differences associated with PCWA rounding flows to the nearest 0.5 cfs whereas Alternative 1 (and the Forest Service) generally uses only whole numbers. The Forest Service final condition corrects some minor typographical errors associated with Alternative 1 flows to the bypassed reach downstream of Middle Fork interbay dam (our analysis of the Alternative 1 and Forest Service final condition does not change). Interior's recommended minimum flow regime at the peaking reach is identical to the Forest Service (and California Fish and Game) condition for this reach and included in Alternative 1. Other differences between the proposed minimum flow regime and Alternative 1 include the following:

- Alternative 1 specifies that minimum instream flows be released by 5 p.m., while PCWA proposes that minimum instream flows be released within 5 days of the dates specified in a new license. In both cases, exceptions would be allowed when access to the instream flow release infrastructure would be prohibited by weather or hazardous conditions.
- Alternative 1 states that hourly running average flow measurements would never be less than the thresholds specified in a new license, except as authorized in advance. PCWA would maintain instantaneous flows at all times to be no less than 90 percent of the required minimum instream flow and maintain daily average flows to be equal to or above the minimum instream flow requirements on all days. PCWA proposes that instantaneous flow would at all times be no less than 90 percent of the required minimum instream flow and that daily average flow would at all times be no less than 90 percent of the required minimum instream flow. Deviations that are less than 10 percent of the required minimum instream flow would be corrected within 3 days of discovery by releasing the equivalent volume of under-released flow into the affected stream reach.

- PCWA proposes to provide instream flow releases specified in a new license within 30 days of issuance of the license at the locations where existing infrastructure and stream gages can provide and measure new releases. For locations requiring infrastructure modifications and/or new facilities, instream flow releases PCWA would provide and monitor within 30 days after completion of the required facility modifications. Alternative 1 indicates a similar schedule where existing infrastructure and stream gages can provide and measure new releases, but indicates specific time frames where bypassed reach infrastructure modifications would be complete ranging from year 3 to 5 from license issuance. Until then, releases from existing infrastructure would be at the maximum capability of the existing infrastructure if the designated minimum flow was higher than the existing infrastructure could accommodate.

The proposed project includes minimum flows for a period of up to 30 days in the peaking reach for conducting annual maintenance. Such outage events would begin between the last Sunday in September through the end of October. Flow requirements would be the same as or greater than those under existing conditions. The proposed maintenance outage minimum flows in extreme critical, critical, and dry water year types would be 75 cfs, but in below normal, above normal, and wet water years, the minimum flows would be 110, 150, and 150 cfs, respectively. Under the proposed project, the same minimum flows would apply for up to 48 hours in the event of a forced or unplanned outage at the Middle Fork powerhouse and/or Ralston powerhouse (the delay allows release of water from upstream reservoirs to reach this location and maintain the minimum flow requirements). Alternative 1 makes no special provisions for modifying the peaking reach minimum flows specified in table 15 during planned outages and when unplanned outages at Middle Fork and Ralston powerhouses simultaneously occur from May through September. When just Ralston powerhouse experiences an unplanned outage from June through September for up to a 2-week period, the peaking reach minimum flows would generally either be the same or less than the Alternative 1 minimum flows shown in table 15.

Our Analysis

The minimum instream flow measures for the bypassed reaches included in Alternative 1 are very similar to the ones that PCWA proposes. Minimum flows would be maintained or increased relative to existing conditions in all project-affected reaches under both action alternatives. In addition, minimum flows would vary by month and water year type under the action alternatives, better reflecting natural seasonal and year-to-year variability in the watershed by providing the ability to increase flows in wet and above normal water years. Under the proposed and Alternative 1 flow schedules, summer flows in wet and above normal water years would be higher than under existing conditions in all project-affected reaches. In summers of critical, dry, and below normal water years, minimum flows would be increased or maintained in all bypassed and peaking reaches compared with existing conditions.

Table 15. Minimum instream flows (cfs) by water year under the proposed action and Alternative 1 (Source: PCWA, 2011a; Forest Service, 2012a).

Location	Water Year Type[a]	Proposed Action (Alternative 1 and Forest Service final condition, when different from proposed flows)															
		October	November	December	January	February	March 1-14	March 15-31	April	May 1–14	May 15–31	June 1–14	June 15–30	July	August	Sept. 1–15	Sept. 15–30
Duncan Creek below Duncan diversion dam	E/C	4	4	4	4	4	4	8.5 (9)	13	13	13	6.5 (7)	6.5 (7)	ND[b]	ND[b]	ND[b]	ND[b]
	D	8	8	8	8	8	8	11	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
	BN	8	8	8	8	8	8	12.5 (13)	17	17	17	8.5 (9)	8.5 (9)	ND[b]	ND[b]	ND[b]	ND[b]
	AN	8	8	8	8	8	8	16	24	24	24	12	12	ND[b]	ND[b]	ND[b]	ND[b]
	W	8	8	8	8	8	8	16	24	24	24	12	12	ND[b]	ND[b]	ND[b]	ND[b]
Middle Fork American River below French Meadows reservoir dam	E/C	8	8	8	8	8	8	11	11	11	11	8	8	8	8	8	8
	D	9	9	9	9	9	9	11	13	13	13	11	11	9	9	9	9
	BN	10	10	10	10	10	10	11.5 (11)	13	13	13	11.5 (12)	11.5 (12)	10	10	10	10
	AN	11	11	11	11	11	11	15.5 (15)	20	20	20	15.5 (16)	15.5 (16)	11	11	11	11
	Wet	13	13	13	13	13	13	16.5 (16)	20	20	20	16.5 (17)	16.5 (17)	13	13	13	13
Rubicon River below Hell Hole reservoir dam	E/C	15	15	15	15	15	15	31	31	23	23	19	15	15	15	15	15
	D	20	20	20	20	20	20	35	35	35	35	28	20	20	20	20	20
	BN	20	20	20	20	20	20	42	42	42	42	31	20	20	20	20	20
	AN	25	25	25	25	25	25	55	55	55	55	50	40	30	30	30	30
	W	25	25	25	25	25	25	60	60	60	60	50	40	30	30	30	30

Location	Water Year Type[a]	Proposed Action (Alternative 1 and Forest Service final condition, when different from proposed flows)															
		October	November	December	January	February	March 1-14	March 15-31	April	May 1–14	May 15–31	June 1–14	June 15–30	July	August	Sept. 1–15	Sept. 15–30
Middle Fork American River below Middle Fork interbay dam	E/C	12	12	12	12	12	12	16.5 (16)	18	18	18	12	12	12	12	12	12
	D	24	24	24	24	24	24	25	27	27	27	24	24	18	18	18	18
	BN	24	24	24	24	24	24	32	40	40	40	24	24	24	24	24	24
	AN	25	25	25	25	25	25	45	65	65	65	45	45	26	26	26	26
	W	25.5 (25)	25.5 (25)	25.5 (25)	25.5 (25)	25.5 (25)	25.5 (25)	47	65	65	65	47	47	34	34	34	34
North Fork Long Canyon Creek below North Fork Long Canyon diversion dam	E/C	2	2	2	2	2	2	6	6	6	2	2	2	ND[b]	ND[b]	ND[b]	ND[b]
	D	2	2	2	2	2	2	10	10	10	5	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	BN	2	2	2	2	2	2	7	10	10	10	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	AN	2	2	2	2	2	2	7	11.5 (11)	11.5 (11)	11.5 (11)	6	6	ND[b]	ND[b]	ND[b]	ND[b]
	W	2	2	2	2	2	2	7	11.5 (11)	11.5 (11)	11.5 (11)	6	6	ND[b]	ND[b]	ND[b]	ND[b]
South Fork Long Canyon Creek below South Fork Long Canyon diversion dam	E/C	2.5	2.5	2.5	2.5	2.5	2.5	4.5 (5)	6	6	6	3	3	ND[b]	ND[b]	ND[b]	ND[b]
	D	5	5	5	5	5	5	8.5 (9)	12	12	12	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	BN	5	5	5	5	5	5	8.5(9)	12	12	12	6	6	ND[b]	ND[b]	ND[b]	ND[b]
	AN	5	5	5	5	5	5	9.5 (9)	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
	W	5	5	5	5	5	5	9.5 (9)	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
Middle Fork American River	E	75 (90)	75 (90)	75 (90)	75 (90)	75 (90)	75 (90)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)	75 (100)

Location	Water Year Type[a]	Proposed Action (Alternative 1 and Forest Service final condition, when different from proposed flows)															
		October	November	December	January	February	March 1-14	March 15-31	April	May 1–14	May 15–31	June 1–14	June 15–30	July	August	Sept. 1–15	Sept. 15–30
below Oxbow powerhouse	C	75 (125)	75 (140)	75 (140)	75 (140)	75 (140)	75 (140)	125 (160)	125 (160)	125 (160)	125 (160)	100 (160)	100 (160)	100 (160)	100 (160)	75 (150)	75 (150)
	D	90 (140)	90 (145)	90 (145)	90 (145)	90 (145)	90 (145)	210	210	210	210	150 (210)	150 (210)	150 (200)	150 (200)	120 (160)	90 (160)
	BN	120 (165)	120 (185)	120 (185)	120 (185)	120 (185)	120 (185)	290	290	290	290	200 (245)	200 (245)	200 (245)	200 (245)	160 (200)	120 (200)
	AN	150 (165)	150 (225)	150 (225)	150 (225)	150 (225)	150 (225)	375	375	375	375	250 (300)	250 (300)	250 (300)	250 (300)	200 (250)	150 (250)
	W	200	200 (250)	200 (250)	200 (250)	200 (250)	200 (250)	450	450	450	450	300 (350)	300 (350)	300 (350)	300 (350)	250 (300)	200 (300)
Middle Fork American River below Ralston afterbay dam	E	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	All other years	3	3	3	3	3	3	3 (25)	3 (25)	3 (25)	3 (25)	3 (10)	3 (10)	3 (10)	3 (10)	3 (10)	3 (10)

Notes: Minimum instream flows in parentheses are flows included in Alternative 1 and not the proposed project.

Grey-shaded cells indicate the minimum flow is the specified minimum flow or natural inflow to the bypassed reach, whichever is less

[a] Water year types: E = Extreme critical, C = Critical, D = Dry, BN = Below normal, AN = Above normal, W = Wet

[b] ND = no diversion. If July 1 inflow to the Duncan Creek diversion exceeds the May minimum instream flow requirement, then the July minimum instream flow requirement will be equal to the May minimum instream flow requirement or natural inflow, whichever is less. The intent is to avoid a large flow spike at the end of the diversion season on July 1.

Minimum flow increases in the peaking and bypassed reaches in the wettest water year types would increase wetted stream perimeter, which may increase habitat area and habitat diversity in some reaches for fish and aquatic invertebrates. Increased edge habitat may improve rearing success of YOY fish in wet water years if shallow water or cover is available to increase their ability to avoid aquatic and terrestrial predation. Higher minimum flows should provide more area for aquatic macroinvertebrate communities that make up a large portion of the diet of trout and other fish.

The range of proposed minimum flows in the peaking reach would be from 75 to 450 cfs, whereas the Alternative 1 minimum flows would range from 90 to 450 cfs. However, many of the Alternative 1 minimum flows would be from 15 to 100 cfs higher than the comparable proposed minimum flows for comparable water years and time frames. For the reasons stated in the previous paragraph, this prevailing higher minimum flow would result in the Alternative 1 regime providing minor habitat enhancements compared with the proposed flow regime. However, we expect the primary factor that would limit the quality and quantity of aquatic habitat in the peaking reach to be flow fluctuations, rather than minimum flows. Daily peaking flow fluctuations would be maintained under both action alternatives, and effects of the new minimum flow regime in the peaking reach on fish and other aquatic biota are expected to be negligible because changes in wetted habitat area would be of very short duration and likely insufficient to affect behavior (e.g., foraging), food availability, or production of aquatic biota.

Typically, the period of snowmelt and high runoff occurs between April through mid-June in the basin and the spring pulse flows in the action alternatives reflect this timing. Providing flows that mimic the spring snowmelt pulse may provide benefits to the aquatic community by helping to maintain a variety of seasonal life-history behaviors. Spring minimum flows would be substantially higher than under existing conditions in all water year types under both action alternatives and, when coupled with the pulse flow releases (see section 3.3.1.2, *Geologic and Soil Resources*, table 3), would provide flow changes that simulate those found under unregulated conditions during the seasonal snowmelt period. Both the proposed and Alternative 1 minimum flows would enhance flow conditions for spawning by resident rainbow trout during spring (i.e., mid-March to June), based on the results of PCWA's instream flow analysis (PCWA, 2010b). Higher spring flows may provide access to additional spawning or rearing habitat but may also act to scour redds in some years, both of which occur under natural conditions.

Precipitation in the Middle Fork American River watershed has high inter-annual variation; water year types tend to be either wet or dry, with few years receiving "average" precipitation. Under existing conditions, no provision is made for within-year or between-year variation in flows to reflect local seasonal changes and water year types. Many fish and aquatic macroinvertebrate species may use changes in flows as cues for behaviors such as spawning or movements into appropriate winter or summer habitat. Year-to-year variations in flows may maintain species diversity by benefiting certain species in wet years and others in dry years. Because fish from eastern U.S. streams evolved in streams with little seasonal variation, western streams, with their highly

variable seasonal fluctuation, are believed to be more resistant invasion by eastern non-native fish (Marchetti and Moyle, 2001). All of the above changes that provide seasonal some natural seasonal and year-to-year variability of instream flows would be expected to enhance conditions for the native aquatic species that evolved under such dynamic conditions, providing benefits to aquatic macroinvertebrates and fish.

The proposed and Alternative 1 minimum instream flows are also designed to provide water temperatures that support hardhead in the 0.5 mile of the Middle Fork American River and 5.4 miles of the Rubicon River upstream of Ralston afterbay. Hardhead typically prefer warmer water temperatures than trout. Termination of diversions from Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek during July through September should result in no change in rearing habitat for rainbow trout adult or juveniles during the summer and fall because under existing conditions, no diversions typically occur during this same time frame. Using whole numbers for designated minimum flows, as all Alternative 1 values are presented, is more practical as a standard against which compliance can be monitored than the occasional 0.5 cfs standard that PCWA proposes.

We see no reason that a 5-day grace period for releasing instream flows as proposed by PCWA is needed. If a new license specifies a date when the minimum flow to a project stream reach should change, PCWA could plan appropriately to ensure the flows are released on the designated day as provided for in Alternative 1. It may be infeasible (e.g., because of difficulty in continuously monitoring gaging data, potential errors in reading flow, and time needed to adjust flow releases) for PCWA to maintain instantaneous flows above the minimum flows at all times, and compliance based on maintaining daily average flows above the minimum flows, as specified in Alternative 1, would be achievable. Allowing daily average flows that are only 90 percent of specified instantaneous flows to be compensated by over-releases within 3 days to achieve the designated flow, as proposed by PCWA, is inconsistent with the reasons for an instantaneous minimum flow, which is to ensure a constant base flow for aquatic habitat protection and enhancement. It is reasonable to have specific time frames for implementation of instream flow requirements where facility modifications and construction are needed and this would enhance Commission staff's ability to track compliance with interim minimum flows (those required until infrastructure modifications are complete) and permanent minimum flows.

Minimum flows that would be protective of aquatic habitat during project operations would be similarly protective of habitat during planned and unplanned outages, and the Alternative 1 approach to maintaining minimum flows in the bypassed reach provides this level of assurance while allowing for some reductions under certain circumstances based on limitations of the project. The proposed minimum flows would be less than the Alternative 1 minimum flows during outages, and during unplanned outages, would be constant for up to 48 hours regardless of the timing; therefore, the proposed flows would not account for changes in flow releases that would occur during the summer.

Effects of Ramping Rates on Aquatic Biota

Rapid decreases in instream flows have the potential to strand fish and other aquatic life, leading to direct mortality or predation. Areas of a channel that are alternately wet and dry may create habitat that would not support the macroinvertebrate communities important as food for fish. Juvenile fish are especially vulnerable as they often prefer to reside in shallow waters along stream margins. The primary risks from changes in flows from spill during the snow-melt recession period are disruption of breeding, scouring, and stranding. Under existing conditions, the only restriction on ramping is for the peaking reach, where releases may not cause stage fluctuations greater than 3 feet per hour.

PCWA proposes to implement downramping rates following spill flows from Hell Hole dam to the Rubicon River and from French Meadows dam to the Middle Fork American River, as well as up and downramping rates from Oxbow powerhouse (tables 16 and 17). These are in addition to proposed ramping rates associated with pulse flow changes, discussed in section 3.3.1.2, *Geologic and Soil Resources*. Ramping rates were developed, in consultation with the agencies, to address potential effects of abrupt changes in water depths and velocities on sensitive aquatic species, such as amphibians and spawning trout. Ramping rates in the Rubicon River would be put into effect after seasonal storage improvements are completed at Hell Hole dam (anticipated in year 5 from license issuance). The downramping of spill flows would be measured with new gages in the Rubicon River and in the vicinity of the spillway at Hell Hole dam. If a spill in excess of 600 cfs (average daily combined flow from spillway and reservoir release) occurs at Hell Hole dam from May through July, PCWA proposes downramping the declining limb of the spill the day after flow becomes less than 600 cfs. If a spill event occurs in the months of May to July that does not exceed 600 cfs but exceeds 400, 285, or 170 cfs, PCWA proposes downramping the spill according to the lower flow levels in the schedule. Spills that do not exceed 170 cfs would not be downramped.

PCWA proposes downramping spill flows in the Middle Fork American River downstream of French Meadows dam beginning in the first year following license issuance. The downramp of spill flows would be measured at the Middle Fork American River at the French Meadows gage (USGS Gage No. 11427500). In year 3 after license issuance, flows would be measured at the Middle Fork American River at the French Meadows gage (USGS Gage No. 11427500) and at a new gage in the Middle Fork American River at French Meadows dam. From May through July, if a spill in excess of 400 cfs occurs from French Meadows reservoir, PCWA proposes downramping the declining limb of the spill the day after spill flow becomes less than 400 cfs (see table 16). If a spill event occurs in the months of May through July that does not exceed 400 cfs but exceeds 275, 190, or 115 cfs, respectively, PCWA proposes downramping the spill according to the lower flow levels in the schedule. Spills that do not exceed 115 cfs would not be downramped.

Table 16. Proposed, Alternative 1, and final Forest Service condition no. 24 (in parentheses when different from Alternative 1) downramping rates following spills from Hell Hole reservoir dam into Rubicon River and from French Meadows reservoir dam into Middle Fork American River (Source: PCWA, 2011a,b, and Forest Service, 2012a, as modified by staff).

Location	Schedule	Action
Rubicon River below Hell Hole reservoir dam	**First 600-cfs spill event**	
	Day 1	Release a minimum of 600 cfs
	Day 5	Reduce the flow to a minimum of 400 cfs
	Day 7	Reduce the flow to a minimum of 285 cfs
	Day 10	Reduce the flow to a minimum of 170 cfs
	Day 13	Reduce the flow to a minimum of 95 cfs
	Day 17	Release the minimum instream flow requirement
	Subsequent 600-cfs spill events (if they occur)	
	Day 1	Reduce the flow to a minimum of 400 cfs
	Day 3	Reduce the flow to a minimum of 285 cfs
	Day 6	Reduce the flow to a minimum of 170 cfs
	Day 10	Reduce the flow to a minimum of 95 cfs
	Day 14	Release the minimum instream flow requirement
Middle Fork American River below French Meadows reservoir dam	Day 1	Release minimum of 400 cfs (or a target minimum flow of 400 cfs after year 2 of license issuance)
	Day 2	Reduce the flow to a minimum of 275 cfs (or a target minimum flow of 275 cfs ± 10 percent after year 2 of license issuance)
	Day 3	Reduce the flow to a minimum of 190 cfs (or a target minimum flow of 190 cfs ± 10 percent after year 2 of license issuance)
	Day 4	Reduce the flow to a minimum of 115 cfs (or a target minimum flow of 115 cfs ± 10 percent after year 2 of license issuance)
	Day 5	Reduce the flow to a minimum of 65 cfs (or a target minimum flow of 65 cfs ± 10 percent after year 2 of license issuance)
	Day 7	Release the minimum instream flow requirement

Table 17. Proposed, Alternative 1, and Forest Service final condition up- and downramping rates proposed for March through October at Oxbow powerhouse. Ramping rates would be based on the flow present in the Middle Fork American River near USGS Gage No. 11433300 (Source: PCWA, 2011a,b, as modified by staff).

Upramping		Downramping	
Gage Flow (cfs)	**Maximum Flow Change (cfs/hour)**	**Gage Flow (cfs)**	**Maximum Flow Change (cfs/hour)**
≤175	300	≤500	250
>175–400	450	>500–800	400
>400–750	600	>800–1,300	550
>750	750	>1,300	750

PCWA proposes ramping rates in the peaking reach as specified in table 17. Compliance in years 1 and 2 after license issuance would be based on flow measured in the Middle Fork American River near Foresthill (USGS gage no. 11433300). In year 3 after license issuance or as soon as the new Oxbow powerhouse penstock gage is operational, ramping rates would be measured at the new Oxbow powerhouse penstock gage and the Middle Fork American River near Foresthill (USGS gage no. 11433300). During the months of November through February, PCWA would make a good faith effort to regulate Oxbow powerhouse flow releases in the peaking reach. This would include, to the degree possible, scheduling Oxbow powerhouse generation to moderate peaking in the Middle Fork American River using available active Ralston afterbay storage. PCWA also proposes to impose a 900 cfs upper limit on Oxbow powerhouse releases in the summer of drier water years.

Alternative 1 includes the ramping rates specified in Forest Service condition no. 24 and, for the peaking reach, Interior's 10(a) recommendation no. 3. Alternative 1 and the Forest Service final condition are similar to PCWA's proposal for ramping, except for two elements: (1) they do not include the 900 cfs upper limit on Oxbow powerhouse releases; and (2) they include an additional clause indicating that during the first two events when down ramp of spill flows occur at Hell Hole and French Meadows reservoirs, PCWA would test its ability to manage spill flow to provide the specified ramping rates. Deviations from the criteria during these tests would not be considered violations but would be reported to the Forest Service California Fish and Game, and the Water Board within 30 days of the occurrence. After each spill event, a testing report would be submitted to the Forest Service, California Fish and Game, and the Water Board. After the second spill event, PCWA would include in the report any recommendations for a modified downramping rate. After agency approval of any

modified ramping rate, PCWA would submit the modified downramping schedule to the Commission.

The Forest Service final condition changes provisions for ramping rate spills from French Meadows dam from a set minimum flow to a target minimum flow plus or minus 10 percent of mean daily flow. During downramping of spill events at French Meadows dam, all inflows to Middle Fork interbay (excluding releases from Middle Fork powerhouse) would be passed downstream of Middle Fork interbay dam (plus or minus 10 percent of mean daily flows).

Our Analysis

The proposed and Alternative 1 ramping rates would minimize abrupt changes in velocity that may dislodge aquatic species from their preferred habitats, provide fish time to move from portions of the channel that may become disconnected from the main channel, and facilitate riparian seed survival. The shape of the down ramp for reservoir spills produces a slowly declining hydrograph that provides riparian and other environmental and recreational benefits compared with the faster decline of spill flows under existing conditions. Ramping rates for the Middle Fork American River below Hell Hole dam and French Meadows dam would result in an additional 10 or 11 years, respectively (in the 33-year period of record) where spills are down ramped when they would not have been under existing conditions. The proposed ramping would result in recession flows that are similar to unregulated recession flows in downstream reaches of the Middle Fork and Rubicon Rivers. The Forest Service final condition modifications of Alternative 1 would restrict PCWA's ability to release higher flows than specified in Alternative 1, and further reduce the potential for downramping following spills to result in stranding of aquatic biota and atypical flows following high flow events, as discussed further in section 3.3.1.2, *Channel Responses to Altered Flow Conditions*.

Compared with existing conditions, flow fluctuations in the peaking reach would be reduced by about 100 cfs or more. Ramping rates in the peaking reach would be about 1-foot-per-hour under both action alternatives, which is 50 percent slower than current upramping rates and 41 percent slower than current downramping requirements. The proposed, Alternative 1, and final Forest Service condition all include language such as "good faith effort," "reasonable good faith effort," and "reasonable and feasible efforts" to moderate peaking flows from after the annual maintenance event at the Oxbow powerhouse through February. Such terms are not enforceable by the Commission. Even with the added definition of moderating peaking flow in the final condition (decreasing the difference between the minimum and maximum flows over any 24 hours), there is no definition of what constitutes an acceptable or unacceptable decrease in the change in daily flows. We do not dispute that moderating daily flows in the peaking reach during the entire year would provide benefits to aquatic biota, but without clear compliance terms from the end of the annual maintenance event through February, the Commission would only be able to enforce compliance with the peaking reach minimum flows that may be specified in a new license during this period.

The more slowly declining hydrograph under all alternatives, with recession rates comparable to those found under natural conditions, should benefit fish and other aquatic biota populations and enhance recruitment of riparian vegetation (which represents a key habitat component for aquatic biota because it provides cover and access to terrestrial insects) compared with existing conditions.

We recognize that achieving the specified downramping rates at French Meadows and Hell Hole dam would likely entail some experimentation with operating infrastructure that controls releases from the dam, especially where that infrastructure is new. Providing for a test period, as specified in Alternative 1, would enable operational protocols to be developed based on experience. It would also serve to identify those spills that would controllable by PCWA. However, we note that if ramping rates should vary from what may be specified in a new license, PCWA would also need to report any such variances to the Commission with documentation of the circumstances that resulted in the variance. It would be up to Commission staff to determine whether or not the variance represented a violation of the conditions of a license. If a change in ramping rates is recommended by PCWA following the results of the initial testing, we would expect the testing reports to be provided to the Commission to support any such change.

Effects of Recreational Flow Releases on Aquatic Biota

PCWA proposes an instream flow measure that includes flow releases in the peaking reach for recreational whitewater boating and reduced flows to facilitate adequate trail crossing conditions during two special events (Tevis Cup and Western States 100). PCWA does not currently provide recreation-specific flow schedules in the bypassed reaches nor are they included in the proposed project. PCWA's proposed whitewater boating flows would typically involve releases of 800 to 1,000 cfs to the peaking reach for 3 to 5 hours each day during the recreation season. Alternative 1 recreation flows are the same as those specified in Forest Service preliminary condition no. 39 and Interior's 10(a) recommendation no. 5 and entail releases to the peaking reach that are generally higher than PCWA's proposed flows. Alternative 1 provides more details regarding recreational releases than PCWA's proposed recreational release description. Final Forest Service condition no. 40 is similar to Alternative 1, and the minor differences would not have a substantive bearing on aquatic biota. Details regarding recreational releases and our analysis of effects on recreational resources are discussed in section 3.3.5.2, *Recreation and Land Use*.

Our Analysis

PCWA's proposed recreational flow schedule for the peaking reach focuses on providing conditions to support Wild and Scenic River outstandingly remarkable values including whitewater boating, the Western States Trail, and the fishery. Effects on aquatic habitat are expected to be similar under both the proposed and Alternative 1 action alternatives because the recreational flow releases differ only slightly in magnitude and frequency. Compared with existing conditions, the recreational releases are not

likely to substantially change the quantity or quality of aquatic habitat available for fish, macroinvertebrates, and other aquatic biota.

Project Reservoir Management Effects on Aquatic Biota

PCWA proposes changes to the water level management of French Meadows and Hell Hole reservoirs and formalization of sediment management activities at Middle Fork interbay and Ralston afterbay including periodic reservoir drawdowns for sediment removal and other maintenance activities, all of which have the potential to affect aquatic biota and associated habitat at these reservoirs. French Meadows and Hell Hole reservoir water level management is primarily intended to enhance or maintain recreational opportunities at those two reservoirs and is therefore discussed in detail in section 3.3.5.2, *Recreation and Land Use*. Sediment Management and potential shoreline erosion associated with reservoir water surface elevation changes are discussed in detail in section 3.3.1.2, *Geologic and Soil Resources*. We focus our discussion here on aspects that pertain to aquatic habitat in these four reservoirs.

French Meadows and Hell Hole Reservoir Management Changes

The minimum pool water surface elevations proposed by PCWA would:

- result in higher minimum summer water surface elevations in French Meadows reservoir during wet and above normal water year types;
- result in lower winter minimum water surface elevations in French Meadows reservoir during wet and above normal water year types (enhance capacity to accommodate spring runoff);
- result in higher winter minimum water surface elevations in French Meadows reservoir during critical water year types;
- result in higher minimum summer water surface elevations in Hell Hole reservoir during wet, above normal, below normal, and critical water year types;
- result in higher winter minimum water surface elevations in Hell Hole reservoir during critical water year types; and
- implement the summer to winter minimum pool elevation transition immediately after Labor Day instead of at the end of September as occurs under existing operations.

Alternative 1 and final condition no. 38 would generally provide these same circumstances. However, the transition from summer to winter minimum pool management occurs at different times based on water year type. Alternative 1 and final condition no. 38 also specify higher minimum water surface elevations for French Meadows reservoir during the peak recreation season than what PCWA proposes.

Our Analysis

Based on operation model runs for the period of record, both PCWA's proposed action, Alternative 1, and final condition no. 38 would result in relatively little change in the actual operational reservoir elevations and volumes as compared with existing operations, and these measures would not substantially affect surface area or water depth in French Meadows or Hell Hole reservoirs. Objectives for mid-summer reservoir levels specified in Alternative 1 and final condition no. 38 are similar to the water surface elevations that typically occur under existing project operations. Reservoir levels based on projected future demand are also similar to or greater than what is specified in Alternative 1 and final condition no. 38. We expect the effects of the proposed action, Alternative 1, and final condition no. 38 on French Meadows and Hell Hole reservoir fish habitat to be negligible.

Middle Fork Interbay and Ralston Afterbay Sediment Management and Maintenance

Periodic removal of sediment in Middle Fork interbay and Ralston afterbay would continue under both action alternatives, as would annual drawdown for gate inspection and maintenance at the powerhouses. These activities require partial or complete dewatering of the impoundments for about 6 to 8weeks. Fish are present in both impoundments, with Ralston afterbay in particular providing habitat for hardhead, a Forest Service sensitive species. The proposed Sediment Management Plan included in both action alternatives and final condition no. 46 specify that water surface elevations in Ralston afterbay would be maintained at no lower than 1,149 feet, the elevation of the bottom of the spill gates, to provide a refuge pool for fish during these activities. During drawdown of both reservoirs, surveys would be conducted and any stranded fish observed would be removed and placed downstream of each reservoir. A hardhead tagging study is proposed under both action alternatives to investigate hardhead movements during the first sediment removal at Ralston afterbay.

Our Analysis

Periodic drawdowns of Ralston afterbay for sediment removal and maintenance have the potential to affect hardhead, but, as under existing conditions, a refuge pool for fish is provided during these events by maintaining a minimum water surface elevation of no lower than the bottom of the spill gates (elevation 1,149 feet) in Ralston afterbay during both sediment removal activities and the annual maintenance outage. During this period, the minimum flows required for the peaking reach would flow from the spill gates and through the afterbay and refuge pool to maintain suitable temperature and dissolved oxygen conditions for fish (dissolved oxygen concentrations have always measured greater than 7 mg/L under existing conditions). Overall, we expect no substantial changes in existing conditions of reservoir fish habitat under either action alternative. Fish health, abundance, and distribution should be maintained under either alternative.

Monitoring Compliance with Water Quality Objectives

Routine project operations and maintenance activities, implementation of non-routine recreation activities, modification of existing or construction of new project facilities, and modifications to hydrology (pulse flows, increased minimum instream flows) in the bypassed reaches could affect water quality. Proposed and Alternative 1 project changes are scheduled to occur over a period of up to 14 years and public use patterns of project lands and waters may also change during the term of a new license, all of which may have a bearing on water quality.

PCWA proposes a Water Quality Monitoring Plan with a goal of periodically characterizing physical, chemical, and bacterial, water quality conditions in the bypassed and peaking reaches and reservoirs associated with the project over the term of a new license. Water quality monitoring would be conducted every 5 years beginning 3 years after a license is issued. Water quality monitoring would include the collection of *in-situ* measurements, general water quality sampling, and fecal and total coliform sampling. Information gathered from the water quality monitoring would be compared with basin plan objectives, the California Toxics Rule water quality standards (Federal Register 65 FR 31682, EPA 2000), and the National Toxics Rule water quality standards (Federal Register 57 FR 60848, EPA 1992) to confirm whether the water quality objectives set forth in these plans are being maintained.

Forest Service 4(e) condition no. 28 includes a finalized Water Quality Monitoring Plan. The Forest Service plan is similar to PCWA's plan, but adds a new bacterial sampling station on the Rubicon River downstream of Ellicott Bridge, June *in-situ* riverine sampling to the proposed fall sampling, and Middle Fork interbay to the reservoirs where monthly *in-situ* sampling would be conducted from June through October.

Our Analysis

Existing water quality in the project is generally high (exceptions are described below). Increased flows under the proposed and Alternative 1 actions would have little to no effect on existing water quality. The proposed sampling methods and sites are consistent with those in the Commission-approved pre-filing licensing studies, with the exception of a new coliform sampling station on Duncan Creek downstream of the proposed new primitive recreation site. The proposed coliform sampling locations are all near locations where public recreational use is focused, and would document that the sanitation measures in place are effective or whether changes to the facilities may be needed. The Forest Service plan adds an additional coliform sampling station on the Rubicon River, which would document water quality that ultimately enters Ralston afterbay and whether there are sanitation issues associated with recreational use in the reach from Ellicott Bridge to Ralston afterbay. Adding *in-situ* riverine sampling in June and Middle Fork interbay to the summer and early fall impoundment sampling, as specified in the Forest Service plan, would frame conditions at the beginning of the

summer, the onset of the growing season and period of most intensive recreation use, and provide a more solid basis for confirming compliance with basin plan objectives.

Elevated levels of iron and manganese in water collected from leakage channels immediately below French Meadows dam were observed during project relicensing studies. The source of the iron and manganese is the rock and gravel dam material (local source material). As water seeps through the dam, iron and manganese become soluble under anoxic conditions. These conditions are partially related to low oxygen levels in seepage water, but are otherwise not controllable. Water samples collected 800 feet downstream showed concentrations that were within range of basin plan water quality objectives due to oxygenation and dilution by instream flow releases and accretions downstream from the leakage channels. Under the proposed and Alternative 1 actions, minimum instream flow releases from French Meadows dam would be increased (ranging from 8 to 20 cfs), thereby further diluting the water from the leakage channels (see table 15) as the proposed action. PCWA's proposed and the Forest Service revised Water Quality Monitoring Plan would monitor iron and manganese as part of its general water quality sampling. Sampling results would document whether the expected decrease in downstream iron and manganese concentrations occurs and provide a basis for assessing whether additional actions may be necessary.

The Water Quality Monitoring Plan would confirm whether water quality objectives are being met and proper conditions are being maintained for aquatic biota and recreational users at the project for the term a new license. The Water Quality Monitoring Plan includes protocols for modification of the monitoring program in consultation with the resource agencies based on the monitoring results.

Project Effects on Spawning Habitat

The proposed Sediment Management Plan, discussed in detail in section 3.3.1.2, *Geologic and Soil Resources*, includes measures to retrofit existing small diversion structures on Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks with self-cleaning, wedge-wire screen intakes on the upstream side of the diversion weirs that would facilitate passage of sediment and woody debris over the diversion dams. In addition, coarse sediment removed from Middle Fork interbay and Ralston afterbay would be added to the river channel downstream of these two reservoirs at approved augmentation sites. The Sediment Management Plan includes monitoring of sediment transport in augmentation areas and monitoring of channel conditions associated with augmentation activities. Additional monitoring related to fluvial geomorphic conditions in the reach would also be conducted as part of implementation of the proposed and Forest Service revised Geomorphology/Riparian Monitoring Plan, discussed in detail in sections 3.3.1.2, *Geologic and Soil Resources*, and 3.3.3.2, *Terrestrial Resources*.

The Forest Service specifies in condition no. 26 that, within 1 year of license issuance, PCWA should complete a spawning habitat improvement plan for the Middle Fork American River downstream of Ralston afterbay dam. The rationale statement for

condition no. 26 indicates that the focus is to improve spawning habitat by augmenting coarse sediment in the Middle Fork American River channel between the Ralston afterbay dam and the tailrace from Oxbow powerhouse (the bypassed reach), where salmonid habitat is not influenced by daily peaking flow fluctuations. The Forest Service states that this bypassed reach is thought to be a prime location for enhancing trout spawning during spring flow releases and an opportunity to improve YOY recruitment into the peaking reach downstream. Daily flow fluctuations are not conducive to successful rainbow trout spawning, incubation, or rearing (Nehring and Anderson, 1993; not seen as cited in Forest Service, 2011).

PCWA's proposed action, Alternative 1, and the Forest Service final conditions each include the Sediment Management Plan. However, PCWA's proposed action does not include provisions for development of a spawning habitat improvement plan as specified by the Forest Service in condition no. 26 and PCWA does not list condition no. 26 as being included in Alternative 1 in its summary of the proposed project and Alternative 1 filed with the Commission on January 11, 2012 (see appendix B).

Our Analysis

Trout spawning typically occurs over gravel at the head or tail of riverine pools. Compared with existing conditions, 5-year recurrence flows sufficient to mobilize gravel would be reduced under the proposed action and Alternative 1 in the bypassed reaches of the smaller streams: Duncan, North Fork Long Canyon, South Fork Long Canyon, and mainstem Long Canyon Creeks; however, we expect the proposed and Alternative 1flow regimes to be sufficient to maintain fine sediment at its current low levels. Under both action alternatives, the bypassed reaches of the Middle Fork American and Rubicon Rivers would maintain a similar frequency of high-flow events capable of gravel mobilization as under existing conditions. Fine sediment in project related pools and spawning gravels is very low under existing conditions and conducive to high reproductive success by trout. These conditions are expected to be maintained under both action alternatives.

Modifications to small diversion structures on Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek would facilitate the transport of coarse sediment through the bypassed reaches and increase gravel- and cobble-size sediment in the bypassed reaches downstream of the diversion dams. The average annual amount of spawning-gravel-size sediment expected to pass downstream of these facilities rather than being trapped by the diversion pools and excluded from these reaches (as it is currently) ranges from 75 to 2,645 cubic yards/year, depending on location. The modifications would also create a shallower, more riverine habitat behind the small diversion dams because sediment would collect on the inclined screens, aggrading the channel upstream and creating more riverine channels that would replace the former pool habitat. We do not expect this loss of pool habitat at the three small diversion dams to have negative effects on trout spawning—pools are abundant throughout these streams.

Passage of wood at the modified diversion dams would likely increase in the bypassed reaches of Duncan Creek, South Fork Long Canyon Creek, and North Fork Canyon Creek. This may have a beneficial effect on trout spawning because large wood can add habitat diversity to the channel by promoting pool scour and trapping and storing patches of sediment that may be used for spawning by trout. Large and small woody debris also provide valuable cover from predators for fry, juvenile, and adult trout and velocity refuge from which to most efficiently forage on macroinvertebrates in the drift.

Combined with pulse flows (see section 3.3.1.2, *Geologic and Soil Resources)*, the modified small diversion dams should act to maintain or enhance existing channel morphology downstream of these structures and sustain the low levels of fine sediment currently found in pools and spawning gravels. Effects on trout populations from these modifications would be beneficial due to increased coarse sediment deposition and the resulting increase in spawning gravel availability in the affected reaches.

PCWA's proposed placement of spawning-sized gravel downstream of Middle Fork interbay dam and downstream of Ralston afterbay at Indian Bar and Junction Bar would increase spawning gravels in downstream reaches compared with existing conditions. Additional benefits to trout spawning success and juvenile recruitment in the Middle Fork American River downstream of Ralston afterbay could likely be realized by developing and implementing the spawning habitat improvement plan specified in Forest Service condition no. 26. In response to condition no. 26, PCWA clarified in its September 6, 2011, filing with the Commission that the spawning habitat improvement plan would pertain to the 0.48 mile reach immediately downstream of Ralston afterbay dam, consistent with pre-filing consultation. This suggests that this plan was considered as a potential environmental measure, even though it is not included in either the proposed action or Alternative 1. There is evidence in the record that implementation of a spawning habitat improvement plan may be included in PCWA's Sediment Management Plan. Table 4 of the Sediment Management Plan indicates that about 56 cubic yards of "material" would be installed in the streambed downstream of Middle Fork interbay, whereas about 389 cubic yards of material would be installed in the channel downstream of Ralston afterbay. The large difference in installed material may relate to the placement of spawning gravel in the bypassed reach downstream of Ralston afterbay dam.

Pre-application fisheries surveys indicate that recruitment of trout in the peaking reach is well below what would be expected in unregulated streams. This is likely because the quality of available spawning habitat is compromised by daily flow fluctuations. Spawning gravel augmentation in the bypassed reach downstream of Ralston afterbay dam would provide especially favorable conditions for trout spawning, incubation, and rearing because it is not subject to daily flow fluctuations. We expect this would enhance recruitment to trout populations in the peaking reach. Developing a plan, in consultation with the agencies, to guide gravel placement in this reach would ensure a documented logical approach to this effort is carried out. Following initial

gravel augmentation in this reach, monitoring for trout redds would document the effectiveness of plan implementation.

Monitoring Instream Flows and Reservoir Water Surface Elevations

PCWA proposes, Alternative 1 and the Forest Service final condition specify, and a new license for the project would likely include provisions for releasing specified instream flows to the bypassed and peaking reaches. In particular, provisions for releasing the following types of instream flows would likely be included in a new license: minimum instream flows in the bypassed and peaking reaches; pulse flows in the bypassed reaches; recreation flows in the peaking reach; ramping rates with maximum flow releases from Oxbow powerhouse; and downramping for spills from French Meadows and Hell Hole dams. In addition, a new license would likely contain provisions for maintaining minimum water surface elevations at French Meadows and Hell Hole reservoir to enhance recreational opportunities. The Commission would need to ensure that compliance with any streamflows or reservoir levels specified in a new license could be documented.

To address the need to document compliance with instream flows and water surface elevations, PCWA proposes a Flow and Reservoir Monitoring Plan. The plan includes much of the details about instream flows detailed in the previous sections and recreation-related flows and reservoir water surface elevations discussed in section 3.3.5.2, *Recreation and Land Use*. Flows and reservoir water surface elevations would be recorded at 15-minute intervals, and 24-hour-average flow and reservoir elevation data annual hydrology summary reports would be provided to the Forest Service, Water Board, California Fish and Game, FWS, and the Commission. The 15-minute gage data for USGS gage no. 11433300 in the peaking reach near Foresthill would be available on request. Figure 10 shows the proposed stream and reservoir gage locations.

In response to preliminary Forest Service condition no. 31, PCWA developed a Streamflow and Reservoir Gaging Plan that would replace its proposed plan (PCWA, 2011f). PCWA included this plan in Alternative 1. Forest Service final condition no. 32 specifies implementing a revised Streamflow and Reservoir Gaging Plan that includes non-substantive changes to PCWA's plan.

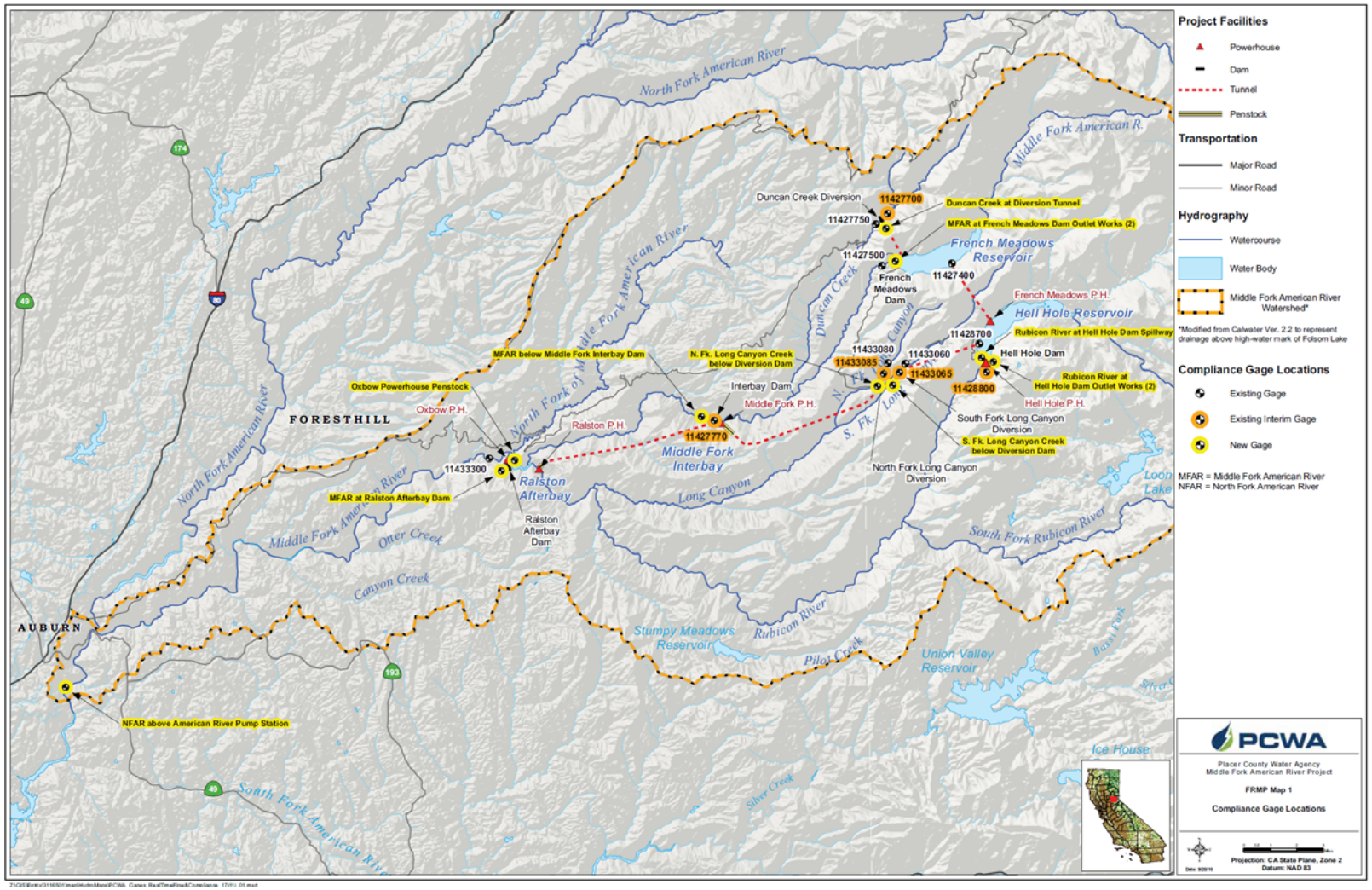

Figure 10. Stream and reservoir gage locations (Source: PCWA, 2011a).

Key differences between the proposed Flow and Reservoir Monitoring Plan and the Alternative 1 and Forest Service Streamflow and Reservoir Gaging Plan include the following:

- The Alternative 1 and Forest Service plans delete many of the details about specific flows and reservoir surface elevations and the supporting rationale for them because those are included in other measures. Instead, provisions for operating and maintaining the gages in accordance with applicable USGS protocols are provided and the USGS protocol documents are attached to the plan.
- The Alternative 1 and Forest Service plans include provisions to provide all 15-minute gage information, not just information from a single gage on the peaking reach, to the agencies and the Commission upon request in a readily accessible electronic format.
- The Alternative 1 and Forest Service plans include two additional gages on the Rubicon River that would be used to disseminate real-time flow information to the public; one near Ellicott Bridge, and one about 900 feet upstream of the Ralston powerhouse.

Our Analysis

Generally, all three monitoring plans would enable compliance with designated streamflows and water surface elevations to be documented. The simplified approach taken in the Alternative 1 and Forest Service plans present the basics of what is needed for monitoring and avoids redundancy of presenting details that are addressed in other measures that pertain to flow and reservoir water level monitoring. The primary information that would be presented in reports under the proposed plan would rely on 24-hour average flows and reservoir elevations. This could conceivably mask substantial variations of flow or water surface elevations within a 24-hour period. Raw data would only be available upon request from a single peaking reach flow monitoring station. The Alternative 1 and Forest Service plans do not specify that reports would only report 24-hour average data. Reporting average daily data with the maximum and minimum values within each day would provide a basis for the agencies and the Commission to decide whether to request files with the raw 15-minute time interval data from PCWA to confirm compliance with instantaneous flow values that may be specified in a new license.

Two gages on the Rubicon River are included in the Alternative 1 and Forest Service plan are not intended to document compliance with any specified flow measures. The primary purpose of both gages is to provide the public with real-time flow data that would be helpful for making decisions about traveling to the Rubicon River for recreational purposes in the reach between Ellicott Bridge and the Ralston afterbay. As shown in figure 10, flows from Hell Hole dam and powerhouse to the Rubicon River would be measured in the vicinity of the dam, and represent flows over which PCWA has control of during most circumstances. Flows on the Rubicon River at and downstream of

Ellicott Bridge are not only influenced from project releases from the Hell Hole development, but also from inflows from the South Fork Rubicon River. South Fork Rubicon River flows are heavily influenced by the operation of the Upper American River Hydroelectric Project (FERC No. 2101). We do not dispute the value to potential recreational visitors of having real-time flow information on the lower reach of the Rubicon River; however, we are unable to establish a nexus of these two gages to project purposes.

All three monitoring plans provide for a gage on the North Fork American River downstream of its confluence with the Middle Fork American River that would also be used to disseminate real-time flow information to the public. As with the two gages on the Rubicon River, the value to potential recreational visitors to the peaking reach of having real-time data for flows in the North Fork American River is not disputed. However, project-related flows in the Middle Fork American River downstream of the Ralston afterbay development would be measured in the bypassed reach (downstream of the afterbay dam), the Oxbow powerhouse penstock, and at the existing USGS gage near Foresthill, downstream of the confluence of the Oxbow tailrace with the bypassed reach. We do not find a project nexus of this additional gage on the North Fork American River.

Fish Entrainment

Entrainment of fish into diversion tunnels and powerhouses typically causes injury or mortality to a portion of the fish that are entrained. The Middle Fork American River project may entrain fish and other aquatic species at the following locations: (1) the large tunnel intakes at French Meadows and Hell Hole reservoirs, (2) the medium tunnel intakes and penstock at Middle Fork interbay and Ralston afterbay, and (3) the small stream diversions on Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks. PCWA pre-application studies indicate that entrainment at the large reservoir tunnel intakes is low because the intakes are situated deeper than most fish are regularly found. Changes in reservoir elevations included in the proposed action and Alternative 1 are minor and not expected to change the existing low levels of entrainment.

PCWA conducted a fish tagging study on Duncan Creek to estimate the magnitude of entrainment at the intakes of the small diversions on Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks under existing conditions. They estimated that about 1 percent of the trout population upstream of each diversion was entrained annually at each of the three diversions (PCWA, 2011h).

The proposed and Alternative 1 Sediment Management Plan includes measures to retrofit the existing small diversion structures on Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks with self-cleaning, stream-bottom intakes with inclined screens on the upstream side of the diversion weirs to facilitate passage of sediment downstream. The conceptual designs for the screens include 1-mm clear spacing but the spacing of the screens in the final design would be consistent with California Fish and Game and other agency requirements to protect fish from entrainment (current California

Fish and Game screen spacing requirements are 1.75 mm for reaches where steelhead fry are present or 2.38 mm for reaches without steelhead fry).

PCWA attempted to quantify entrainment at the intakes to the Ralston and Oxbow powerhouses using split beam echo sounders with three transducers placed behind the trashracks of each powerhouse intake. PCWA concluded that the results of this monitoring were unreliable because with the velocity of the water monitored to ensure that fish detections would be entrained, fish could not be distinguished from debris, and fish appeared to be using the shade of the intake structure as habitat refuge and milled about within the detection fields of the transducers (PCWA, 2011h). Therefore, there are currently no direct measurements of entrainment available for both powerhouses.

PCWA commits to conducting further entrainment studies at the Ralston and Oxbow powerhouse intakes in its proposed Fish Population Monitoring Plan, discussed in the following section. Forest Service final condition no. 29 removes entrainment study plan development from PCWA's Fish Population Monitoring Plan, and would make development and implementation of the plan a stand-alone measure. The plan would be developed in consultation with the Forest Service, California Fish and Game, and the Water Board and submitted to the Commission for approval prior to implementation. Elements of the plan would be similar to those originally contained in PCWA's proposed plan although much more detail is provided regarding plan content.

Our Analysis

The proposed wedge-wire screens that meet or exceed applicable guidelines for fish protection would be protective of resident fish populations. Installing the proposed wedge-wire screens at the small diversions would prevent the entrainment of fish that occurs under existing conditions in Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks, which would benefit trout and other vulnerable fish or aquatic species. No change in the existing low levels of entrainment is expected at the large and medium reservoir tunnel intakes at French Meadows and Hell Hole reservoirs, or the Middle Fork interbay and Ralston afterbay. There are no reliable direct measurements of fish entrainment at Ralston and Oxbow powerhouses. Conducting additional entrainment studies at Ralston and Oxbow powerhouses, as proposed by PCWA and specified by the Forest Service, would provide information that would indicate whether or not protective measures are warranted at these two powerhouses.

Monitoring Fish Populations in Project Waters

PCWA proposes to implement its Fish Population Monitoring Plan. The general purpose monitoring component of the plan would entail periodic monitoring surveys over the term of a new license at sites sampled during the 2007–2009 relicensing studies, using the same methods and analyses. Results would be used to characterize fish species composition, distribution, abundance, condition factor, and age structure in project bypassed and peaking reaches. In addition to the general purpose monitoring, the plan includes special purpose monitoring consisting of three shorter-term, focused studies: (1)

sampling YOY and juvenile fish in the peaking reach, (2) monitoring hardhead movements in Ralston afterbay, and (3) further investigating entrainment at Ralston and Oxbow powerhouses. The plan contains a general description of the methods proposed for YOY and juvenile sampling and the hardhead movement study, but the entrainment study remains to be developed.

Forest Service 4(e) condition no. 28 includes a revised Fish Population Monitoring Plan. As discussed in the previous section, the revised plan does not include provisions for developing an entrainment study plan; it is now a stand-alone measure specified in condition no. 29. The remainder of the plan is similar to PCWA's plan. However, a new provision in the plan calls for additional fish population monitoring in the Rubicon River in the vicinity of Ellicott Bridge annually for the first 10 years from license issuance. PCWA's plan called for monitoring at this location during the same time frame at 2, 3, 7, and 8 years from license issuance. The purpose of the annual monitoring is to understand between-year variability and identify any unusual population deviations that may occur during the years general fish population monitoring does not occur. At the end of 10 years, monitoring results would be reviewed and a recommendation made regarding whether to continue monitoring and/or modify the monitoring location.

Our Analysis

The proposed general purpose monitoring studies would provide appropriate information for characterizing fish populations in the bypassed and peaking reaches. Collection of data at the same sites and use of the same methods and analyses used for the relicensing studies should allow comparative analysis of results and evaluation of fish population status and trends over time, although this is not overtly stated as a plan objective. Such trend analysis would allow evaluation of the response of fish populations to proposed changes in project operations, sediment management, flow management, reservoir drawdowns, and other proposed activities and the resultant changes in sediment dynamics, channel geomorphology, and riparian conditions. The proposed plan contains only limited detail on the objectives of the general purpose monitoring studies (to collect periodic information for comparative purposes in the peaking reach and selected bypassed reaches). The reports of monitoring results would follow the same format as pre-application reports. However, no details are provided in the plan about additional report contents, such as population trends that may trigger consideration of changes in project facilities or operation and whether such recommended changes, if needed, would be included in the reports.

The Forest Service plan provision for annual monitoring in the vicinity of Ellicott Bridge for at least 10 years would enable an assessment of population variability over time. This reach of the Rubicon River is affected by project releases from Hell Hole dam and inflows from the South Fork Rubicon River, which are heavily influenced by operation of the Upper American River Project (FERC No. 2101). Therefore, fish population dynamics in this reach are more complex than in most of the other project-

affected reaches, and more frequent monitoring to enable potential variability and associated causes is warranted.

The proposed special purpose monitoring for YOY and juvenile fish would occur in the peaking reach during years 2, 3, and 4 following license issuance. This would document the response of fish populations to sediment augmentation, although this is not stated in the plan. Based on information in the Sediment Management Plan, there is no certainty that sediment augmentation would occur within the first 4 years of license issuance. Provisions in PCWA and Forest Service plans would allow adjustments of the monitoring schedule if deemed appropriate. In terms of fish population monitoring, this would be appropriate if project operations do not entail operations that could influence fish populations.

Hardhead are a Forest Service sensitive species, and very little is known of trends in their abundance and distribution in the project area or potential effects of the project on the population. Both the proposed and Forest Service Fish Population Monitoring Plan include hardhead radio-tagging monitoring that may elucidate some effects of the proposed project operations on this species, including the degree of entrainment at Ralston afterbay based on hardhead responses to drawdowns and sediment management activities and responses to changes in water temperature. Tagging procedures to be used in the study would include measures to minimize risk to tagged fish; however, some stress to individuals and possible mortality could result, but provisions in the plan include measures that would minimize potential stress to hardhead during the tagging process. According to the plan, the 2 year monitoring program would encompass at least 2 annual maintenance drawdowns and may include sediment management activities.

Monitoring Water Temperature in Project Waters

Project operations have altered the water temperature regimes in the large bypassed and peaking reaches, particularly during the summer and early fall. Storage of cold water in French Meadows and Hell Hole reservoirs during the spring runoff period and its subsequent release from low-level outlets and powerhouses throughout the summer and fall have reduced water temperatures of the Middle Fork American and Rubicon Rivers by as much as 15°F or more compared with modeled unregulated flow conditions (e.g., from low 60–70°F to mid 40–50°F).

Under existing conditions, mean daily summer water temperatures in most of the project reaches are generally consistent with the basin plan beneficial uses for coldwater freshwater habitat and habitat for reproduction and early development of fish, with two of the river reaches (the downstream reach of the Rubicon River and the Middle Fork American River downstream of Middle Fork interbay) exhibiting transition zones from coldwater to warmer water habitat during the summer.

The proposed and Alternative 1 actions include modifications to hydrology (pulse flows, increased minimum instream flows) in the bypassed reaches that could further reduce water temperature. Decreased water temperature in the bypassed reaches would

potentially influence the location of the transition zones of coldwater and warmer water species. Flows under both action alternatives are not anticipated to affect water temperature in the peaking reach.

PCWA's proposed Water Temperature Monitoring Plan describes methods and analyses for collection of water temperature data at selected sites in bypassed and peaking reaches associated with the project. The monitoring approach is based on the approach taken in pre-application Commission-approved study plans. This information would be used to characterize water temperatures within the monitored reaches over time and to aid interpretation of biological monitoring data. Alternative 1, which includes flows similar to the proposed action, would have similar effects on water temperature. Alternative 1 also includes the proposed Water Temperature Monitoring Plan. Forest Service final condition no. 28 includes a Water Temperature Monitoring Plan that refines some of the text in PCWA's plan, but is not substantively different.

Our Analysis

Both the proposed action and Alternative 1 include additional minimum and spring pulse flow releases that are designed to enhance aquatic habitat and balance the temperature preferences of coldwater species (e.g., trout) and transition zone species (e.g., hardhead and foothill yellow-legged frog). Both alternatives would result in water temperatures that are substantially lower in the summer and fall than under unregulated conditions and that are consistent with basin plan objectives. Under the proposed and Alternative 1 actions, we consider it likely that water temperatures in the bypassed and peaking reach would remain consistent with the basin plan beneficial uses for cold freshwater habitat, warm freshwater habitat, and habitat for reproduction and early development of fish. The natural warming of the water along the length of the river reaches, similar to existing conditions, would also be consistent with the basin plan objectives. Implementation of the proposed and Forest Service Water Temperature Monitoring Plans would confirm whether flows are protective of the basin plan designated beneficial uses of cold freshwater habitat and warm freshwater habitat, and do not adversely affect water temperatures for local aquatic- and riparian-dependent species assemblages. In particular, temperature monitoring would provide key input to the interpretation of monitoring results associated with trout, hardhead, and foothill yellow-legged frog, the distribution and population vitality of which are strongly related to water temperature.

Monitoring Benthic Macroinvertebrate Responses to Project Operations

Non-fish aquatic species are important components of riverine aquatic communities, facilitating nutrient transfer and serving as an important food source for many fish and other species. The proposed action may affect suitable habitat for benthic macroinvertebrates and aquatic mollusks as a result of the proposed sediment augmentation program, decreasing water quality by use of pesticides as part of routine vegetation and noxious weed management, and changes to minimum instream flows and

associated water temperature, pulse flows, and spill flows. PCWA proposes to implement a Benthic Macroinvertebrate Monitoring Plan, which includes monitoring two sites in the peaking reach and eight sites in the bypassed reaches in years 2, 3, 7, 8, 13, and 14 from license issuance and thereafter for 2 consecutive years during every 10-year period during the term of a new license.

Forest Service 4(e) condition no. 28 includes a revised Benthic Macroinvertebrate Monitoring Plan that refines some of the text in PCWA's plan and adds a monitoring station in the peaking reach upstream of the confluence with the North Fork American River.

Our Analysis

Increased minimum flows in bypassed reaches would result in relatively minor changes in the depth and velocity of aquatic habitats compared with current conditions; however, under the action alternatives, instream flows would vary monthly and between years to better reflect natural seasonal variations that native plant and animal communities are adapted to. We anticipate that PCWA's proposed changes to instream flows would result in an increase in wetted perimeter in bypassed reaches and therefore enhanced productivity of benthic organisms. The proposed plan would enable documentation of this expected outcome. In addition, many species of benthic macroinvertebrates, either on an individual species or assemblage basis, are indicative of both good and degraded water quality. The results of the proposed monitoring plan would provide indications of any such positive or adverse effects, which may trigger follow-up actions to determine if potential adverse effect indications are project-related or anomalies. The additional monitoring station in the Forest Service plan would provide data for a more robust assessment of the invertebrate community response to flow regime changes in the peaking reach.

Both Benthic Macroinvertebrate Monitoring Plans includes a consultation and reporting provision that would allow the agencies to recommend modifications to the plan, if necessary, to facilitate detecting changes in macroinvertebrate communities. We note that any recommended change to a Commission approved plan would require Commission approval before the changes could be implemented.

Controlling Aquatic Invasive Species

New Zealand mud snails, quagga mussels, and zebra mussels are invasive aquatic mollusk species that have the potential to affect aquatic communities (e.g., New Zealand mud snails feed on the algae that is normally consumed by aquatic insects that make up a large portion of the diet of fish, and quagga mussels filter and remove plankton, which may also modify food webs). These species are not currently known to inhabit any project-related waters. However, the potential exists for them to become established during the term of a new license. The invasive algae *Didymosphenia geminate* has been documented throughout the project area but it is not known whether the distribution is project-related and there is currently no known safe treatment to control this species.

None of PCWA's proposed plans address either invasive mollusks or algae. Forest Service preliminary condition no. 46 specifies that PCWA revise its proposed VIPMP to include provisions that address invasive mollusks and algae. The proposed VIPMP includes the following provision that addresses invasive aquatic weeds: if aquatic and invasive weeds are identified as being present at French Meadows or Hell Hole reservoirs, PCWA would consult with the agencies to determine the appropriate measures to prevent their spread. In response to Forest Service preliminary condition no. 46, PCWA developed the Alternative 1 VIPMP which includes this provision, and addresses the invasive algae *Didymosphenia geminate*: if future scientific studies document that the presence or abundance of invasive algae (*Didymosphenia geminate)* found in river and stream reaches in the vicinity of the project is project-related, and if a safe method of reducing this invasive algae exists, PCWA would consult with the Forest Service to determine the feasibility of reducing the algae in project-affected reaches. If a feasible method exists, PCWA would implement this task in project-affected locations. The Forest Service specifies implementing the Alternative 1 VIPMP in its final condition no. 47.

The Alternative 1 VIPMP introduction includes a statement that it has developed a program to prevent the inadvertent and unwanted introduction of invasive mussel species in its Invasive Mussel Protection Plan (PCWA, 2010a). This plan was developed in accordance with state regulations and approved by California Fish and Game on September 17, 2010. Although this plan was not included in the Alternative 1 VIPMP, it was filed on June 18, 2012, with the Commission, and we assume it would be included as a provision of this plan without being specifically included.

Forest Service final condition no. 48 specifies that PCWA file with the Commission a plan approved by the Forest Service to address invasive species such as the New Zealand mudsnail, Quagga mussels, and zebra mussels if they are found during any monitoring. The condition also provides aquatic invasive species BMPs to be implemented within the project boundary at project reservoirs.

Our Analysis

The provisions included in the Alternative 1 VIPMP would provide a reasonable path forward if safe control methods for invasive algae are developed in the future and there is an established nexus of existing populations of this algae in project waters to project operations or facilities.

PCWA's publically available Invasive Mussel Protection Plan (2010a) concluded that the project has a low level of vulnerability to the introduction of invasive mussels based on its geographic location, recreational uses, and water quality. Calcium concentrations within the reservoirs average 3.1 milligrams per liter (mg/L), which is lower than the 15 mg/L threshold below which poor zebra and quagga mussel health and population growth have been documented. Effects of low calcium levels on these invasive mussels include low growth rates, shell degradation, and poor larval production (California Resources Agency, 2008, as cited in PCWA, 2010a). PCWA's plan includes

the following measures: (1) public education on how to minimize transfer of invasive mussels and other invasive species into project waters by posting signage regarding cleaning and drying boats between launches and distributing information cards to the public at numerous locations; (2) annual monitoring; and (3) a rapid response plan, to be developed in consultation with California Fish and Game in the event that one of these species is documented.

We conclude that these measures would minimize potential invasions and associated effects on aquatic communities in project-affected waters. However, we note that the Commission has authority over hydropower licensees. The Invasive Mussel Protection Plan referenced in the VIPMP was developed in consultation with California Fish and Game. However, there is no evidence that the Forest Service was consulted during the development of the plan, and it was not filed with the Commission for approval. Although the plan, in combination with the Alternative 1 VIPMP, appears to include all the elements specified in Forest Service condition no. 48, developing an aquatic invasive species management plan in consultation with the Forest Service would ensure that the latest Forest Service directives regarding management of resources on NFS lands are accommodated by the plan.

3.3.2.3 Cumulative Effects

Water Quantity

Flows passing through the project are described in section 3.3.2.1 and shown in tables 10 and 12. As shown in figure 2, the amount of water entering the project via the Rubicon and South Fork Rubicon River is heavily influenced by operations of Sacramento Municipal Utility District's Upper American River Project (FERC No. 2101) and Georgetown Divide Public Utility District's Stumpy Meadows Project (a non-FERC regulated project). In addition, flows downstream of Oxbow powerhouse are influenced by the following non-project facilities: (1) Foresthill Public Utility District's Sugar Pine Dam Project, which diverts flow from a tributary to the North Fork American River for consumptive use; (2) Pacific Gas and Electric Company's Drum-Spaulding Project (FERC No. 2310), which diverts flows for hydroelectric generation from two tributaries to the North Fork American River; (3) PCWA's Pulp Mill Canal Diversion Dam Project, which diverts flows for consumptive use from a tributary to the North Fork American River; and (4) PCWA's American River Pump Station, which diverts water from the North Fork American River for consumptive use. Operation of each of these projects is expected to be similar in the future compared to current operations with the possible exception of the Drum-Spaulding Project, which is in the midst of relicensing.

PCWA modeled the cumulative effect of all these flow-related projects, including the Middle Fork Project, on inflow to Folsom reservoir. Compared to the hypothetical unregulated watershed upstream of Folsom reservoir, flows entering the reservoir during all water year types are generally lower from January through June and higher during the

rest of the year. This trend is evident under existing and proposed operations of the Middle Fork Project.

Water Temperature

As discussed earlier in this section, storage of cold water in French Meadows and Hell Hole reservoirs during the spring runoff period and its subsequent release from low-level outlets and powerhouses through the summer and fall have reduced water temperatures of the Middle Fork and Rubicon Rivers by 15°F or more compared to unregulated conditions. Diversion of flows by the four other projects discussed in the previous subsection can also influence water temperature by diminishing flows in bypassed reaches making remaining flows more susceptible to solar warming or shielding water from solar water by passing it through flow conduits.

PCWA modeled the cumulative effect on water temperature of the existing and proposed project coupled with the other four projects that influence flows upstream of Folsom reservoir. The modeling showed that the mean monthly water temperature at the Folsom reservoir high water mark in a wet water year would be lower from June through September under the proposed action compared to existing conditions, with the most pronounced difference, about 2 degrees Celsius (°C), occurring during August. Under both existing conditions and the proposed project, the mean monthly water temperature at Folsom reservoir from May through September would be less than 17°C. Modeling of dry water year temperatures showed that proposed project operations would result in mean monthly water temperatures at Folsom reservoir from 1 to 2°C lower during June, July, and August, compared to existing conditions. Under both existing conditions and the proposed project, the mean monthly water temperature at Folsom reservoir during a dry year would be less than 20°C. Therefore, operating the project under PCWA's proposed flow regime would have a positive cumulative effect on water temperature downstream of Oxbow powerhouse by serving to reduce water temperatures, thus making the affected stream reaches more suitable for trout. This could have important ramifications if Central Valley steelhead should be reintroduced upstream of Folsom reservoir.

Central Valley Steelhead

Nimbus dam on the American River currently blocks upstream migration of all anadromous fish, preventing access to reaches affected by the Middle Fork Project. Two large, non-project barriers to upstream fish passage exist in the peaking reach downstream of the project—"Tunnel Chute" at RM 22.9, which was created by mining activity in the 1880s and "Ruck-a-Chucky rapids" at RM 10.7, created by a landslide in the 1940s. These barriers pre-date the construction of Nimbus and Folsom dams in 1955. A plan for reintroducing steelhead upstream of Nimbus and Folsom dams and into the upper American River watershed was included in the *Biological Opinion for Long-term Operations of the Central Valley Project and California State Water Project* (NMFS, 2009b), and NMFS expects these reintroduction efforts may possibly occur sometime

during any new license term of the project. The public draft recovery plan (NMFS, 2009a) identified the Upper American River as a primary focus for recovery of Central Valley steelhead. Following reintroduction, if it is eventually proven to be feasible, NMFS would then develop recommendations for additional protection, mitigation, and enhancement measures to protect listed anadromous fish.

However, there are a number of actions that would need to be completed prior to reintroduction of Central Valley steelhead upstream of Folsom dam, according to the biological opinion and draft recovery plan, including planning and scheduling, permitting, evaluations, and funding. These include but are not limited to:

- evaluation of potential habitat in all three forks of the American River upstream of Folsom and Nimbus dams;
- development of a fish passage pilot plan;
- implementation of a 5-year pilot reintroduction program that would include construction of fish collection and tagging facilities, procuring equipment to haul fish to identified release sites, and identification of downstream fish passage options through reservoirs and dams; and
- development of annual pilot program effectiveness evaluation reports with a final summary report due by the end of 2015.

Only after the final comprehensive fish passage report indicates that long-term fish passage is feasible and desirable would full scale steelhead reintroduction upstream of Folsom reservoir occur (NMFS, 2009b).

We note that there are considerable uncertainties regarding the viability and implementation program set forth by NMFS (2009b). PCWA points out that at the time its final license application was filed in February 2011 most of the actions associated with the items listed above had not been implemented. NMFS (2009b) states that the concept of collection of outmigrating juveniles at facilities at the head of reservoirs to ensure safe and timely downstream passage of juvenile and post-spawn steelhead is untested, and multiple concepts may need to be tested simultaneously. In the draft recovery plan, NMFS (2009a) estimates that funding for the first 5 years of near-term feasibility studies, habitat evaluations, development of reintroduction plans, and implementation of pilot reintroductions for just the American River watershed would be about $50 million. Obtaining funding to conduct these near-term actions, along with similar actions in other targeted watersheds, will be challenging. Thus, the implementation of a long-term steelhead reintroduction program is uncertain.

If and when steelhead are reintroduced into the upper American River watershed, NMFS could exercise its reserved authority to prescribe fishways and could make recommendations for additional terms and conditions to protect these species. NMFS recommends that PCWA, in consultation with NMFS, Reclamation, FWS, and California Fish and Game, annually file a report on the status of reintroduction of federally listed

anadromous fish into the American River watershed. The report would include a discussion of the steps that have been taken to assist in the reintroduction process, and provide a summary of the results of any studies that have been undertaken to benefit the reintroduction effort.

Alternative 1 includes a commitment from PCWA to collaborate with NMFS regarding potential reintroduction of steelhead into the American River basin and to submit an annual report on the status of reintroduction of listed species into the American River watershed to the Commission.

If steelhead should be reintroduced upstream of Nimbus and Folsom dams, they could gain access to project-affected reaches of the Middle Fork. This could make it appropriate for the Commission to consider project-related protection and enhancement measures for this federally listed species. We consider the key element of the NMFS recommendation to be ensuring that the Commission is notified that concrete plans to reintroduce steelhead upstream of Nimbus and Folsom dams are in place. Concurrent notification of Reclamation, FWS, and California Fish and Game would ensure that the resource agencies are aware of both the restoration plans and that the Commission is aware of the plans. Although filing annual reports with the Commission regarding the status of reintroduction plans would be informative, there are likely to be long periods with little or no progress. Consequently, annual reporting would be burdensome to PCWA and the agencies consulted during the development of each report.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

This section summarizes existing vegetation communities and wildlife habitats, describes documented special-status plant and wildlife species, provides information on documented noxious weeds, and characterizes riparian vegetation in the project area.

Vegetation Communities and Wildlife Habitats

During the relicensing effort, 24 vegetation communities and 12 wildlife habitats were documented in the vicinity of the project (table 18); vegetation communities/wildlife habitats were classified based on Forest Service mapping for the Eldorado and Tahoe National Forests and California wildlife habitat mapping from California Fish and Game. Vegetation communities and wildlife habitats in the vicinity of the project vary with elevation. At higher elevations around French Meadows and Hell Hole reservoirs, mixed conifer communities are dominated by either white fir or sugar pine and Jeffery pine. These mixed conifer communities transition into stands dominated by ponderosa pine and Douglas fir in the mid-elevations near Middle Fork interbay. At the lower elevations near Ralston afterbay and Oxbow powerhouse, the surrounding habitat is dominated by canyon live oak woodland.

Special-status Plants

Special-status plants include those protected by the state of California as endangered, threatened, and candidate for listing; included on the California Rare Plant Rank Lists 1B (rare, threatened, or endangered in California and elsewhere) and 2 (rare in California but more common elsewhere); and designated as Forest Service Sensitive (FSS) for the Eldorado and Tahoe National Forests. Federally listed threatened or endangered species are discussed in section 3.3.4, *Threatened and Endangered Species*. Seven special-status plants have been documented by California Natural Diversity Database (CNDDB), Forest Service, and California Native Plant Society (CNPS) (2011) data in the project vicinity (table 19). PCWA also identified 40 more species of special-status plants that could occur within the project vicinity (see PCWA, 2011a, table 7.6-2, for a listing, species status, and habitat where they are typically found).

Table 18. Vegetation communities and wildlife habitats in the Middle Fork Project vicinity (Source: PCWA, 2011a, as modified by staff).

Vegetation Community[a]	Wildlife Habitat[b]	Acreage within the Middle Fork Project Boundary from License Application
Annual Grasses and Forbs	Annual Grass	2
Barren	Barren	53
Gray Pine	Blue Oak–Foothill Pine	2
Douglas Fir–Pine	Douglas Fir	160
Pacific Douglas Fir		
Huckleberry Oak		
Lower Montane Mixed Chaparral	Montane Chaparral	178
Upper Montane Mixed Chaparral		
Black Oak		
Canyon Live Oak		
Interior Live Oak	Montane Hardwood	277
Interior Mixed Hardwoods		
Montane Mixed Hardwoods		
Mountain (Thinleaf) Alder	Montane Riparian	23
Cottonwood–Alder		
Mixed Riparian Hardwoods		
White Alder		

Vegetation Community[a]	Wildlife Habitat[b]	Acreage within the Middle Fork Project Boundary from License Application
Willow		
Willow–Alder		
Ponderosa pine	Ponderosa pine	24
Mixed Conifer–Fir Mixed Conifer–Pine	Sierran Mixed Conifer	776
White Fir	White Fir	20
N/A	Urban	105
N/A	Water (Riverine and Lacustrine)	2,532
	Total Acreage	4,150

[a] Vegetation community classification is based on the Classification and Assessment with LANDSAT of Visible Ecological Groupings (Forest Service, 2000, as cited in PCWA, 2011).

[b] Wildlife habitat classification is based on California Wildlife Habitat Relationships (California Fish and Game, 2010, as cited in PCWA, 2011a).

Table 19. Special-status plant species known to occur in the project vicinity (Source: PCWA, 2011a,b; CNPS, 2011; Hickman, 1993).

Species Name	Status[a]	Blooming Period	Habitat	Occurrence Notes
Pleasant Valley mariposa lily *(Calochortus clavatus* var. *avius)*	FSS; 1B.2	March–July	Lower montane coniferous forests with Josephine silt loam and volcanic soils in elevations ranging from about 1,000 to 5,900 feet.	Forest Service records show a population in the immediate vicinity of the Hell Hole-Middle Fork tunnel, about 2 miles west of the North Fork Long Canyon Crossing Removable Section. The tunnel at this location is underground.
Brandegee's clarkia (*Clarkia biloba* ssp. *brandegeeae*)	FSS; 1B.2	May–July	Foothill woodlands, chaparral, roadcuts of lower montane coniferous forest, and cismontane woodlands in elevations ranging from about 240 to 3,000 feet.	Documented by CNDDB in the rocky, upland areas along the river canyon of the Middle Fork American River. This species was not, however, observed during the relicensing special-status plant surveys.
Red Hills soaproot (*Chlorogalum grandiflorum*)	1B.2	May–June	Chaparral, cismontane woodland, and lower montane coniferous forest on serpentine, gabbroic and other soils, at elevations ranging from about 800 to 4,000 feet.	Documented by CNDDB along PG&E powerline rights-of-way on the rocky ledge above the river canyon near Ralston afterbay and near the confluence of the Rubicon River and Long Canyon Creek. This species was not observed during the relicensing special-status plant surveys.

Species Name	Status[a]	Blooming Period	Habitat	Occurrence Notes
Butte County fritillary (*Fritillaria eastwoodiae*)	FSS; 3.2	March–June	Dry benches and slopes, generally in chaparral, cismontane woodland and openings in lower montane coniferous forest, sometimes on serpentine, at elevations ranging from about 160 to 5,000 feet.	Documented by CNDDB in the rocky, upland areas along the Middle Fork American River. This species was not observed during the relicensing special-status plant surveys.
Saw-toothed lewisia (*Lewisia serrata*)	FSS; 1B.1	May–June	Mesic, rocky slopes in broad-leaved upland forest, lower montane coniferous forest, and riparian forest on mesic steep, nearly vertical cliffs and inner gorges at elevations ranging from about 2,900 to 4,700 feet.	Documented by the Forest Service and CNDDB in the rocky, upland areas along the Long Canyon Creek. This species was not observed during the relicensing special-status plant surveys.
Yellow bur navarretia (*Navarretia prolifera* ssp. *lutea*)	FSS; 4.3	May–July	Chaparral and cismontane woodland in elevations ranging from about 2,800 to 4,600 feet	Forest Service records show a population at the Hell Hole-Middle Fork tunnel butterfly valve house access road.

Species Name	Status[a]	Blooming Period	Habitat	Occurrence Notes
Stebbins' phacelia (*Phacelia stebbinsii*)	FSS; 1B.2	May–July	Cismontane woodlands, lower montane coniferous forest, and meadows and seeps. Found on dry, open rocky sites (bedrock outcrops, rubble, or talus) on ledges and moderate or steep slopes as well as inner gorges and near seeps in elevations ranging from about 2,000 to 6,600 feet.	Sixty-three populations (115 acres) were documented within the study area around project facilities including: • 58 populations in the vicinity of Hell Hole reservoir (about 2.5 to 5.0 million individuals) • Two small populations in the vicinity of Brushy Creek (about 200 individuals) • One population in the vicinity of French Meadows reservoir (one individual) • Two populations in the vicinity of the Rubicon River at Ellicott Bridge (four individuals) Additional populations were documented by Forest Service and CNDDB in rocky, upland areas along the Rubicon River, Long Canyon Creek, and Duncan Creek.

Note: CNDDB–California Natural Diversity Database

[a] FSS = Forest Service Sensitive; California Rare Plant Rank: 1B = rare, threatened or endangered in California and elsewhere; 3 = need more information; 4 = plants of limited distribution (watch list);_.1 = Seriously endangered in California (more than 80 percent of occurrences threatened or high degree and immediacy of threat); _.2 = Fairly endangered in California (20-80 percent occurrences threatened); _.3 = Not very endangered in California (<20 percent occurrences threatened or no current threats known).

Noxious Weeds

A total of 27 noxious weed species were detected in the study area[21] during PCWA's noxious weed surveys. Specifically, 24 species were identified at existing project facilities and features; 18 species at project recreation facilities; and 23 species at dispersed recreational use areas. In general, noxious weeds were common throughout the study area, particularly at facilities and features associated with the project's four largest impoundments, Ralston afterbay, Middle Fork interbay, Hell Hole reservoir, and French Meadows reservoir. The greatest number and highest densities of noxious weed species occur near the lower-elevation project facilities (i.e., Ralston afterbay and Middle Fork interbay) and the number and density generally decreases in the vicinity of the higher-elevation project facilities (i.e., French Meadows and Hell Hole reservoirs). Populations were also documented along bypassed reaches and the peaking reach where no routine maintenance activities are conducted. PCWA's current vegetation management practices, which would include noxious weed control, are primarily limited to vegetation trimming by hand and with equipment, with limited use of herbicides and fungicides within the fence lines of Middle Fork, Ralston, and Oxbow powerhouses.

Priority noxious weeds (i.e., non-native or invasive plants) are those noxious weed species on which Eldorado National Forest and Tahoe National Forest are focusing their forest-wide weed management efforts. There are 21 species (1,759 acres) of priority noxious weed species in the vicinity of the project (table 20). The most abundant noxious weed species observed in the study area were:

- woolly mullein (*Verbascum thapsus*)—72 populations occupying about 319 acres;
- cheatgrass (*Bromus tectorum*)—101 populations occupying about 280 acres; and
- rattail fescue (*Vulpia myuros*)—77 populations occupying about 225 acres.

Five noxious weed species were found that had not previously been recorded in the vicinity of the project:

- Italian thistle (*Carduus pycnocephalus*);
- Malta starthistle (*tocalote*) (*Centaurea melitensis*);
- Canada thistle (*Cirsium arvense*);
- White sweet clover (*Melilotus albus*); and
- Spreading hedgeparsley (*Torilis arvensis*).

[21] The study area for noxious weeds included buffer zones ranging from 10 to 100 feet from existing or proposed project facilities and riparian zones along representative portions of the bypassed and peaking reaches.

Table 20. Project priority noxious weeds list (Source: PCWA, 2011a, as modified by staff).

Scientific Name	Common Name	Tahoe National Forest Priority Species	Eldorado National Forest Priority Level	Acres in the Project
Ailanthus altissima	Chinese tree of heaven		2	2.7
Bromus diandrus	Ripgut brome		4	97.2
Bromus tectorum	Cheat grass	X	2	246.8
Carduus pycnocephalus	Italian thistle		3	18.3
Centaurea melitensis	Tocalote	X	2	18.9
Centaurea solstitialis	Yellow starthistle	X	2	6.67
Chondrilla juncea	Rush skeletonweed	X	2	75.9
Cirsium arvense	Canada thistle	X	1	0.05
Cirsium vulgare	Bull thistle		3	103.8
Cynosurus echinatus	Hedgehog dogtailgrass		4	81.4
Hirschfeldia incana	Shortpod mustard		4	43.8
Hypericum perforatum	Klamathweed	X	3	125.1
Lepidium latifolium	Tall whitetop (pepperweed)	X	1	8.9
Melilotus officinalis, M.albus	Yellow sweet clover, white sweet clover		3	57.9
Rubus discolor	Himalayan blackberry	X	3	32.1
Rumex acetosella	Red (sheep) sorrel		4	189.5
Taeniatherum caput-medusae	Medusahead	X	2	21.2
Torilis arvensis	Spreading hedgeparsley		4	84.4
Verbascum thapsus	Woolly mullein	X	4	318.7
Vulpia myuros	Rattail fescue		4	225.3

Additionally, algae abundance surveys conducted within the study area identified *Didymosphenia geminata*, a nuisance algae species. Based on the summer algae abundance surveys, algae coverage was sparse at most of the instream flow sites but was relatively dense at the top of the peaking reach. Cumulative filamentous macroalgae and microalgae coverage ranged from a low of 11 percent at the Rubicon River near Ellicott Bridge to a high of 86 percent at Middle Fork American River downstream of Ralston afterbay. The only project-affected streams and rivers where *Didymosphenia geminata* was not documented was North Fork Long Canyon Creek.

Riparian Vegetation

To characterize riparian vegetation in the vicinity of the project, riparian vegetation around the project reservoirs and diversion pools and along the bypassed and peaking reaches was mapped from helicopter and ground surveys during the relicensing effort and information on the distribution, composition, and age classes of existing woody riparian vegetation was collected. These attributes of the riparian vegetation on the bypassed and peaking reaches were then compared with the riparian vegetation at unregulated river reaches (North Fork American and North Fork of the Middle Fork American Rivers) and upstream of project diversions (South Fork Long Canyon and Duncan Creeks).

Project Impoundments

PCWA found that riparian vegetation was generally sparse along all the reservoirs and diversion pools, with a total of 16.9 acres and 5.0 miles mapped along the impoundment shorelines. The large and medium project reservoirs (Hell Hole and French Meadows reservoirs, Middle Fork interbay, and Ralston afterbay) are generally surrounded by rock outcrops and steep slopes, and the shorelines are primarily composed of bedrock or coarse substrates that are not suitable for riparian vegetation establishment. The riparian communities around the reservoirs were composed of primarily native riparian and wetland species, including willows, alders, and cottonwoods. Sedges and other herbaceous species were also present along the shorelines. Table 21 provides a summary of riparian vegetation around project reservoirs and diversion pools.

Riparian Vegetation along Project-Affected Reaches

Riparian habitat occurred along about 93 linear miles (i.e., total linear miles includes vegetation established along both stream banks) or 42 percent of the total river miles along the bypassed and peaking reaches and was discontinuously distributed along another 30 linear miles of stream (14 percent of total river miles). The abundance and distribution patterns of riparian vegetation along the bypassed reaches were largely influenced by the geology of the site (i.e., confined valley walls and bedrock or coarse substrate) and historical land use activities (in particular mining).

Table 21. Summary of riparian vegetation around project reservoirs and diversion pools (Source: PCWA, 2011a, as modified by staff).

Location	Total Acreage Riparian Vegetation	Total Miles of Vegetated Shoreline	Total Miles of Shoreline
Large Reservoirs			
Hell Hole reservoir	6.1	2.3	11
French Meadows reservoir	2.5	0.6	9
Medium Reservoirs			
Middle Fork interbay	1.7	0.6	1
Ralston afterbay	6.1	1.3	4
Diversion Pools			
Duncan Creek diversion pool	0.2	0.1	<1
South Fork Long Canyon diversion pool	0.3	0.07	<1
North Fork Long Canyon diversion pool	None mapped		
Total	**16.9**	**5.0**	**~26**

The riparian communities along the bypassed and peaking reaches were composed of primarily native riparian and wetland species, including willows, alders, cottonwoods, and dogwood. Alder was the dominant species within all the riparian communities. The communities along the bypassed reaches were predominantly composed of young and medium-aged individuals or mixed age classes (young, medium-aged, and mature individuals). In the peaking reach, a little more than 50 percent of the communities were composed of primarily older individuals (medium and mature aged trees and shrubs). Regeneration (hundreds of seedlings) was observed in the peaking reach during field surveys on bars with suitable-sized substrates for seedling establishment; however, many of the bars are made up of large coarse material that is not suitable for riparian establishment.

In general, riparian vegetation distribution and abundance along the channel, community composition, age structure, canopy structure, and health were similar between the bypassed and peaking reaches and the appropriate comparison unregulated reaches, with a few exceptions. Along the peaking reach, the distribution and abundance of riparian vegetation was greater, with more mature patches compared with the North Fork American River comparison reach. On the Rubicon River, riparian vegetation abundance along the margins of bars was typically greater than that observed along the comparison

unimpaired river reach on the North Fork American River. On Duncan Creek, the abundance of riparian vegetation was a little greater and occurred in larger patches upstream of the diversion compared with downstream.

Riparian Resources and Hydrologic Regime Relationships

PCWA assessed the influence of the current hydrologic regime on riparian vegetation in the vicinity of the project, the hydrology associated with successful recruitment events (scouring and recruitment flows and recession rates) and the position of vegetation along the channel (frequency, duration, and width and depth of inundation). Tree cores from the bypassed and peaking reaches and comparison reaches from nearby unregulated rivers were analyzed as was the lateral distribution of riparian trees adjacent to the channel which was compared with that on the comparison unregulated river reaches and upstream of the project diversions.

Riparian recruitment flows (i.e., the flow at which additional increases in flow provide very little additional width and depth of inundation of the channel) were evaluated for the spring and early summer (May through June) time period. Successful recruitment events were often preceded by large magnitude scouring flows in the bypassed and peaking reaches. Furthermore, sediment and channel conditions in the bypassed and peaking reaches were being maintained by the current flow regime and berm development was not observed. Scouring flows generally occurred during the 6 wetter water years in the bypassed and peaking reaches for a total of 14 to 22 days (depending on the reach) during the period of record.

The majority of trees in the bypassed, peaking, and unregulated comparison river reaches became established during years with low to moderate magnitude spills following particularly high magnitude winter events (e.g., 1986 and 1996 to 1997) that scoured banks and bars, and prepared seed beds. PCWA stated that it is possible that other recruitment events occurred during or prior to the period of record evaluated (1975 to 2007), but the trees were removed (scoured) during more recent events.

In general, riparian recruitment flows in the larger bypassed reaches occurred during wet and above normal water years, with an average duration of 7 to 28 days in wet water years and 3 to 14 days in above normal water years. On the smaller bypassed reaches, recruitment events also typically occurred in wet and above normal water years, with an average duration of 3 to 22 days in wet water years and 0 to 6 days in above normal water years. In the peaking reach, recruitment flows were less frequent and of shorter duration compared with the bypassed reaches (2 days on average). However, hundreds of seedlings and young individuals were observed by PCWA on bars with suitable substrates during field surveys.

On the larger bypassed reaches, particularly immediately downstream of the large dams, and in Duncan Creek, recession rates of the spring high flow (early May to late June) were typically faster than those identified in the literature (2 to 3+ inches per day) and typically decreased with distance downstream as a result of accretion and tributary

inflows. Recession rates were typically faster in wet water years than those associated with spills that occurred during above normal water years. On the Long Canyon Creek bypassed reaches, recession rates associated with spring high flows were generally relatively slow and within the range for high seedling survival success identified in the literature.

On the larger bypassed and peaking reaches, the lateral distribution of vegetation adjacent to the channel was influenced by the availability of suitable substrate, summer water availability, and magnitude and frequency of scouring flows. Bedrock and large boulders along the channel margins and high, coarse bars limited riparian establishment in many locations. The trees that established following the large scouring events (1986 and 1997) were rooted at elevations that corresponded to the stages of the spring flows that occurred during subsequent years.

On the Middle Fork American River bypassed reaches, riparian vegetation was established at similar positions relative to the low-flow channel as that observed along the comparison river reach (North Fork of the Middle Fork American River). On the peaking reach, the amount of vegetation was greater and typically occurred in larger corridors and closer to the channel compared with the comparison reach. Vegetation in the peaking reach was typically established within the elevational range influenced by summer flows (up to about 1,000 cfs, depending on the water year type). In contrast, summer flows are substantially lower on the North Fork American River (40 to 100 cfs), the comparison river reach for the peaking reach. On the North Fork American River, particularly in drier years, PCWA concluded that seedlings would need to be rooted low in the channel to reach water during the late summer and fall, and therefore would be susceptible to erosion during winter flows. In comparison, on the peaking reach, seedlings can survive through the summer farther away from the channel even during drier years due to the higher summer and fall flows and would not be as susceptible to erosion by winter flows.

In the narrower, confined reaches of the Rubicon River, riparian vegetation was established at similar locations along the channel as that observed along the comparison reach on the North Fork American River. Where large bars were present, however, the position of the vegetation differed. On the Rubicon River, vegetation was established along the perimeters of large, coarse bars. On the comparison reach, the bars were not as high and the substrate was finer than the bars on the Rubicon River and the majority of the larger trees and shrubs were located towards the back of the bars at the base of the hillslopes. Primarily young shrubs were established along the bar perimeters, where frequent scour by winter and spring flow occurs.

Along the small bypassed streams (Duncan, South Fork Long Canyon, and North Fork Long Canyon Creeks) and the comparison reaches upstream of the diversions, the stream valleys are very confined, with a very narrow floodplain zone between the low flow channel and the hillslope (i.e., limited floodplain development). As a result, riparian vegetation, where present, was typically distributed in this narrow zone between the stream margins to the edge of the hillslopes.

Wildlife

Wildlife resources are diverse within the project area due to the associated diverse vegetation community structure and include both resident and migratory species. PCWA obtained data to characterize wildlife resources by conducting a literature review and stakeholder consultation, general avian point count surveys, general terrestrial visual encounter surveys, special-status species surveys, and making observations during studies to characterize project-related vegetation resources.

Open water habitats, which include reservoirs and bypassed and peaking reaches, encompass about 60 percent of the acreage in the project area (see table 18). This aquatic habitat can provide foraging habitat for a number of special-status amphibians, reptiles, bats, and birds, such as bald eagle, osprey, American white pelican, harlequin duck, and Vaux's swift. Ten osprey nests were identified during the review of existing information and osprey nest relicensing surveys. This includes six active nests identified during osprey surveys in the study area—three nests at French Meadows reservoir and three nests at Hell Hole reservoir. In addition, numerous incidental osprey observations were recorded during implementation of other technical studies, and four additional active osprey nests were observed at French Meadows reservoir (PCWA, 2011b). Montane riparian habitat (<1 percent of acreage in project) along project reservoirs and bypassed reaches may provide suitable habitat for riparian-nesting song birds (e.g., yellow warbler and yellow-breasted chat). Aquatic amphibian and reptile observations documented during relicensing surveys included California newt and American bullfrog, as well as the special-status species described below.

Forest and woodland habitat (blue oak-foothill pine, Douglas fir, montane hardwood, ponderosa pine, Sierran mixed conifer, white fir) encompasses about 30 percent of the acreage in the project (see table 18). This habitat can provide breeding and/or foraging habitat for the sooty (blue) grouse, mountain quail, calliope hummingbird, Lewis' woodpecker, Williamson's sapsucker, hairy woodpecker, black-backed woodpecker, olive-sided flycatcher, fox sparrow, Cassin's finch, flammulated owl, great gray owl, and American peregrine falcon. Dense mixed conifer–fir forests with mature trees can provide denning habitat for mesocarnivores and tree foliage can provides roosting habitat for solitary western red bats. Game species primarily observed in forested habitat in the vicinity of French Meadows and Hell Hole reservoirs include blue grouse, mountain quail, band-tailed pigeon, coyote, gray fox, black bear, mountain lion, and mule deer.

The presence of man-made structures (e.g., substations, dams, warehouses) can provide habitat for Townsend's big-eared bats and other roosting bat species. However, bat surveys did not document any bat roosts in project facilities and features or project recreation facilities and features.

Special-status Wildlife

Special-status species include those protected by the state of California as endangered or threatened, candidate for listing, California species of special concern, California fully protected species, California Fish and Game special animal, Forest Service Sensitive and management indicator species, and FWS birds of conservation concern (table 22). Federally listed threatened or endangered species; candidate species for listing; and any applicable designated critical habitat for a listed species are discussed in section 3.3.4, *Threatened and Endangered Species*. Table 22 summarizes associated habitat and occurrence information for special-status species known to occur or with the potential to occur within the existing project boundary.

3.3.3.2 Environmental Effects

Vegetation

Project operations and maintenance activities can disturb existing vegetation communities in the project area by removing individuals or degrading habitat. Project activities that could affect vegetation include routine maintenance activities, non-routine recreation maintenance activities, modification of existing project operations, modification of existing facilities, and construction of new facilities.

PCWA's proposed VIPMP is intended to address project-related effects on vegetation as well as nuisance species of wildlife (addressed later in this section under *Wildlife*). The Alternative 1 VIPMP modifies some aspects of the proposed plan and reorganizes some elements into what we find is a more logical sequence than presented in the proposed VIPMP. Both plans include provisions for annual consultation with the Forest Service regarding completed and planned vegetation management and pest control activities. Overall, compared to the proposed plan, the Alternative 1 plan provides much more detail regarding plan objectives, which establish a solid foundation upon which the elements of the plan are based. Forest Service final condition no. 47 includes the Alternative 1 VIPMP. The following subsections address issues in each of the plans, highlight key differences, and analyze plan elements and their differences. Following our discussion of VIPMP components, we discuss the effects of proposed changes in project operations and facilities on vegetation, which are not directly addressed in either VIPMP plan.

Table 22. Special-status wildlife species that potentially occur within the project vicinity (Source: PCWA, 2011a,b).

Species Name	Status	Habitat	Occurrence Notes
Amphibians			
Foothill yellow-legged frog (*Rana boylii*)	FSS CSC	Breeds in rocky streams with cool clear water in a variety of habitats, including valley and foothill oak woodland, riparian forest, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadows; occurs from sea level to 6,000 feet.	Most of the perennial streams and rivers in the vicinity of the project below 4,500 feet provide suitable habitat for one or more life stages of this species. Surveys documented breeding in the lower portions of the Rubicon River (below 3,350 feet) and Middle Fork American River (below 1,800 feet) bypassed reaches, four lower elevation tributaries to the peaking reach (American Canyon Creek, Gas Canyon Creek, Todd Creek, and Otter Creek), and comparison river reaches.
Mount Lyell salamander (*Hydromantes platycephalus*)	CSC	High elevation rock outcrops associated with free surface water (permanent streams, waterfalls, and seeps); breeds beneath granite rocks or slabs covering most granitic soil. Sierra to Tulare Counties from 4,000 to 11,600 feet.	A species-specific relicensing survey for Mount Lyell salamander was not conducted. No incidental observations of this species were documented during the field surveys.

Species Name	Status	Habitat	Occurrence Notes
Reptiles			
Western pond turtle (*Actinemys marmorata*)	FSS CSC	Perennial wetlands and slow-moving creeks and ponds with overhanging vegetation up to 6,000 feet; suitable basking sites such as logs and rocks above the waterline.	Although species-specific surveys were not conducted for reptiles, western pond turtles were observed during other field surveys. Suitable habitat was recorded during other aquatic amphibian and fish surveys. Several off-channel pond and wetland habitats were identified during California red-legged frog surveys. Potential nesting habitat occurs along bypassed and peaking river reaches, but nesting habitat on project reservoirs was limited due to steep slopes, vegetation, and rocky soils. During amphibian and fish relicensing surveys, six western pond turtles were observed in the Middle Fork American River or tributaries downstream of Ralston afterbay (peaking reach), including two hatchlings in Otter Creek and two in the North Fork American River.

Species Name	Status	Habitat	Occurrence Notes
Birds			
American white pelican *(Pelecanus erythrorhynchos)*	CSC	In California, the pelican only nests at large lakes in the Klamath Basin. Year-round habitat for the pelican occurs in central and southern California. Preferred foraging habitat includes shallow marshes, rivers, and reservoir edges. The project is located within migratory pathways between summer and year-round habitats.	Suitable habitat is present within the study area. This species is predominantly migrating through the area and may forage in rivers and reservoir edges. Point count surveys conducted as part of the relicensing surveys did not document this species; however, in 2008, an incidental observation occurred of seven individuals flying over Hell Hole reservoir.
Harlequin duck *(Histrionicus histrionicus)*	CSC	Breeding habitat includes clear fast-flowing rivers and streams. Breeding and wintering habitat are located north of California. Historical breeding grounds included the west slope of the Sierra Nevada where the species is now only rarely documented.	Although suitable habitat may be present in the study area, the species has a low potential to occur as the study area is outside of the current and preferred breeding and wintering range. No species-specific relicensing surveys were conducted for the harlequin duck and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Northern goshawk *(Accipiter gentilis)*	FSS CSC	Prefers mature and dense conifer forests for foraging and nesting with dominant trees averaging at least 24-inches diameter at breast height, and at least 70% tree canopy cover. Year-round habitat is inclusive of the study area.	Suitable habitat is present within the study area. This species has the potential to be a year-round resident. An incidental detection in 2007 occurred at South Fork Long Canyon diversion dam. No detections occurred during the goshawk surveys near Hell Hole reservoir in 2008. Northern goshawk nests and associated PACs (breeding territories) intersect with FERC project boundaries at the following locations: French Meadows reservoir, Duncan Creek diversion dam, South Fork Long Canyon diversion dam, Brushy Canyon adit and access road, and Middle Fork-Ralston tunnel. No detections during 2011 surveys near Ellicott Bridge on the Rubicon River.
Golden eagle *(Aquila chrysaetos)*	CFP	Suitable foraging habitat includes grasslands and early successional stages of forest and shrub habitats and nesting includes secluded cliffs with overhanging ledges or large trees in open areas with unobstructed views. Year-round habitat is inclusive of the study area.	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. Point count surveys conducted as part of the relicensing studies did not document this species; however, the species was incidentally detected in 2008 during the bald eagle relicensing surveys about 1 mile downstream of Middle Fork interbay. Documented near Duncan Creek during supplemental biological studies in 2011.

Species Name	Status	Habitat	Occurrence Notes
Bald eagle *(Haliaeetus leucocephalus*	FSS BCC BEGEPA SE CFP	Typically breeds in forested areas adjacent to large bodies of water. The study area is on the southern edge of the preferred breeding range and is located within the winter range.	Suitable foraging habitat within the project includes project reservoirs and bypassed and peaking reaches and suitable nesting or roosting structures include large trees. Habitat may support the bald eagle year-round. During the relicensing surveys in 2007 and 2008 and incidental sightings in 2011, bald eagles were observed in flight at Hell Hole and French Meadows reservoirs, near Duncan Creek, and at several locations along the Middle Fork American River and the Rubicon River. One active bald eagle nest is present near the confluence of Rubicon River and Hell Hole reservoir. Three bald eagle winter night roosts are present along the shoreline of Hell Hole reservoir. The bald eagle nest and roosts are located within 0.25 mile of only one project facility, Hell Hole reservoir.
American peregrine falcon *(Falco peregrinus anatum)*	BCC CFP	Suitable breeding habitat includes woodlands, forests, and riparian areas near wetlands, lakes, rivers, or other water on high cliffs or banks. Nests in the Sierra Nevada and migrants occur in the western Sierra in spring and fall. The study area is located within the winter range and on the western edge of the preferred breeding range.	This species has a potential to winter or reside year-round as the study area is within the geographic range and suitable habitat is present. No species-specific relicensing surveys were conducted and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
sooty (blue) grouse *(Dendragapus obscurus)*	MIS	Occurs in open, medium to mature-aged stands of fir, Douglas fir, and other conifer habitats, interspersed with openings and available water. Found in the Sierra Nevada up to 11,000 feet. The study area is located on the western edge of the preferred year-round range	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. The species was documented in a snag located along the north shore of Hell Hole reservoir during the September 2008 relicensing point count surveys. Also observed in 2011 near Hell Hole reservoir.
Mountain quail *(Oreortyx pictus)*	MIS	Typically found in most major montane habitats California from mid- to high elevations. Found seasonally in open, brushy stands of conifer and deciduous forest and woodland, and chaparral. The study area is located within the preferred year-round range.	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. The species was documented along Hell Hole reservoir during the May and September 2008 relicensing point count surveys and incidental observations in 2011 documented the species near Hell Hole and French Meadows reservoirs.
Flammulated owl *(Otus flammeolus)*	BCC	Generally associated with montane forested habitats with a brushy understory, and nest sites include woodpecker holes or natural tree cavities. The study area is located within the preferred summer (breeding) range.	Suitable habitat is present within the study area. This species has the potential to be present in the study area during the summer. No species-specific relicensing surveys were conducted for the flammulated owl and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Great gray owl *(Strix nebulosa)*	FSS SE	Nests in old-growth coniferous forests and forages in montane meadows. Distribution includes the Sierra Nevada and Cascade Ranges from 4,500 to 7,500 feet. The study area is located on the western edge of the preferred year-round range.	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. The nearest CNDDB record is 30 miles south near Leoni Meadows in the Eldorado National Forest. No species-specific relicensing surveys were conducted for the great gray owl and the species was not documented during point count surveys, nor were there any incidental sightings.
California spotted owl *(Strix occidentalis occidentalis)*	FSS MIS BCC CSC	Prefers forest habitat with two or more tree canopy layers; trees in the dominant and co-dominant crown classes averaging 24-inches diameter at breast height or greater; and at least 70% tree canopy cover (including hardwoods). The study area is located within the species preferred year-round range.	California spotted owl nests and associated PACs (breeding territories) intersect with FERC project boundaries at the following locations: French Meadows reservoir; North and South Fork Long Canyon diversion dams, Middle Fork interbay, French Meadows-Hell Hole tunnel, Hell Hole-Middle Fork tunnel, interbay dam road, Brushy Canyon adit and access road, and Middle Fork-Ralston tunnel. This species has the potential to be present in the study area year-round.

Species Name	Status	Habitat	Occurrence Notes
Black swift *(Cypseloides niger)*	BCC CSC	Nests in moist crevices or caves, or on cliffs near waterfalls in deep canyons. Forages widely over many habitats. The study area is located on the western edge of the preferred breeding range and on the eastern edge of the preferred migratory range.	The study area is within the known geographic breeding and migratory range for this species and suitable habitat is present. The black swift has been documented within the watershed at Grouse Creek, a tributary to the North Fork of the Middle Fork American River. However, no species-specific relicensing surveys were conducted for the black swift and the species was not documented during point count surveys, nor were there any incidental sightings.
Vaux's swift *(Chaetura vauxi)*	CSC	Prefers redwood and Douglas fir habitats with nest sites in large, hollow trees and snags, especially tall, burned-out stubs. Forages over moist terrain and habitats, preferring rivers and lakes. The study area is located within the preferred breeding range.	Suitable habitat is present within the study area. Point count surveys conducted as part of the relicensing studies did not document this species; however, an incidental observation in 2008 documented a large flock of Vaux's swifts at French Meadows reservoir.
Calliope hummingbird *(Stellula calliope)*	BCC	Breeds in mixed brushland, forest edges, and openings and nests are typically built in conifers. The study area is located within the preferred breeding range.	The study area is within the known geographic breeding range of this species. No species-specific relicensing surveys were conducted for the calliope hummingbird and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Lewis' woodpecker *(Melanerpes lewis)*	BCC	Inhabits ponderosa pine forests at higher elevations, while riparian woodlands dominated by cottonwoods are preferred at lower elevations. The study area is located within the preferred year-round habitat and also along a migratory corridor between wintering and breeding habitats.	The study area is within the known geographic range of this species. The species has the potential to migrate through the study area or reside year-round. No species-specific relicensing surveys were conducted for the Lewis' woodpecker and the species was not documented during point count surveys, nor were there any incidental sightings.
Hairy woodpecker *(Picoides villosus)*	MIS	Inhabits mixed conifer and riparian deciduous habitats from sea level to 9,000 feet. The study area is located within the species preferred year-round range.	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. Hairy woodpecker was detected during relicensing avian point count surveys and incidental observations were made during vegetation surveys and supplemental surveys. Documented occurrences included Hell Hole reservoir, South Fork Long Canyon diversion dam, French Meadows reservoir, and Ellicott Bridge on the Rubicon River.
Black-backed woodpecker *(Picoides arcticus)*	MIS	Found predominantly in fir and lodgepole pine forest habitats from 6,000 to 9,500 feet. Typically forages in snags and dying or insect-infested trees, and prefers large trees for foraging and nesting. The study area is located within the species preferred year-round range.	Suitable habitat is present in the study area. This species has the potential to be a year-round resident. No species-specific relicensing surveys were conducted for the black-backed woodpecker and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Olive-sided flycatcher *(Contopus cooperi)*	BC CSC	Nesting habitat includes mixed conifer, montane hardwood-conifer, Douglas fir, redwood, red fir, and lodgepole pine forests. The study area is located within the species preferred summer range.	Suitable habitat is present and the study area is within the known geographic breeding range of this species. Point count surveys conducted as part of the relicensing studies did not document this species; however, an incidental observation in 2007 occurred at French Meadows reservoir and in 2011 near French Meadows reservoir and Duncan Creek.
Willow flycatcher *(Empidonax traillii [brewsteri])*	FSS BCC SE	Suitable habitat includes wet meadows, open river valleys, and montane riparian habitats from 2,000 to 8,000 feet. The species is associated with shrubby willows and may be present as a potential summer (breeding) resident in appropriate habitat. The study area is located on the edge of the preferred summer range.	The study area is within the known geographic and elevational range for this species and suitable breeding habitat is present. No species-specific relicensing surveys were conducted for the willow flycatcher and the species was not documented during point count surveys, nor were there any incidental sightings.
Williamson's sapsucker *(Sphyrapicus thyroideus)*	BCC	Found in ponderosa pine forests and open coniferous forests in the Sierra Nevada and Cascades mountain ranges in California. The study area is located within the preferred year-round habitat and also between wintering and breeding habitats.	The study area is within the known geographic range of this species. The species has the potential to migrate through the study area or reside year-round. No species-specific relicensing surveys were conducted for the Williamson's sapsucker and the species was not documented during point count surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Yellow warbler *(Dendroica petechia brewsteri)*	MIS CSC	Breeding habitat includes riparian woodlands, montane chaparral, open ponderosa pine, and mixed conifer habitats with substantial amounts of brush up to 8,000 feet in the Sierra Nevada. The study area is located within the preferred summer range.	Suitable habitat is present and the study area is within the known geographic breeding range of this species. In 2008, the yellow warbler was detected during point count surveys at Hell Hole reservoir and an incidental observation occurred at French Meadows reservoir. Incidental sightings in 2011 documented the species near Duncan Creek and Hell Hole reservoir.
Yellow-breasted chat *(Icteria virens)*	CSC	Uncommon summer resident and migrant in coastal California and in foothills of the Sierra Nevada, up to about 4,800 feet in valley foothill riparian habitat. Nests in dense shrubs along streams or rivers. The study area is not located within preferred breeding, wintering, year-round, or migratory range.	Suitable habitat is present in the study area; however, the species has a low potential to occur as the study area is outside of the preferred breeding and wintering ranges and migratory pathways. Point count surveys conducted during relicensing studies did not document this species; however, in 2008, an incidental observation of a yellow-breasted chat occurred at Ralston picnic area.
Fox sparrow *(Passerella iliaca)*	MIS	Breeds commonly in mountains of California, in dense montane chaparral and brushy understory of other wooded, montane habitats. Found in winter in dense brush habitats, including understories of open forests, throughout foothills and lowlands. The study area is located within the preferred summer range.	The study area is within the known geographic breeding range and suitable breeding habitat is present. No species-specific relicensing surveys were conducted for the fox sparrow and the species was not documented during point count surveys. Incidental sightings in 2011 documented the species near French Meadows reservoir and Duncan Creek diversion.

Species Name	Status	Habitat	Occurrence Notes
Cassin's finch *(Carpodacus cassinii)*	BCC	Resident of higher mountain ranges in California in tall, open coniferous forests, with nearby wet meadows and grassy openings for foraging. The study area is located on the edge of preferred year-round habitat.	The study area is within the known year-round geographic range and suitable habitat is present. No species-specific relicensing surveys were conducted for the Cassin's finch and the species was not documented during point count surveys. Incidental sightings in 2011 documented the species near French Meadows reservoir.
Mammals			
Pallid bat *(Antrozous pallidus)*	FSS CSC	Inhabits arid, low elevation (<6,000 feet), rocky habitats and higher elevation coniferous forests (>7,000 feet). Most abundant in xeric ecosystems. Typically roosts in caves, crevices, or mines. Requires open habitat for foraging.	Suitable habitat is present in the study area. Pallid bat was detected during the special-status bat relicensing surveys at French Meadows dam and outlet works, Ralston afterbay dam, Middle Fork interbay dam, North Fork Long Canyon diversion dam, and French Meadows powerhouse and penstock and butterfly valve house. No roost sites were documented. The species has been documented in the vicinity of French Meadows reservoir and on Duncan Creek upstream of the Duncan Creek diversion.

Species Name	Status	Habitat	Occurrence Notes
Townsend's big-eared bat *(Orynorhinus townsendii)*	FSS CSC	Found in all but alpine and subalpine habitat types, ranging from sea level to 10,800 feet. Most abundant in mesic habitats. Habitat associations include: coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Requires caves, mines, tunnels, buildings, or other man-made structures for roosting. Extremely sensitive to disturbance and may abandon a roost if disturbed.	Suitable habitat is present in the study area. Townsend's big-eared bat was detected during the special-status bat relicensing surveys at French Meadows dam and outlet works, Ralston afterbay dam, North Fork Long Canyon diversion dam, French Meadows powerhouse and penstock and butterfly valve house, and the upper end of Hell Hole reservoir. No roost sites were documented.
Western red bat *(Lasiurus blossevillii)*	FSS CSC	In California, it occurs from sea level up through mixed coniferous forest. Day roosts commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. May be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores). In California, it is known to roost solitarily in cottonwood and willow trees.	Suitable habitat is present in the study area. Western red bat was detected during the special-status bat relicensing surveys at French Meadows dam and outlet works, Ralston afterbay dam, Middle Fork interbay dam, North and South Fork Long Canyon diversion dams, French Meadows powerhouse and penstock and butterfly valve house, and the upper end of Hell Hole reservoir. No roost sites were documented.

Species Name	Status	Habitat	Occurrence Notes
Spotted bat *(Euderma maculatum)*	CSC	Found in a wide range of habitats including open areas, pinyon-juniper woodland, ponderosa pine, mixed and high-elevation conifer forests, sub-alpine meadows canyon bottoms, cliffs, and riparian areas from below sea level to 10,600 feet. Prominent rock features appear to be a necessary feature for roosting. Foraging habitat includes over water and along marshes.	The study area is within the known geographic and elevational range and suitable habitat is present. The species has been documented in the watershed. This species has been documented in the Tahoe National Forest; however, no specific site information is available for this record. The species was not documented during the special-status bat relicensing studies.
Greater western mastiff bat *(Eumops perotis californicus)*	CSC	Occurs in open habitats, conifer and deciduous woodlands, coastal scrub, chaparral, desert scrub, and urban areas mostly below 4,000 feet. It typically roosts in caves, crevices, or other rock formations, and requires open areas for foraging. Recent surveys in California have documented roosts up to 4,600 feet. Acoustic records in California document foraging or commuting at up to 10,000 feet.	The study area is within the known geographic and elevational range and suitable habitat is present. The species was not documented during the special-status bat relicensing studies.

Species Name	Status	Habitat	Occurrence Notes
Sierra Nevada sewellel (mountain beaver) (*Aplodontia rufa californica)*	CSC	Occurs in dense riparian and open brushy stages of most forest types. In the Sierra Nevada, the species is typically associated with montane riparian habitat at higher elevations (5,000 to 9,800 feet). Deep, friable soils are required for burrowing along cool, moist microclimates (e.g., streams and springs).	The study area is within the known geographic range and suitable habitat is present. CNDDB records include an occurrence east of Duncan Peak. No species-specific relicensing surveys were conducted for this species and it was not documented during terrestrial visual encounter surveys, nor were there any incidental sightings.
American marten (Sierra marten) (*Martes americana [sierrae])*	FSS MIS	Optimal habitats are various mixed evergreen forests with more than 40% crown closure and large trees and snags for den sites. The marten is commonly found in red fir and lodgepole pine forests between 4,000 and 10,600 feet.	The study area is within the known geographic and elevational range. While potential forest habitat for these species is present in the vicinity of the project, there are no documented mesocarnivore dens and no Forest Service buffer areas near the project. A CNDDB report (polygon) includes Duncan Creek diversion road, located within the watershed. No species-specific relicensing surveys were conducted for the American marten and the species was not documented during terrestrial visual encounter surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
California wolverine *(Gulo gulo luteus)*	FSS ST CFP	Suitable habitat includes mixed conifer, red fir, and lodgepole habitats, and probably sub-alpine conifer, alpine dwarf shrub, wet meadow, and montane riparian habitats. Wolverine occurs in the Sierra Nevada from 4,300 to 10,800 feet; however, this species is extremely rare in California. The majority of recorded sightings are above 8,000 feet.	The study area is within the known geographic and elevational range. While potential forest habitat for these species is present in the vicinity of the project, there are no documented mesocarnivore dens and no Forest Service buffer areas near the project. No species-specific relicensing surveys were conducted for this species and the species was not documented during terrestrial visual encounter surveys, nor were there any incidental sightings.
Ringtail *(Bassariscus astutus)*	CFP	Suitable habitat includes most forest and shrub habitats associated with rock and/or riparian areas, usually no more than 0.6 mile from water. Suitable denning habitat includes hollow trees, snags, and other cavities.	The species has been documented by incidental observations of PCWA field personnel. No species-specific relicensing surveys were conducted in the project area for this species.
Northern flying squirrel *(Glaucomys sabrinus)*	MIS	Suitable habitat includes coniferous habitats from ponderosa pine through lodgepole pine forests and riparian-deciduous forest including the Sierra Nevada from 5,000 to 8,000 feet.	The study area is within the known geographic and elevational range and suitable habitat is present. No species-specific relicensing surveys were conducted and the species was not documented during terrestrial visual encounter surveys, nor were there any incidental sightings.

Species Name	Status	Habitat	Occurrence Notes
Mule deer *(Odocoileus hemionus)*	MIS	Common to abundant, yearlong resident or migrant with a widespread distribution through most of California. Prefers a mosaic of various-aged vegetation that provides woody cover, meadow and shrubby openings, and free water.	Mule deer migration routes and important habitat areas were documented during relicensing studies. For the Blue Canyon mule deer herd, fawning areas are located along the north shore of Hell Hole reservoir (about 0.5 mile east of French Meadows powerhouse), critical summer range habitat is present in the areas surrounding upper Hell Hole reservoir and French Meadows reservoir, critical winter range habitat is present at Middle Fork interbay and along Brushy Canyon adit road, holding areas are present along the northwest shore of Hell Hole reservoir, and migration routes are present in the vicinity of Hell Hole reservoir and French Meadows reservoir. For the Pacific mule deer herd, only critical summer range habitat is present in the area surrounding Hell Hole reservoir.

Notes: CNDDB–California Natural Diversity Database

Federal Status

FT = Federal Threatened; FE = Federal Endangered; FC = Federal Candidate; FPD = Federal Proposed for Delisting; FSS = Forest Service Sensitive; MIS = Management Indicator Species; BCC = Federal bird of conservation concern; BEGEPA = Bald Eagle and Golden Eagle Protection Act

State Status

SR = listed by California as Rare; ST = California Threatened; SE = California Endangered; SCT = Candidate for listing as California Threatened; SCE = Candidate for listing as California Endangered; CFP = California Fully Protected; CSC = California Species of Special Concern.

Vegetation Management

Both the proposed and Alternative 1 VIPMP define the areas proposed for active vegetation management, including distances from project-related features. Each plan provides a table listing the specific project elements where vegetation management is proposed and the type and expected frequency of management activities. The Alternative 1 VIPMP table includes 25 more project facilities than are included in the proposed VIPMP (193 versus 168, respectively). Each plan includes a description of each method that would be used for vegetation management—trimming by hand, trimming with equipment, herbicide use, and fungicide use, and specific vegetation management restrictions intended to protect special-status plan populations. However, unlike the proposed plan, the Alternative 1 plan specifies that active management would be conducted within 100 feet of recreation features for fire fuel management purposes and up to 150 feet of recreation features for hazard tree removal. Details of the use of trimming by hand that would be used for both purposes are also provided in the Alternative 1 plan.

Our Analysis

Vegetation management is necessary to maintain safe access to and reduce fire hazards in the vicinity of project-related features. The general approach to vegetation management in both plans is consistent with generally accepted practices. The inclusion of 25 more sites in the vegetation management program in the Alternative 1 VIPMP would enhance project safety and increase the level of fire fuel management at these additional sites. Although vegetation management was included at recreation sites in both plans, the specificity provided in the Alternative 1 plan minimizes any ambiguity regarding what is intended for implementation and would facilitate documentation of compliance with the plan by Commission staff. We note that if the Commission should determine that a facility is not project-related in a license that may be issued for this project, it would not be able to enforce vegetation management activities at any such site.

Noxious Weed Management

Activities associated with project operations and maintenance can disturb existing vegetation, which could spread or facilitate the introduction of noxious weeds in the project area. Project activities with the potential to affect the distribution of noxious weeds include routine maintenance activities, non-routine recreation maintenance activities, modification of existing facilities, and construction of new facilities.

Both the proposed and Alternative 1 VIPMP include provisions for conducting noxious weed inventory surveys at 5-year intervals, controlling identified noxious weed populations (manually and with herbicides), revegetation following treatment, monitoring of treatment success, preventative measures, water quality monitoring before and after herbicide treatments to ensure compliance with applicable standards and objectives, and

employee training regarding noxious weed control procedures. However, the two plans differ in several ways.

The proposed plan would treat areas where routine vegetation management occurs which is similar to the Alternative 1 plan. However, the proposed plan would treat and monitor areas within the project boundary where vegetation management does not occur on a regular basis using a two-phased approach. In the first year following license issuance, PCWA would consult with the Forest Service and select up to 27 acres for noxious weed treatment and follow-up monitoring for a maximum of 3 years. In the second year following license issuance, PCWA would again consult with the Forest Service and select up to 26 acres for noxious weed treatment with a maximum of 3 years of post-treatment monitoring. This two-phased approach is omitted from the Alternative 1 plan, and specific treatment of noxious weed infestations identified within the project boundary would be developed during annual consultation with the Forest Service.

The Alternative 1 plan also contains much more detail than the proposed plan about revegetation of treated areas, post-treatment monitoring, and consultation regarding potential adjustments of treatments. The proposed plan includes a table of streamside protective buffers around perennial streams, all other streams, and special aquatic features for herbicides and fungicides that range from 0 to 75 feet, depending on the specific herbicide and aquatic feature. The analogous table in the Alternative 1 plan adds buffers for dry aquatic features, reservoirs, and sensitive plants and sets buffers that correspond to the type of herbicide and the application method. The specified buffers in the Alternative 1 plan range from 0 to 500 feet.

The Alternative 1 plan includes several elements not included in the proposed plan including: (1) provisions for weed management and monitoring associated with future ground-disturbing activities; (2) provisions for consulting with Native Americans prior to implementing noxious weed or vegetation management treatments to ensure that TCPs including traditional gathering areas are protected; and (3) if future studies document that the presence or abundance the invasive algae *Didymosphenia geminata* in project waters is project-related, and it is determined there is a safe method of reducing this invasive algae in rivers, provisions to implement control methods in project-related locations.

Our Analysis

Noxious weeds have the potential to occur in nearly all areas within the project boundary. Populations may become established by project-related activities or by natural dispersal mechanisms. The survey, prevention, treatment, revegetation, monitoring, and education elements that are common to both the proposed and Alternative 1 plans would help to control existing populations of noxious weeds and minimize the establishment and spread of noxious weeds in the future. Measures to limit the introduction and spread of noxious weeds near riparian resources would enhance riparian habitats through improving habitat conditions (i.e., reducing competition with noxious weeds).

Regarding the proposed plan's phased approach to noxious weed management in areas within the project boundary but not in areas where active vegetation management is proposed to occur, we note that the project boundary is intended to include all lands necessary for the operation and maintenance of project-related facilities. Thus all lands included in a new license for this project would have a nexus to project purposes. The proposed one-time treatment of 27 acres of land during the first year after license issuance and 26 acres during the second year after license issuance with subsequent monitoring for a maximum of 3 years implies that noxious weed populations that occur elsewhere within the project boundary but not in areas undergoing active vegetation management, are not the responsibility of PCWA. Similarly, noxious weeds populations could become established within the project boundary at any time during the term of a new license. A one-time treatment of a total of 53 acres of noxious weed populations with a maximum of 3 years of post-treatment monitoring suggests that future noxious weed populations that could become established within the project boundary would be the responsibility of another entity. This limited duration approach to addressing noxious weed control within the 4,554 acres of land within the existing project boundary where active vegetation management is not proposed, would only treat a small fraction of noxious weeds and would likely be ineffective in controlling existing and newly established noxious weed populations. The Alternative 1 VIPMP would provide for comprehensive noxious weed control throughout the area within the project boundary and for the duration of a new license.

The buffer zones specified in the Alternative 1 plan within which herbicides would not be applied are much more expansive than those in the proposed plan. Noxious weeds within the buffer zone would need to be controlled by manual methods, unless there are site-specific prohibitions on manual control. These wider buffer zones would afford additional protection of sensitive environmental resources from inadvertent adverse effects from use of herbicides to control noxious weeds.

The three elements of the Alternative 1 VIPMP not included in the proposed plan would include provisions that would address noxious weed control that may be associated with future ground-disturbing activities not addressed in this NEPA document, provide for the protection of traditional plant gathering locations that are important to Native Americans, and provide for control of invasive algae should its presence be linked to project operations and an effective and safe control protocol is established in the future. These provisions provide a framework for future protection as site-specific information becomes available.

Avoidance and Protection Measures that Pertain to Plants

Both the proposed and Alternative 1 VIPMPs include a table of avoidance and protection measures that are intended to: refine management activities; establish limited operating periods and buffer areas; and incorporate applicable Forest Service standards and guidelines. Forest Service BMPs to protect water quality are the same in both plans and discussed further in section 3.3.2.2, *Aquatic Resources*, and measures to protect

aquatic amphibians and raptors are discussed later in this section under *Wildlife*. Avoidance and protection measures in the analogous tables of both plans pertaining to pesticides are the same, although differences regarding the two plans are discussed in the previous subsection.

Regarding measures that pertain to riparian vegetation, the proposed VIPMP would allow riparian vegetation that may become established at the Junction Bar augmentation area and along the edge of the Indian Bar augmentation area to be annually removed to allow for mobilization of sediments. The Alternative 1 VIPMP also provides for riparian vegetation removal from these two augmentation areas, but sets specific limits to the amount of vegetation that can be removed annually: no more than 0.34 acre annually from Junction Bar and 0.53 acre from Indian Bar, plus 0.4, 0.1, and 0.2 acre periodically at Junction Bar, Indian Bar, and Willow Bar, respectively, to provide a temporary bridge for sediment augmentation activities. Both plans include a statement that, at all other project facilities, riparian vegetation would not be destroyed or removed unless it is determined that it must be removed. In such cases, the Forest Service and California Fish and Game would be consulted prior to removal. The proposed plan includes a statement that a minimum of 75 percent ground cover, where it currently exists, would be retained within 100 feet of perennial streams.

Both the proposed and Alternative 1 VIPMP include a provision that, if a new special-status plant species is detected during the term of a new license, PCWA would consult with the Forest Service, FWS, and California Fish and Game, as appropriate, to determine a site-specific protective buffer around the population. Additionally, both plans include the same general measures to protect Stebbins' phacelia populations: no manual target noxious weed treatments would be conducted within 50 feet of a known population, and no herbicide would occur within 100 feet of a known population. Site-specific protective restrictions are listed for 10 sites in the proposed plan and 11 sites in the Alternative 1 plan (the extra site is associated with the proposed Hell Hole reservoir trail, a proposed Alternative 1 recreational enhancement). Both plans provide for surveys at 5-year intervals for special-status plants and mosses consistent with the methods in the special-status plants technical study report (PCWA, 2008a), agency consultation regarding the survey results, and filing final reports with the Commission. The Alternative 1 plan adds that surveys for special-status fungi and lichens would be conducted only if new facilities are added to the project or if operations and maintenance activities are proposed in areas where appropriate habitats to support these species are present.

Our Analysis

Both VIPMPs provide sound avoidance and protection measures that would protect plant resources that may be affected by the project. However, the proposed plan is not specific regarding how much riparian vegetation would be removed at sediment augmentation sites, whereas the Alternative 1 plan is very specific about the maximum amount of riparian vegetation that can be removed: 0.94 acre. The specificity in the

Alternative 1 plan regarding riparian vegetation removal at augmentation sites would avoid any misinterpretation about the acceptable limit of riparian disturbance and enable Commission staff to confirm compliance with the VIPMP during the term of a new license. Sediment management activities and vegetation management at the augmentation areas would permanently eliminate up to 0.94 acre of riparian vegetation at Junction Bar, Indian Bar, and Willow Bar. These effects, however, would be outweighed by a net benefit to riparian vegetation from proposed sediment management activities because natural sediment supply and transport function would be enhanced in these areas. Sediment management is discussed in more detail in section 3.3.1.2, *Geologic and Soil Resources*.

Similarly, sediment management activities in conjunction with the proposed and Alternative 1 modified instream flow regime have the potential to affect special-status plant populations along unsurveyed project stream reaches. Any such effects on unidentified plant populations would be outweighed by the overall ecosystem enhancements that would accrue from approaching more natural geomorphological processes and flow regimes.

For the Commission to approve a proposed plan, it should represent a stand-alone document that can be used by Commission staff to document compliance with the plan without having to refer to documents not included in the plan. Both plans state that surveys would be conducted in accordance with methods specified in a technical study report filed with the final license application (PCWA, 2009b). We therefore assume that implementation of either VIPMP would entail the methods specified in the technical study report, even though the report is not appended to either plan.

Protection of Riparian Vegetation along Bypassed and Peaking Reaches

Routine maintenance activities, changes in project operations and maintenance activities, and construction activities associated with modification of existing or construction of new project facilities could alter the abundance or distribution of riparian species and communities. Routine vegetation management and noxious weed control measures, discussed previously and addressed in the VIPMPs, could result in direct loss of individuals. Other effects on riparian resources could include direct loss of individuals from trampling riparian plants, and crushing or cutting resulting from vehicle and equipment use.

Under the proposed and Alternative 1 operating regimes, minimum flows in the peaking and bypassed reaches would be equal to or greater than under existing conditions and, in general, the number and duration of pulsed flows during the spring would increase over existing conditions. These flow regimes all have the potential to influence riparian vegetation and are discussed in greater detail in section 3.3.2.2, *Aquatic Resources*.

Both the proposed action and Alternative 1 include the Sediment Management Plan filed with the final license application (discussed in detail in section 3.3.1.2, *Geologic and Soil Resources*). Implementation of this plan would affect riparian

vegetation. The plan includes routine sediment management activities that would be carried out at three small diversion pools and two medium reservoirs during the term of a new license, and it outlines periodic sediment removal by heavy equipment in small and medium-sized reservoirs. The plan also outlines infrastructure modifications (e.g., retrofitting existing structures with self-cleaning, wedge-wire screen intakes) to allow sediment transport past small diversion facilities during high-flow events. A portion of sediment removed from medium-sized reservoirs during periodic sediment management activities would be placed at approved channel sites in the Middle Fork American River downstream of the Middle Fork interbay and Ralston afterbay dams to augment the supply of coarse sediment in downstream reaches. Placement downstream of Ralston afterbay dam is discussed in the previous subsection. The plan includes interim and contingency sediment management activities; specifications for sediment removal, disposal, and in-channel placement; as well as measures for avoiding and protecting biological resources, monitoring, reporting, and agency consultation.

PCWA also proposes a Geomorphology and Riparian Monitoring Plan that includes monitoring of riparian species composition, age class structure, relative cover, community structure, position along the stream channel, and health of riparian vegetation in the bypassed and peaking reaches. The proposed Geomorphology and Riparian Monitoring Plan also includes monitoring of channel and sediment conditions in the bypassed and peaking reaches, including channel cross-section geometry, bank conditions, and fine sediment in pools. Forest Service final condition no. 28 modifies channel monitoring aspects of PCWA's proposed plan (discussed in section 3.3.1.2, *Geologic and Soil Resources*) but riparian vegetation aspects of the plan are the same as those in PCWA's proposed plan.

Our Analysis

Under the proposed and Alternative 1 actions, operations of the diversion pools have the potential to affect riparian resources, particularly during the spring (time of seed release) and summer growing period. Overall, implementation of the small diversion infrastructure modifications, sediment management activities below medium-sized dams, and new instream flow measures plus avoidance and protection measures included in both VIPMPs, the Sediment Management Plan, and the Geomorphology and Riparian Monitoring Plan would adequately maintain or enhance riparian vegetation in the project vicinity. Specifically, the proposed and Alternative 1 actions would result in a more natural hydrologic regime and improved sediment supply and transport downstream of project facilities. Implementation of these actions would: (1) enhance sediment supply and transport downstream of the small diversions and enhance sediment supply and transport downstream of the medium dams; (2) preserve the frequency of high magnitude scouring ("re-setting") flows in river and stream reaches; (3) enhance riparian recruitment flows in wet and above normal water years by providing pulse flows with natural recession rates and more natural downramping of spills; and (4) provide higher minimum flows, particularly during the spring, summer, and fall. In a few areas, however, riparian

vegetation may be temporarily or permanently affected during implementation of the proposed measures.

Project-related changes in flows to the bypassed and peaking reaches could affect plants adjacent to such reaches. Populations of five special-status plants (Brandegee's clarkia, Butte County fritillary, Red Hills soaproot, saw-toothed lewisia, and Stebbins' phacelia) were documented within 200 feet of bypassed or peaking reaches. However, these populations grow primarily in rocky areas on the steep river canyon walls and in upland canyon live oak woodlands, both of which are elevated above the wetted perimeter of the bypassed and peaking reaches. Some of these populations may experience inundation during infrequent, high-magnitude flows under existing conditions and all action alternatives.

Modification of existing facilities and construction of new facilities, including the small diversion modifications (i.e., modification of the small stream diversion dams into self-cleaning, stream-bottom intakes), and outlet works modifications could potentially affect riparian resources either by direct loss of riparian individuals and/or degradation of habitat. Construction activities associated with the modification of existing facilities would result in the following:

- At Duncan Creek diversion pool, about 0.03 acre would be permanently removed for construction of the modified dam structure.
- At South Fork Long Canyon Creek diversion pool, about 0.03 acre of willows and alders would be permanently removed for construction of the modified diversion structure.
- At Hell Hole dam outlet works, re-contouring of the Rubicon River channel in proximity (about 650 feet) to the outlet works to accommodate the pulse flows would remove about 0.24 acre of riparian vegetation.

However, because riparian vegetation would be replanted following completion of the recontoured Rubicon River reach, effects at Hell Hole dam outlet, which account for the majority of the area that would be disturbed for these construction activities (i.e., 0.24 acre out of 0.28 acre total), would be temporary.

At the Duncan Creek and South Fork Long Canyon Creek diversion pools, riparian vegetation would be removed if it should be impeding operations of the diversion facilities or downstream sediment transport. Similarly, at sedimentation augmentation areas downstream of Middle Fork interbay dam, riparian vegetation management would occur to ensure that riparian vegetation does not impede downstream transport of sediment from the augmentation areas. However, under existing conditions, there is minimal riparian vegetation at these augmentation areas because of steep side slopes, coarse substrate, and periodic high flows from spills that scour vegetation and prevent plant populations from becoming established.

For routine maintenance activities and non-routine recreation maintenance activities there may be minor disturbances to existing vegetation. However, vegetation likely would reestablish through pioneering of plant species from adjacent areas, growth of plants from the existing seed bank, and restoration of native vegetation as provided for in the previously discussed VIPMPs.

Effects of Proposed Changes in Hell Hole Reservoir Operations on Vegetation

Daily and seasonal fluctuations in reservoir water surface elevations at Middle Fork interbay and Ralston afterbay are not expected to change under the proposed action compared with existing conditions; therefore, riparian resources would be maintained around these reservoirs. Under the proposed action, average water surface elevation at French Meadows reservoir in April through August would typically be slightly lower compared with existing and conditions, and would not likely have a substantive effect on the associated vegetative communities. However, proposed changes to the operation of Hell Hole reservoir have the potential to affect plant communities along the shoreline.

Currently, Stebbins' phacelia grows along the shoreline of Hell Hole reservoir, including portions of the shoreline that are inundated for part of the growing season (April through August) in wet, above normal, and below normal water year types (see table 4). Under the proposed action, in years when French Meadows dam and Hell Hole dam would spill, operation of Hell Hole reservoir with the proposed modified spillway crest gates would allow storage of up to an additional 7,600 acre-feet of water. This operation of the spillway crest gates would result in an increase in the existing maximum normal operating water surface elevation from 4,630 feet to 4,636 feet in the early summer. This proposed change in project operations has the potential to affect Stebbins' phacelia populations. The Alternative 1 reservoir operating regime, for the purposes of this analysis, would be essentially the same as the proposed action.

Our Analysis

Changes to spillway crest gate operations could affect Stebbins' phacelia in Areas 1, 2a, and 2b (table 23). In Area 1, model results for the proposed action indicate that number of years in which inundation occurs would be similar to existing conditions. In Area 2a, the overall frequency of inundation during the growing season for Stebbins' phacelia for all water year types combined would increase from 11 (existing conditions) to 14 years (proposed operation) or 13 years under Alternative 1 over the period of record (33 years modeled). This increase in inundation frequency would occur in above normal and below normal water years. The average duration of inundation (average days per year) under the proposed operation would increase under the proposed action by 8 days in wet years, by 9 days in above normal years, and by 8 days in below normal years. Under Alternative 1 operations, the average duration of inundation would increase by 6 days in wet years, 21 days in above normal years, and 7 days in below normal years. Similar to existing conditions, Area 2a would not be inundated in dry or critical water years under the proposed action or Alternative 1. Therefore, changes in operations that affect the

surface elevation in Hell Hole reservoir would result in only relatively minor changes in the frequency and duration of inundation in areas that support Stebbins' phacelia in Areas 1 and 2a.

Table 23. Stebbins' phacelia populations at Hell Hole reservoir that may be affected by the proposed Hell Hole reservoir seasonal storage increase (Source: PCWA, 2008a).

		Area		
Area	**Definition**	**(square feet)**	**(acres)**	**No. Individuals**
Area 1	At or below the current maximum normal operating water surface elevation of 4,630 feet down to about 4,605 feet	17,910	0.41	9,000–18,000
Area 2a	Maximum normal operating water surface elevation of 4,630 feet to 4,636 feet with installation of 6 foot spillway crest gates	107,727	2.47	53,000–106,000
Area 2b	From 4,636 feet with installation of 6 foot gate to the maximum flood pool elevation at 4,640 feet with installation of 10-foot gate	198,290	4.55	117,000–234,000

In Area 2b, which was not inundated in any water year type in the period of record under existing conditions, portions of the area would be inundated under the proposed and Alternative 1 action in years when Hell Hole reservoir spills (i.e., in 6 of 10 wet water years and in 1 of 6 above normal water years) during the growing season for Stebbins' phacelia. The average duration of inundation under the proposed action would be 22 days per year in wet water years and 15 days in above normal water years. Similar to existing conditions, Area 2b would not be inundated in below normal, dry, or critical water years under the proposed action. Area 2b supports a substantially greater population size than that supported by Area 2a and Area 1, potentially because current conditions are more suitable in this area as opposed to closer to the water. Therefore, it is possible that there would be a reduction in size of the population of Stebbins phacelia in Area 2b.

Modifications to operations at Hell Hole reservoir could affect other riparian resources on the reservoir shoreline and along tributaries that flow into the reservoir because vegetation would be inundated more frequently, for longer periods of time, and under deeper water. Operation changes could also reduce the amount of area for

establishment of riparian plants if water surface elevations are high when seeds are dispersed and if water surface elevations continue to remain high through the growing season. Riparian trees and shrubs are well adapted to surviving anoxic soil conditions that may occur with prolonged inundation, although individuals may be susceptible to drowning if the entire plant is inundated. The timing of reservoir drawdown would not change under the proposed action. As noted in our analysis of Stebbins' phacelia, there would be little change in the inundation pattern at Area 1, and therefore little if any expected change in the overall vegetative community in this area. Under the proposed action, the duration of inundation in Area 2a would increase by from 8 to 9 days in wet, above average, and below normal water years compared with existing conditions. The duration of inundation in Area 2a under Alternative 1 would increase by 6 days in wet years, 21 days in above normal years, and 7 days in below normal water years. The duration of inundation in Area 2b would increase by 22 days in wet and 15 days in above normal water years compared with existing conditions. Consequently, there is the potential that, over the long-term, the extent of riparian vegetation in Areas 2a and 2b may be reduced, because of the increased duration of inundation under proposed operations. In particular, young sprouts established below a water surface elevation of 4,630 feet and elevations of 4,630 and 4,636 feet may be affected. Under existing conditions, riparian vegetation is present below water surface elevations of 4,630 feet) that are inundated. The timing of reservoir drawdown would not change under the proposed action. Therefore, distribution and abundance of riparian vegetation around the reservoir under the proposed action likely would be maintained compared with existing conditions. However, it is also possible that the extent of riparian vegetation at Hell Hole reservoir, in particular in Areas 2a and 2b, would be reduced. Implementation of vegetation monitoring in both the proposed and Alternative 1 VIPMPs would enable documentation of the actual effects of the future Hell Hole reservoir management on riparian vegetation and whether remedial measures may be warranted.

Effects of Proposed Changes in Project Facilities on Vegetation

The effects of proposed facility modifications related to sediment management are addressed in the previous subsection. In addition, the PCWA proposed and Alternative 1 and final 4(e) Recreation Plans specify the removal of all 13 campsites at the Upper Hell Hole Campground. PCWA's proposed Recreation Plan calls for the removal of two campsites at Hell Hole Campground whereas the Alternative 1 and Forest Service final condition no. 34 Recreation Plans call for either removing three sites or converting Hell Hole Campground to a group campground. A population of about 47,000–94,000 individuals of Stebbins' phacelia is documented at a recreation area at Hell Hole Vista, which currently undergoes vegetation management, road maintenance, and recreation facility maintenance. PCWA also proposes to reduce the area where routine vegetation management and heavy recreation facility maintenance activities would occur at Hell Hole Vista from 2.2 to 0.4 acre to reduce the size of the project footprint on a population of Stebbins' phacelia.

Modification of existing project facilities and construction of new project facilities could potentially affect upland special-status plants, including Stebbins' phacelia. Potential effects would include direct loss of plants through trampling, crushing, or removal of individual plants as a result of foot traffic, use of heavy equipment, and ground disturbance associated with modification and construction activities.

Our Analysis

The proposed reduction and removal of the two recreational facilities at Hell Hole reservoir would reduce the potential for disturbance of nearby populations of Stebbins' phacelia, and would enable sites that were occupied by recreational facilities to eventually revegetate with native vegetation. Although there would be short-term effects on vegetation, including some Stebbins' phacelia populations, related to construction activities associated with decreasing the footprint of recreation facilities, following construction, disturbed areas would be revegetated by seeding with plants indigenous to the area. Adjacent populations would be expected to augment seeding and in the long-term, this would result in a net increase in vegetated areas.

PCWA's proposed reduction in the recreation area at Hell Hole Vista that would undergo vegetation management and maintenance would reduce the project-related effects on this population by about 80 percent, protecting about 38,300–76,600 individual Stebbins' phacelia plants from potential project-related effects. This would represent a substantial protective measure for this special-status species population compared to existing conditions.

Wildlife

For wildlife species for which a species-specific management plan has been developed (foothill yellow-legged frog, western pond turtle, and bald eagle), potential effects on the species are described below by species. Effects on other special-status wildlife species are organized by type of potential effects.

Protection of Foothill Yellow-Legged Frogs

Foothill yellow-legged frogs could be affected by project operations such as sediment augmentation; use of pesticides as part of routine vegetation and noxious weed management; and changes to minimum instream flows, pulse flows, spill flows, or water temperature. These activities could affect foothill yellow-legged frog distribution, abundance, and timing of breeding. Modifying hydrology has the potential to affect temperature and affect the timing of foothill yellow-legged frog breeding. Spill flows from reservoirs could disrupt breeding, destroy egg masses, and flush tadpoles downstream and during the recession of these flows, tadpoles could be stranded. Excessive mercury may reduce survival, inhibit growth, modify behavior, impair reproduction, or result in various sublethal effects (Zillioux et al., 1993, as cited in USGS 2008), including malformations in amphibian larvae (Unrine et al., 2004, as cited in USGS, 2008).

PCWA proposes to implement a Sediment Management Plan, discussed in more detail in section 3.3.1.2, *Geologic and Soil Resources*. Under this plan, gravel augmentation on Indian and Junction bars in the peaking reach would not occur during the foothill yellow-legged frog breeding season (May 15 to June 15). Also, prior to activities at these bars, foothill yellow-legged frog surveys would be conducted on the bars and within 100 meters of any sediment management activity; any foothill yellow-legged frogs located and captured would be translocated downstream. Methylmercury has the potential to be released during sediment management activities. To determine if this is a concern that needs to be addressed, the Sediment Management Plan includes provisions for monitoring methylmercury levels in Ralston afterbay and in the peaking reach. Alternative 1 and Forest Service final condition no. 46 include PCWA's proposed Sediment Management Plan.

PCWA proposes to manage vegetation in the project area by using pesticides, and includes protective measures in its proposed VIPMP to minimize the potential entry of potentially harmful chemicals into water bodies. These include adhering to Forest Service BMPs that pertain to pesticide use and maintaining designated streamside protective buffers for pesticide applications. In addition, pesticides would not be applied within 500 feet of known occupied sites for the foothill yellow-legged frog. The Alternative 1 VIPMP, discussed in more detail under *Vegetation*, includes the same BMPs and restriction of pesticide use within 500 feet of known occupied foothill yellow-legged from habitat, but includes much more expansive pesticide buffer zones and more details regarding resources to be protected.

PCWA proposes to modify hydrologic conditions by: (1) initiating higher minimum instream flows in all bypassed and peaking reaches (compared with current operations); (2) implementing environmental pulse flows in all the bypassed reaches and downramping of spill flows in the bypassed reaches below French Meadows and Hell Hole reservoirs; and (3) reducing flow fluctuations in the peaking reach. Higher minimum instream flows in the bypassed reaches were specifically designed to maintain the current distribution of the upstream distribution and abundance of foothill yellow-legged frogs. During critical, dry, and below normal water year types when water temperature modeling showed that changes to minimum flows could affect water temperature, the summer minimum flows were set to approximately maintain the current location of the point at which water temperature would be at or above 17°C (foothill yellow-legged frog lower optimum temperature) in the Middle Fork American River downstream of Middle Fork interbay and the Rubicon River downstream of Hell Hole reservoir. Pulse flows (wet and above normal water year types) are timed to start in early May (prior to the initiation of foothill yellow-legged frog breeding) and include a down ramp recession designed to the extent practicable to mimic a snowmelt run-off hydrograph. Spill flows from the reservoirs would continue to occur under ongoing operations, except that the proposed action includes provisions for downramping of the spills from French Meadows and Hell Hole dams in May through July. The slowly declining hydrograph following pulse flows and, to a lesser extent, spills from French

Meadows and Hell Hole dams, would enhance conditions for successful foothill yellow-legged frog breeding, as egg masses are typically laid during the snow-melt recession period each spring. The Alternative 1 hydrologic modifications, discussed in more detail in sections 3.3.1.2, *Geologic and Soil Resources*, and 3.3.2.2, *Aquatic Resources*, are slightly different from PCWA's proposed flow regime, but for factors that could influence foothill yellow-legged frogs, they are essentially the same.

PCWA proposes to implement its Foothill Yellow-legged Frog Monitoring Plan, which includes general and special-purpose monitoring. General monitoring would determine species abundance (egg masses, tadpoles, and YOY) in select locations in the bypassed and peaking reaches, including tributaries; document the approximate upstream distribution of foothill yellow-legged frog in the Rubicon River and the Middle Fork American River (upstream of Ralston afterbay); and determine the approximate timing of the initiation of foothill yellow-legged frog breeding season in the Rubicon River and Middle Fork American River (upstream of Ralston afterbay). Special-purpose monitoring would consist of monitoring foothill yellow-legged frog breeding timing in relation to the pulse flow releases during the initial implementation years; monitoring foothill yellow-legged frog in relation to flows during the annual fall maintenance outage in the initial implementation years; and monitoring foothill yellow-legged frog in relation to potential flow changes during emergency power outages.

Forest Service final condition no. 28 includes a revised Foothill Yellow-legged Frog Monitoring Plan. Refinements of text in the PCWA plan are provided. However, the plan also includes provisions for monitoring egg mass and early tadpole abundance twice in the spring and summer as well as YOY and juvenile abundance once in the Middle Fork interbay bypassed reach and the Rubicon River at Ellicott Bridge. The purpose of the annual monitoring is to understand between-year variability and identify any unusual population deviations that may occur.

Our Analysis

Implementation of the proposed Sediment Management Plan would adequately provide for the protection of water quality during sediment management activities and identify the need for additional protective measures, as appropriate. The use of a grade and screen during sediment augmentation activities would decrease the effects of fine sediment downstream to below significant levels. Sediment management activities would not likely affect breeding foothill yellow-legged frogs as activities would not occur during the breeding season. In addition, foothill yellow-legged frog surveys would occur prior to vegetation removal activities associated with sediment augmentation activities and prior to the installation of the temporary bridge across Willow Bar, and any individuals documented within 100 meters of any sediment management activity would be translocated downstream. Conducting sediment activities outside of the breeding season and conducting pre-construction surveys and rescue relocation prior to the sediment augmentation and bridge installation would protect the species.

Application of pesticides within 500 feet of known locations of foothill yellow-legged frog has the potential to result in direct and indirect effects on the species. The proposed and Alternative 1 VIPMPs state that pesticides would not be applied within 500 feet of known occupied sites for the foothill yellow-legged frog (in addition to other amphibians: California red-legged frog, Cascades frog, Yosemite toad, mountain yellow-legged frog, and northern leopard frog). However, the potential exists that undiscovered populations may occur in waterbodies with suitable foothill yellow-legged frog habitat. The broader buffer zones specified in the Alternative 1 VIPMP for pesticide application near perennial streams (between 5 and 100 feet, depending on the pesticide) compared to the buffer zones specified in PCWA's proposed plan (0 to 75, depending on the pesticide), would be more protective of foothill yellow-legged frog populations that may not have been identified during surveys.

Ongoing operations would likely preclude foothill yellow-legged frog occurrence in the peaking reach because water temperatures are too cold. In the peaking reach just downstream of Ralston afterbay, the water temperatures modeled under current conditions were about 12°C and under unregulated conditions the water temperature would be about 22°C; the lower optimum temperature for foothill yellow-legged frog is 17°C. Fluctuating flows would also likely limit distribution in the peaking reach; however, we do not expect that implementing the reduction of flow fluctuations to result in any changes to the current distribution of foothill yellow-legged frog downstream of Ralston afterbay.

Within the bypassed reaches, Middle Fork American River, and Rubicon River upstream of Ralston afterbay, the proposed action and Alternative 1 (minimum, pulse, and spill flows) would maintain the existing distribution and abundance of foothill yellow-legged frogs. The total amount of foothill yellow-legged frog breeding or tadpole habitat is not likely to be limited by minimum flows under current operational activities or the proposed action and Alternative 1 because there is a large amount of available habitat along the channel margins compared with the size of the foothill yellow-legged frog populations. The current existing upstream distribution and abundance of foothill yellow-legged frog appears to be largely a function of water temperature, which is affected by current project operations.

The proposed action and Alternative 1 are only expected to result in minimal changes to summer water temperatures compared with existing conditions. Water temperature modeling indicates that the pulse flows would cool water temperatures and delay warming, which may delay foothill yellow-legged frog breeding; however, effects are anticipated to be minimal because pulse flows would recede prior to the end of the breeding season and would result in the timing of breeding to be more synchronized with natural hydrology timing (late May and June). The shape and timing of the pulse flows would also provide natural breeding cues to which foothill yellow-legged frog are adapted. Ongoing spill flows would continue to have the potential to disrupt breeding, destroy egg masses, and flush tadpoles downstream; however, the proposed action and

Alternative 1 include downramping the spills to reduce potential stranding of tadpoles. Reducing the number of spill flows at Hell Hole reservoir, from current operation activities, is expected to benefit foothill yellow-legged frog populations. Under all alternatives, PCWA would seek to minimize spills to the extent possible because any water spilled reduces the flow available for generation. Suitable habitat for the foothill yellow-legged frog would continue to be affected, mostly by water temperatures being too cold, as a result of project operations under all action alternatives.

The proposed Foothill Yellow-legged Frog Monitoring Plan includes provisions that would enable identification of the need to consider additional protective measures. The proposed plan includes provisions for agency consultation and plan modification in response to conditions that may change during the term of a new license. The Forest Service plan provision for annual monitoring in the Middle Fork American River upstream of Ralston afterbay and the Rubicon River in the vicinity of Ellicott Bridge for at least 10 years would enable an assessment of population variability over time to be assessed. Modifications of the flow regime in the bypassed reach downstream of Middle Fork interbay dam are intended to enhance foothill yellow-legged frog habitat, and more intensive monitoring of this reach would enable evaluation of whether this enhanced habitat translates to increased populations. The reach of the Rubicon River in the vicinity of Ellicott Bridge is affected by project releases from Hell Hole dam and inflows from the South Fork Rubicon River, which are heavily influenced by operation of the Upper American River Project (FERC No. 2101). Therefore foothill yellow-legged frog population dynamics in this reach are more complex than in most of the other project-affected reaches, and more frequent monitoring to enable potential variability and associated causes is warranted. Implementation of the Forest Service modified PCWA monitoring plan, in conjunction with other protective measures discussed earlier in this section, would ensure the species would continue to be adequately monitored over time and the need for adjustments in protective measures identified.

Protection of Western Pond Turtles

Western pond turtles could be affected by the same project activities that could affect foothill yellow-legged frogs, such as sediment augmentation; use of pesticides as part of routine vegetation and noxious weed management; and changes in minimum instream flows, pulse flows, spill flows, and reservoir water surface elevations. Release of mercury has the potential to affect aquatic species, as described previously for foothill yellow-legged frog. These activities could affect western pond turtle distribution, abundance, and habitat quality in suitable habitat located in bypassed reaches and the peaking reach. Although suitable habitat is present in Wallace Canyon and Horseshoe Bar ponds, project activities are not anticipated to affect these locations.

PCWA's proposed sediment and vegetation management activities and modification of minimum instream flows, spill flows, and pulse flows, are described previously in the foothill yellow-legged frog section. Although there are no pesticide buffers that pertain specifically to western pond turtles, as discussed in the previous

section the Alternative 1 VIPMP buffer zones are more expansive and detailed than those in the proposed VIPMP.

Implementation of PCWA's proposed Sediment Management Plan would still entail the need to periodically drawdown Ralston afterbay and Middle Fork interbay to remove accumulated sediment that could disrupt project operations. When these drawdowns occur, they would affect western pond turtle habitat. Historically, drawdowns for sediment removal occurred at intervals that vary from 1 to 9 years at Middle Fork interbay and from less than 1 to 5 years at Ralston afterbay. At the small diversions (Duncan Creek, North Fork Long Canyon diversion pool, South Fork Long Canyon diversion pool) PCWA proposes to install self-cleaning wedge-wire screens which PCWA anticipates would reduce the need for dewatering the diversion pools that historically occurred as part of routine sediment management activities. This would reduce or possibly eliminate the effect of pool drawdowns on western pond turtle habitat.

PCWA's proposed Western Pond Turtle Monitoring Plan would periodically characterize and report western pond turtle distribution and abundance in the bypassed and peaking reaches and project impoundments during the term of a new license. Phase I, the Distribution Assessment, would be conducted in year 2 after license issuance at 26 sites (reservoirs, mainstem, and tributaries) to develop a western pond turtle distribution map (any incidental sightings from other studies would also be included). Phase II, Relative Abundance and Age Class Existing Conditions Monitoring, would occur in year 3 at sites selected in consultation with the Forest Service, California Fish and Game, and the Water Board. Phase III, License Period Monitoring, would occur every 5 years after the Phase II studies, and sites would be coordinated with respective agencies. Based on the results of the monitoring and/or comments received during the review process, PCWA and the agencies may call a meeting to discuss the results or modify the monitoring program.

Forest Service final condition no. 28 includes a revised Western Pond Turtle Monitoring Plan that deletes one Phase I peaking reach monitoring station and adds another peaking reach station and a tributary to the peaking reach, Volcano Canyon Creek. The remainder of the plan is in essence the same as PCWA's plan.

Our Analysis

Implementing the protective measures in the proposed Sediment Management Plan, and associated monitoring for turbidity and methylmercury would protect western pond turtles in reaches downstream of the Middle Fork interbay and Ralston afterbay dams and identify the need for additional protective measures. We expect that increasing minimum instream flows, establishing more naturally shaped hydrographs, reducing flow fluctuations, increasing the wetted perimeter, and maintaining reservoir physical conditions as provided for in PCWA's proposed plan and Alternative 1 would maintain or enhance western pond turtle habitat in the bypassed and peaking reaches compared with current operations.

Impoundment drawdowns for sediment management activities affect small and mid-sized reservoirs, which may provide suitable habitat for western pond turtles. As part of the Western Pond Turtle Monitoring Plan, PCWA proposes to conduct a Phase I Distribution Assessment at each of the project impoundments. This would identify if measures to protect turtles during scheduled drawdowns are necessary. The Sediment Management Plan includes provisions for retaining a refuge pool for fish when Ralston afterbay is drawn down. If turtles are present in the afterbay, the refuge pool would also serve to protect turtles. The Sediment Management Plan also includes a provision that all reservoirs would be checked during dewatering and any stranded species would be transported to an appropriate location. Although this measure is primarily intended to protect fish, if western pond turtles are present, it would also serve to protect them during scheduled drawdowns. The frequency of drawdowns is likely to be similar in the future at Middle Fork interbay and Ralston afterbay relative to historic operations. The need for future drawdowns at the small diversion pools would be less because of the installation of self-cleaning wedge-wire screens that would facilitate downstream transport of sediment that previously would accumulate in the diversion pools. Therefore, under the proposed and Alternative 1 actions, turtles, if present, would be less likely to experience disruption from pool drawdowns than under existing conditions.

Although potential effects of pesticides on western pond turtle are relatively unknown, degraded water quality has the potential to affect health and survival, either directly, through toxic effects, or indirectly by changing the abundance and distribution of zooplankton (the key food source for hatchlings). However, western pond turtles appear to be fairly tolerant of low water quality, although there has been little research on the subject. The absence of literature on documented adverse water quality effects and the presence of apparently healthy western pond turtles in wastewater treatment ponds in the Central Valley (Germano and Bury, 2001), suggest that water quality may not be a key limiting factor for western pond turtle survival. Neither the proposed nor the Alternative 1 VIPMP has any pesticide buffers specific to western pond turtles. Incidental observations during relicensing studies documented western pond turtle in the Middle Fork American River and peaking reach, and suitable nesting habitat was identified along the bypassed and peaking reaches. Basking and egg-laying sites for western pond turtles include suitable upland habitat up to 1,640 feet from water. Although both VIPMPs include protective buffers for rivers and streams, the Alternative 1 VIPMP identifies pesticide buffers that are generally equal to or greater than buffers identified in the proposed VIPMP. The generally more expansive pesticide buffers identified in the Alternative 1 VIPMP would be protective of western pond turtles by minimizing potential effects on water quality and suitable basking and nesting habitat.

The proposed Western Pond Turtle Monitoring Plan includes provisions that would enable identification of the need to consider additional protective measures in most cases. The exception is discussed in the following paragraph. The proposed plan includes provisions for agency consultation and plan modification in response to conditions that may change during the term of a new license. Implementation of

PCWA's monitoring plan, in conjunction with other protective measures discussed earlier in this section, would ensure the species would continue to be adequately monitored over time and the need for adjustments in protective measures identified. The Forest Service plan provides for one additional tributary station monitoring along the peaking reach, which would further identify locations of turtle populations that may be available to colonize peaking reach habitat under the flow regime included in a new license.

We identified an inconsistency in the proposed and Forest Service Western Pond Turtle Monitoring Plan in relation to the extent of monitoring at the bypassed and peaking reach sites. The distance to sample described in the methods text is 250 m, whereas in a footnote to table 1 in the plan it is given as 1,000 m. We assume the intended survey distance is 250 m, which is consistent with the visual survey technique protocol referenced in the plan (USGS, 2006).

Protection of the Bald Eagle and Other Raptors

Recreation, routine maintenance, non-routine recreation facility activities, and modifications to existing project facilities and construction of new project facilities have the potential to affect bald eagles and other raptors. Increased noise or increased human presence within 0.25 mile of an active nest or roost could affect reproduction during the nest building and breeding season (January through July). Foraging habitat may be affected by modifying minimum instream flows and pulse flows in the bypassed and peaking reaches, modifying reservoir water surface elevations and diversion pools, and reservoir stocking of fish. In addition, effects on the bald eagle and other raptors could occur as a result of electrocution at power lines and removal of active nests during power line maintenance activities, use of herbicides, surfactants, and fungicides, and secondary poisoning as a result of rodent control.

Proposed modifications of minimum instream flows, pulse flows, and spill flows, and reservoir elevations are described previously in the foothill yellow-legged frog section and in section 3.3.2.2, *Aquatic Resources*.

Fish represent a major prey base for bald eagles and ospreys. PCWA proposes, in its Recreation Plan, to continue to annually stock fish in Hell Hole and French Meadows reservoirs to 50 percent of California Fish and Game's annual management target or 50 percent of the historical average stocking into the reservoir (2001 to 2009), whichever is less. Fish species and size class stocking targets would be determined in consultation with California Fish and Game but would be similar to historical stocking efforts. The Alternative 1 Recreation Plan includes provisions to stock Hell Hole and French Meadows reservoirs with 100 percent of California Fish and Game's annual management target or 100 percent of the historical average stocking into the reservoirs, whichever is less.

Both the proposed and the Alternative 1 VIPMP include avoidance and protection measures for use of herbicides, surfactants, fungicides, and rodenticides as part of noxious weed management and rodent control. Additional detail regarding application

methods and buffers is provided in the Alternative 1 plan. At the request of the California Department of Safety of Dams, metal phosphide fumigants (i.e., gas cartridges) would be used in rodent burrows on earthen dams (i.e., French Meadows and Hell Hole dams) to control rodents. Secondary poisoning to bald eagles and other raptors and wildlife that feed on carrion can occur if a rodent is consumed that has been killed by the metal phosphide fumigants. The plan includes specific application methods to be used on earthen dams to protect bald eagles and other scavengers from secondary poisoning. These methods include: requiring metal phosphide fumigants to be administered by a licensed pest control advisor, restricting the use of fumigants to active rodent burrows, placing the fumigant at the burrow opening and subsequently covering it with soil, conducting follow-up monitoring of the application area, and collecting and disposing of rodent carcasses.

PCWA proposes to implement its Bald Eagle Management Plan, which includes the following: (1) annual active nest monitoring and 5-year nest and winter roost surveys; (2) if a nest is documented, bald eagle nest protection; (3) implementation of an employee environmental training program; (4) project power line maintenance, which includes retrofitting all project power poles and power lines that have one or more elements that pose a risk of avian electrocution pursuant to Avian Power Line Interaction Committee guidelines within 15 years of license issuance; (5) within 1 year of license issuance, evaluation and replacement of poles installed in 2006 and 2008 if the configuration is inconsistent with Avian Power Line Interaction Committee guidelines; (6) reporting electrocution of any protected avian species to FWS and evaluation of the powerline; (7) implementation of Forest Service Water Quality BMPs when applying pesticides; and (8) establishment of protective buffers around streams and special aquatic features when applying pesticides. The plan also specifies that if bald eagles nest within 0.25 mile of non-routine recreation facility activities, routine maintenance activities, or construction of new or modification of existing facilities, PCWA would consult with resource agencies to: (1) review the adequacy of measures to avoid disturbance of these nests and roosts; and (2) obtain all appropriate permits or agreements. Alternative 1 includes implementation of the proposed Bald Eagle Management Plan as does Forest Service final condition no. 27.

One northern goshawk nest and four osprey nests are located within 500 feet of the new French Meadows reservoir trail, which would be constructed under Alternative 1. To avoid adverse effects on nesting goshawks or osprey, PCWA would not conduct any construction activities within 500 feet of the nests during the breeding season (i.e., March 1 through August 31 for osprey and February 15 through September 15 for northern goshawk).

PCWA incorporated measures to protect any new special-status raptor nests that could occur in the vicinity of facility modification and construction projects into Alternative 1. These include implementing construction activities outside the breeding season to the extent possible and conducting pre-construction clearance surveys prior to

implementing facility modification or construction activities. If active nests are found, construction activities would not be implemented within 500 feet of the nest during the applicable nesting season (PCWA, 2011b).

Our Analysis

Increasing minimum instream flows in the bypassed and peaking reaches as well as reduced flow fluctuations in the peaking reach are expected to increase habitat and food production (aquatic macroinvertebrates) and would likely increase fish abundance, consequently increasing the prey base for bald eagles and ospreys.

There is an active bald eagle nest in proximity to Hell Hole reservoir, and modification of existing facilities and construction of new project facilities have the potential to disturb bald eagle breeding if equipment noise or increased human presence should occur nearby. However, all construction activities associated with the proposed project and Alternative 1 would occur more than 4 miles from the active nest. This greatly exceeds the 660-foot activity buffer recommended by FWS in the *National Bald Eagle Management Guidelines* (FWS, 2007) for construction activities that do not entail blasting as well as the 0.25-mile buffer analyzed by PCWA at the request of California Fish and Game for prevention of disturbance of disturbance of bald eagles during construction activities. Therefore, we find that construction associated with modified or new recreation facilities would not result in disturbance of bald eagle breeding.

PCWA's proposed measure to survey for bald eagle nests within 0.25 mile of routine or non-routine recreation facility activities, or construction or modification of existing facilities, would initiate consultation with resource agencies, if active nests are found, and implement appropriate protective measures. Such protective measures could include, but not be limited to, seasonal restrictions or equipment limitations on construction activities. The Alternative 1 measure to conduct pre-construction surveys for all raptor nests would afford all raptors similar protection from disturbance during the breeding season.

PCWA proposes to continue to manage project reservoirs that result in changes to surface water elevations. Sediment management activities (discussed in more detail in section 3.3.1.2, *Geologic and Soil Resources*) would result in a complete drawdown of Middle Fork interbay, similar to what occurs under existing conditions, and three small impoundments (Duncan Creek diversion pool, North Fork Long Canyon diversion pool, and South Fork Long Canyon diversion pool), although proposed new infrastructure at the small diversion dams would reduce the frequency of drawdowns. A fish salvage effort would occur at these reservoirs and all rescued fish would be placed downstream. The drawdowns would be temporary and would result in a temporary loss of aquatic foraging reservoir habitat and prey base, until the prey base naturally recovered. Reservoirs with partial drawdown (Ralston afterbay) would result in a temporary loss of aquatic foraging reservoir habitat. Suitable habitat in nearby rivers and reservoirs would likely provide sufficient foraging habitat and prey during the temporary drawdowns.

Noise disturbance from recreation activities (e.g., boats, campers) occur during the bald eagle breeding season and have the potential to affect foraging birds. However, because the closest bald eagle nest is about 0.5 mile from Hell Hole reservoir, it is unlikely that existing nesting habitat would be disturbed by the proposed project. Upper Hell Hole Campground (located about 0.5 mile from a bald eagle nest site) would be removed under the proposed action and Alternative 1, thus reducing disturbance in the area. Proposed, Alternative 1, and Forest Service final condition no. 34 changes to project-related recreation sites are discussed in more detail in section 3.3.5.2, *Recreation and Land Use*.

PCWA is proposing to stock at about 50 percent of the historical average (2001 to 2009) stocking in the Hell Hole and French Meadows reservoirs. This would result in a net loss in fish prey available in the project vicinity to bald eagle and osprey, if another entity does not provide the full historical average stocking target. The Alternative 1 Recreation Plan would have PCWA providing 100 percent of the historical average of stocked fish, which would result in no change in the bald eagle or osprey prey base. Proposed and Alternative 1 fish stocking measures are discussed in more detail in section 3.3.5.2, *Recreation and Land Use*.

Secondary poisoning as a result of metal phosphide fumigants has a potential to affect bald eagles and other scavenging wildlife (e.g., special-status mesocarnivores such as Pacific fisher, California wolverine, and American marten and game species such as coyote and black bear). However, implementing the measures identified in the proposed and Alternative 1 VIPMPs regarding administration of fumigants by a licensed pest control advisor, restriction to active rodent burrows, application methods of the fumigant, conducting follow-up monitoring of the application area, and collecting and disposing of rodent carcasses would minimize the risk of secondary poisoning of bald eagle and other raptors and scavengers in the vicinity of French Meadows and Hell Hole dams. Because the proposed and Alternative 1 VIPMPs are consistent with use of rodenticides, both versions would be equally protective.

Use of herbicides, surfactants, and fungicides as part of the routine vegetation and noxious weed management has the potential to degrade foraging habitat. Implementing the protection measures (e.g., restrictive applications of chemicals near reservoirs and special aquatic features) identified in the Alternative 1 VIPMP would minimize effects on bald eagle and osprey foraging habitat. Although both versions of the VIPMP include application buffers, Alternative 1 provides further detail about the type of herbicide, method of treatment, and associated buffer distance. We previously summarize the differences between the proposed and Alternative 1 VIPMPs in the subsection titled *Noxious Weed Management*.

Implementation of the proposed Bald Eagle Management Plan would protect the resource by conducting nest monitoring, protecting known nests, training employees, retrofitting power lines per the Avian Power Line Interaction Committee guidelines, reporting of special-status avian electrocutions, implementing BMPs for pesticides

application, and establishing protective buffers around streams and special aquatic features when applying pesticides. Disturbance from routine maintenance activities and non-routine recreation facility activities is unlikely to affect bald eagles and no activity is expected to occur within 0.25 miles of a known nest site. The proposed annual active nest monitoring and 5-year nest and winter roost surveys would identify new nests. If a bald eagle nest is identified within 0.25 miles of project-related operation and maintenance activities, PCWA would consult with the agencies during the proposed annual meetings regarding any needed site-specific protective measures and obtain the appropriate permits or agreements.

The proposed Bald Eagle Management Plan includes provisions to use raptor-safe powerline design configurations described in *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC, 2006) for all new powerlines or when replacement of existing poles, phase conductors, and associated equipment is proposed. The cited Avian Power Line Interaction Committee guidelines are considered by agencies and the utility industry to represent the best available technology to protect raptors and other large birds from collisions and electrocution associated with powerlines.

We note that the measures discussed above to protect bald eagles would also be protective of other special-status raptors that could potentially occur in the vicinity of project powerlines including northern goshawk, golden eagle, osprey, California spotted owl, flammulated owl, great gray owl, and American peregrine falcon.

Protection of Newly Designated Special-Status Plants and Wildlife

Project effects have not been assessed for special-status species that may move into the project-affected area or for species that may become newly listed or receive a special-status from California Fish and Game, FWS, or the Forest Service.

PCWA proposes in its Sediment Management Plan, VIPMP, Bald Eagle Management Plan, Recreation Plan, Transportation System Management Plan, and HPMP to consult with the Forest Service, California Fish and Game, and FWS annually to discuss appropriate measures to protect new special-status plants, wildlife nest, roost, or den sites; identify other resources to be protected during implementation of routine maintenance activities; and discuss the effectiveness of avoidance and protective measures. Special-status plant surveys would be conducted at 5-year intervals, which would include any newly designated special-status plants. Prior to facility modification or construction activities, surveys would be conducted to determine if any active special-status raptor nests occur in proximity of proposed construction activities. If active nests are found, construction would not occur within 500 feet of the next during the nesting season. Alternative 1 plans area either the same as the proposed plans or have the same provisions for annual agency consultation to discuss avoidance and protective measures.

Forest Service condition no. 27 specifies that if new occurrences of Forest Service special-status species are detected prior to or during ongoing construction, operation, or maintenance of the project, PCWA would immediately notify the Forest Service and

develop and implement protective measures as appropriate. In addition, PCWA would develop a study plan to assess project effects on newly listed special-status species if they are likely to occur on project-affected area. Forest Service condition no. 11 specifies that PCWA would prepare and submit a biological evaluation for Forest Service approval prior to taking actions to construct new project features on NFS lands that may affect Forest Service special-status species. NMFS and Interior make similar recommendations pertaining to federal and state special-status species.

Our Analysis

The Alternative 1 supplemental filing does not directly address Forest Service conditions 11 and 27, but implementation of the annual consultation with California Fish and Game, Forest Service, and FWS, and monitoring specified in both the proposed and Alternative 1 plans would enable appropriate avoidance and protective measures to be taken in the event of new information regarding species presence in the project area or changes in the status of species that were previously not considered special-status species. If a new species is to be addressed, identification of project-related effects and subsequent avoidance, protection, or minimization measures developed through a Forest Service biological evaluation (for species that may occur on NFS lands), FWS biological assessment, and/or equivalent means of addressing effects on state and federal special-status species would protect the resources. However, before construction of new project features not addressed in this EIS could occur, PCWA would first need to file with the Commission an application to amend its license. If appropriate, a biological evaluation or, if federally-listed species could be involved, a biological assessment for special-status species would be developed as part of the license amendment proceeding.

Bear-Human Interaction Management

Interactions between bears and humans can occur at campsite areas where human food and trash has the potential to entice bears. Existing project recreation facilities include single family sites that typically include a bear-proof food storage locker and group campsites that typically include bear-proof garbage containers and bear-proof food storage lockers. PCWA proposes to include a bear-resistant garbage container when developing the Duncan Creek diversion primitive recreation site.

Forest Service condition no. 28 specifies that within 1 year of license issuance, PCWA would, in consultation with Forest Service and California Fish and Game, prepare a bear management monitoring plan that is approved by the Forest Service and California Fish and Game. The Forest Service provides a rationale stating that this measure is needed to ensure that project facilities and associated recreational use do not result in bear-human interaction problems.

Our Analysis

Continuing to establish and maintain bear-proof garbage containers and bear-proof food storage lockers, as proposed by PCWA and also included in Alternative 1, would continue to minimize the potential for adverse human and bear interactions. The Forest Service initially provided no information about why a bear management monitoring plan may be needed, and we are not aware of any reported problem interactions in the project area between bears and humans. In addition, no details were initially provided regarding what specifically would be included in the plan. No information was provided as to what would be monitored (bear populations, effectiveness of bear-proof containers, or both) and what types of bear management actions would occur beyond those already in use.

In response to the draft EIS, the Forest Service, California Fish and Game, and California State Parks state that the purpose of the bear management monitoring plan would be to establish and formalize a monitoring and reporting process for bear-related incidents and to evaluate measures for reducing adverse interactions between humans and bears at project campgrounds and facilities. Information provided through implementation of this plan would provide a basis for adjusting actions and strategies related to bears. Evidently, a reason there have been no reported problem interactions between humans and bears is the lack of a formalized monitoring and reporting process for bear-related incidents at project-related recreation facilities. Establishing this process would provide a basis for PCWA and the agencies to evaluate measures for reducing such incidents at specific recreation facilities where documented problematic bear-human interactions occur.

Protection of Special-Status Wildlife Species during Routine Maintenance Activities, Modification of Existing Facilities, and Construction of New Facilities

Habitat removal and modification, as a result of routine maintenance activities, modification of existing facilities, and construction of new facilities, has the potential to nesting riparian songbirds, raptors, and mammals. The analysis below is grouped by species that use similar habitat types (i.e., riparian, aquatic, forest).

Riparian Wildlife

Riparian habitats along diversion pools, reservoirs, and bypassed and peaking reaches associated with the project provide potential breeding habitat for special-status riparian-breeding songbirds (e.g., yellow warbler, yellow-breasted chat) and mammals (e.g., western red bat). Removal of riparian vegetation during the bird and bat breeding season[22] could result in destruction of nests and loss of individuals.

[22] Breeding season for yellow warbler and yellow-breasted chat is May 15–July 15 and April 1–July 31, respectively, and the maternity season for bats is early May through late August.

Ongoing activities that include loss of riparian vegetation as described in the proposed Sediment Management Plan and VIPMP include periodic removal of about 0.04 acre of riparian habitat from Junction Bar (0.01 acre), Indian Bar (0.01 acre), and Willow Bar (0.02 acre) during the placement of a temporary bridge as a result of sediment augmentation activities, and removal and continued vegetation management of about 0.87 acre along channel margins of Junction (0.34 acre) and Indian (0.53 acre) bars to maximize sediment transport during high-flow events. PCWA proposes in its VIPMP to only remove riparian vegetation associated with sediment augmentation between August and March, which is outside of the breeding season for yellow-breasted chat and yellow warbler (April through July).

Under the proposed action, modification of existing and new facility construction includes permanent loss of riparian habitat at the following locations: Duncan Creek diversion dam modification (0.03 acre), a new water supply at French Meadows North (0.02 acre), South Fork Long Canyon Creek diversion dam modification (0.03 acre), a new stream gage downstream of South Fork Long Canyon Creek diversion dam (0.01 acre), Hell Hole dam outlet works modification (0.24 acre), and a new stream gage downstream of the Middle Fork interbay dam (0.01 acre). PCWA states in its Sediment Management Plan (which is the same as the Alternative 1 plan) that it would obtain appropriate permits (e.g., California Fish and Game Streambed Alteration Agreement, U.S. Army Corps of Engineers (Corps) Section 404 Permit, 401 Certification, or a Forest Service Special Use Authorization) and follow measures identified in these permits.

Most of the effects and proposed measures to protect riparian wildlife habitat are also included in Alternative 1 with the following exceptions. Under Alternative 1, additional permanent riparian vegetation would be removed to construct the new French Meadows reservoir trail (0.07 acre) and the Alternative 1 VIPMP specifies that permanent removal of vegetation associated with construction of new project facilities would be conducted between August and March. This restriction is not specified in the proposed VIPMP.

Our Analysis

Although some riparian habitat would be removed as a result of the proposed and Alternative 1 actions, we find that increased minimum instream flows, pulse flows with recession rates (in the bypassed reaches only), and down-ramping of spills below French Meadows and Hell Hole reservoir would enhance riparian resources along 79 miles of bypassed reaches and would maintain riparian resources along 28 miles along the peaking reach. In addition, implementation of minimum reservoir pool requirements, installation of the Hell Hole spillway gates, and small diversion modifications would maintain riparian resources at project reservoirs and diversion pools. Implementing measures incorporated in the Alternative 1 VIPMP, which include vegetation removal outside of the bird breeding season, would protect nesting birds using riparian habitat, including species protected by the Migratory Bird Treaty Act and reduce the risk of effects on other

breeding special-status species, should they occur in riparian habitat. Although the bird breeding season does not completely encompass the maternity season for bats, the riparian-roosting western red bat is not a colonial nester; therefore, it is unlikely that a large roost would be disturbed.

Aquatic-dependent Wildlife

Proposed actions may affect wildlife species that either forage or breed along or near aquatic habitat. Project actions that have the potential to affect aquatic dependent wildlife (such as invertebrate or fish that provide a prey base for special-status wildlife) include use of pesticides as part of routine vegetation and noxious weed management, fluctuation of water elevations at small and medium diversions, increasing instream flows in the bypassed and peaking reaches, reducing flow fluctuations in the peaking reach, changing reservoir volume, modification of diversion pools, and continued stocking of fish in French Meadows and Hell Hole reservoirs. In addition to foothill yellow-legged frog, western pond turtle, bald eagle, and osprey (discussed previously), other special-status bird species and mammals have been documented foraging at project-affected streams and reservoirs (e.g., American white pelican, Vaux's swift, pallid bat, Townsend's big-eared bat, and western red bat) and could potentially breed near project waterbodies (e.g., harlequin duck). PCWA's proposed and Alternative 1 sediment management activities and modification of minimum instream flows, spill flows, and pulse flows are described previously in this section in the discussion of the foothill yellow-legged frog and in more detail in sections 3.3.1.2, *Geologic and Soil Resources*, and 3.3.2.2, *Aquatic Resources*. Fluctuation of impoundment water surface elevations as a result of sediment management activities is described previously in the discussion of the western pond turtle. PCWA's proposed and the Alternative 1 VIPMPs are discussed in detail in section 3.3.3.2, *Vegetation*.

Our Analysis

Use of herbicides, surfactants, and fungicides as part of the routine vegetation and noxious weed management has the potential to degrade aquatic habitat; however, implementing the measures near project-related waterbodies (e.g., restrictive applications of chemicals) identified in the proposed and Alternative 1 VIPMPs would minimize effects on special-status wildlife using project impoundments, perennial or seasonal streams, and special aquatic features. Although both versions of the VIPMP include application buffers, Alternative 1 provides further detail about the type of herbicide, method of treatment, and associated buffer distance.

Increasing minimum instream flows in the bypassed and peaking reaches, reduced flow fluctuations in the peaking reach, continued stocking of Hell Hole and French Meadows reservoirs, and minor if any changes to minimum pool requirements are expected to maintain or enhance of aquatic macroinvertebrate and fish populations in bypassed reaches, peaking reach, and reservoirs, and as a result enhance aquatic foraging

habitat for special-status species. A change in instream flows is unlikely to affect nesting harlequin ducks, as the preferred breeding range is outside of the project area.

The temporary dewatering of small- and mid-sized impoundments has the potential to affect foraging year-round resident bats (pallid bat, Townsend's big-eared bat, and greater western mastiff bat), invertebrate-eating birds (e.g., swifts), and game mammals (e.g., mule deer). However, the timing of the dewatering would occur during the late summer and fall (post-reproduction). Nearby aquatic features would provide alternative suitable foraging habitat. Following the modification of the diversions at the small-sized impoundments, dewatering at these locations is expected to decrease substantially or cease and subsequently it is expected that foraging habitat would improve over a new license term.

The fish stocking level proposed by PCWA may reduce the number of fish in French Meadows and Hell Hole reservoirs and consequently reduce prey for fish-eating species (e.g., American white pelican). The level of fish stocking under Alternative 1 would ensure that the historical level of stocking would continue over the term of a new license.

Forest-dependent Wildlife

Under the proposed action (including construction of new facilities, routine maintenance, and/or non-routine recreation facility activities), forest-dwelling species have the potential to be affected by secondary poisoning as a result of rodent control, and noise and habitat loss or degradation from vegetation removal and construction activities. Forests in the vicinity of the project have been documented to provide habitat for special-status birds (including northern goshawk, golden eagle, osprey, California spotted owl, sooty [blue] grouse, mountain quail, hairy woodpecker) and mammals (American marten, Pacific fisher, mule deer). Suitable habitat is present for other forest-dwelling species (see table 22), and although not all of these species have been documented in the vicinity of the project, they have the potential to be present and therefore affected by the proposed action or Alternative 1.

PCWA proposes to implement vegetation management and rodent control measures that include protection measures and monitoring as discussed previously in this section. Facility modification and construction activities (e.g., small diversion and outlet works modifications, new gages and weirs, and new facilities associated with the Hell Hole reservoir seasonal storage increase improvement, and recreation facility modifications and additions) have the potential to create noise. PCWA proposes to minimize effects on raptors by conducting activities outside the breeding season[23] to the extent possible; and conducting preconstruction clearance surveys prior to implementing

[23] Breeding season includes March 1 through August 31 for osprey, California spotted owl, and other special-status raptors; and February 15 through September 15 for northern goshawk.

facility modification or construction activities and if active raptor nests are found, construction activities would not be implemented within 500 feet[24] of the nest during the applicable nesting season.

Routine maintenance and non-routine recreation (e.g., road maintenance, noxious weed management, vegetation management [i.e., trimming by hand and with equipment, and use of herbicides and surfactants]) also have the potential to create noise and habitat disturbance. PCWA proposes to incorporate protection measures specified in the VIPMP, Sediment Management Plan, Transportation System Management Plan, and Recreation Plan to minimize the effects on the current and new raptor nests. Protective measures in the proposed VIPMP include the following: if routine vegetation or noxious weed management activities are implemented within 500 feet of a known nest, locate staging areas away from and limit the duration and extent of activities within the nest buffer; vegetation supporting nests would not be trimmed, unless approved by the appropriate state or federal agencies; and pesticides would be applied using methods that would avoid impacts on raptor nests. Protection measures in the Sediment Management Plan include that all sediment management activities would be conducted from September 15 to February 15, outside of the raptor nesting season. Protective measures in the proposed Transportation System Management Plan include the following: if annual road or trail maintenance activities are implemented within 500 feet of a known raptor nest, staging areas would be located away from the nest and the duration and extent of activities within the nest buffer would be limited; periodic and special project activities would be implemented outside of the raptor breeding season to the extent possible; and pre-construction clearance surveys would be conducted prior to implementation of periodic road or trail maintenance implemented during the raptor breeding season. If active raptor nests are found, activities requiring the use of heavy equipment would not be implemented within 500 feet of the nest during the applicable nesting season. Protection measures in the Recreation Plan include clearance surveys prior to implementation of ground disturbing and construction activities implemented during the raptor breeding season. If active nests are found, activities requiring the use of heavy equipment would not be implemented within 500 feet of the nest during the nesting season. Alternative 1 measures that would be protective of forest-dwelling raptors are the same as those specified in the project as proposed by PCWA.

Our Analysis

Measures for pesticide and fumigant application and implementation of monitoring measures for rodent control, as described previously in this section, would protect other special-status wildlife that may prey on small mammals.

Implementing the protection measures identified in the proposed and Alternative 1 VIPMPs, Transportation System Management Plans, the proposed Sediment

[24] In consultation with resource agencies, it was decided that a 500-foot activity buffer would be sufficient to avoid disturbance of raptor nests.

Management Plan, and the proposed and Alternative 1 Recreation Plans would minimize noise-related effects on wildlife by limiting activities outside of the raptor breeding season, restricting or limiting operation within 500 feet of a raptor nest, and/or conducting pre-construction raptor clearance surveys. When possible, conducting activities that result in noise or habitat removal outside of the raptor and special-status songbird breeding seasons, as proposed and provided for in Alternative 1, would also reduce effects on other reproducing special-status wildlife (e.g., other birds and mammals). During pre-construction raptor clearance surveys, extending observations to include all special-status wildlife, and if documented, coordinating with agencies to identify species-specific protection measures, would further protect special-status wildlife. Therefore, when a biologist conducts a pre-construction nest survey, having the biologist extend their search image to include direct observations or signs of other special-status species would enable presence to be detected and consideration of protective measures. No additional costs would be incurred with this modification. In addition, PCWA's proposed and the Alternative 1 Employee Training Program should readily accommodate identification of other special-status wildlife by direct observation and signs would also inform PCWA employees and contractors regarding special-status wildlife and specific work methods to be implemented for their protection.

It is unlikely that a substantial loss to forest-dwelling wildlife populations or suitable habitat would occur from habitat removal associated with vegetation management near facilities and hazard tree removal. Vegetation management at project facilities, features, and recreation areas would be limited to trimming of shrubs and herbaceous vegetation and cutting of overhanging limbs to provide safe access and maintain efficient operation. Hazard tree removal and fuels reduction (brushing and thinning) conducted as part of heavy recreation facility maintenance would be restricted to the perimeter of facilities, features, and recreation areas and would be limited to removal of vegetation necessary to provide safe recreation opportunities and reduce fire risk.

Modification of existing project facilities and construction of new project facilities could potentially disturb mule deer. Mule deer breeding season occurs in early spring to midsummer, with fawning peaking from late April through mid-June (PCWA, 2011b). Construction of the modified diversion structures at Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek is scheduled to occur, in separate years, between June and November. Therefore, the majority of construction activities within the critical summer range would occur outside the peak fawning season. Construction activities would be limited to the minimum area necessary to complete the work. Construction and staging areas for modification of existing facilities or construction of new facilities would be located in already disturbed, graveled, or paved areas.

Recreation activities and maintenance of project facilities occur at French Meadows reservoir during the mule deer breeding season. Therefore, mule deer in the

vicinity of the reservoir are accustomed to and tolerate a baseline level of human activity during the summer breeding season. Furthermore, disturbance from construction activities would be further minimized because the activities would only occur during working hours, when mule deer are less active; mule deer are generally most active at dawn and dusk (PCWA, 2011b).

Construction of the Alternative 1 French Meadows reservoir trail and water supplies, as well as tree removal necessary for construction of the trail and the water supply lines, would alter mule deer habitat. However, construction activities would be limited to the area necessary to complete the work and would not affect surrounding forested lands. In addition, upon completion, the trail and the water supply pipes (which would be located underground) would not impede the movement of mule deer (PCWA, 2011b). Therefore, although facility modification and construction activities in the vicinity of French Meadows reservoir could potentially disturb or alter critical summer habitat for mule deer, these effects would be temporary and limited temporally and spatially to the area necessary for completion of the projects, and would not result in long-term effects on (i.e., would not impede the movement or reproduction of) mule deer.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

During relicensing studies, a list of potentially occurring threatened and endangered species was developed in consultation with the agencies. In total, one federally listed plant species, one listed invertebrate, one federally listed amphibian species, and one mammal that is a candidate for listing potentially occur in the vicinity of the project.

Layne's Ragwort

Layne's ragwort (*Senecio layneae*, also known as Layne's butterweed) is a perennial herb in the sunflower family (*Asteraceae*). It is listed as federally threatened, state-listed as rare, and a CRPR 1B.2 (rare, threatened, or endangered in California and elsewhere; fairly endangered in California). Layne's ragwort is endemic to California and found in Butte, El Dorado, Placer, Sacramento, Tuolumne, and Yuba Counties. It blooms from April through August. Layne's ragwort typically occurs in chaparral and cismontane woodland on rocky, gabbroic, or serpentine soils in elevations ranging from 650 to 3,300 feet. Based on habitat preferences, Layne's ragwort has the potential to occur within the vicinity of the project; however, this species was not observed during the relicensing special-status plant surveys.

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmorcerus californicus dimorphus*) is federally listed as threatened under the ESA. There is no FWS-designated critical habitat for valley elderberry longhorn beetle within the project (45 FR 52803). The valley

elderberry longhorn beetle is associated with various species of elderberry (*Sambucus* spp.) throughout the Central Valley and foothills below 3,000 foot elevation. During the terrestrial, aquatic, and riparian relicensing surveys, blue elderberry was documented at North Fork Long Canyon Creek, below the diversion (at about 4,600 foot elevation). This species is unlikely to occur within the project because relicensing surveys did not document elderberry shrubs on project lands below 3,000 feet in elevation.

California Red-legged Frog

The California red-legged frog (*Rana draytonii*) is federally listed as threatened under the ESA, and is also a California species of special concern. There is no FWS designated critical habitat for California red-legged frog in the immediate vicinity of the project. The closest critical habitat units are the ELD-1 unit, in El Dorado County about 30 miles south of the project, and the NEV-1 unit, in Nevada County about 40 miles to the northwest of the project.

Potential California red-legged frog upland habitats in the project include riparian areas, grasslands that contain seeps and springs, or deeply shaded forest streams immediately adjacent to aquatic breeding. However, any upland habitat that does not contain significant barriers to dispersal may potentially be used by California red-legged frog. Based on the site assessments, field surveys, and consultation with FWS, it was determined that rivers and reservoirs associated with the project do not represent California red-legged frog aquatic breeding habitat. As defined by FWS, these large rivers and reservoirs (e.g., the Middle Fork American River, Rubicon River, Hell Hole reservoir, and Ralston afterbay) represent barriers that would restrict the northward and/or southward movement of California red-legged frog throughout the study area.

FWS identified potential aquatic breeding habitat at three off-channel ponds at Horseshoe Bar. As requested by FWS, protocol-level surveys were completed at these sites. No California red-legged frogs were observed. There is one known California red-legged frog recorded location within 1 mile of the project study area. This record consists of a single adult California red-legged frog that was observed in a pond on the western end of Ralston Ridge in the right-of-way below a PG&E transmission line. No individuals have been observed at this location since 2001.

Pacific Fisher

The Pacific fisher (*Martes pennanti* [*pacifica*]) is a federal candidate for listing under the ESA, as well as a Forest Service sensitive species, a candidate for listing as California threatened, and a California species of special concern. As a candidate for listing, no FWS critical habitat has been designated.

Suitable habitat consists of large areas of mature, dense forest such as red fir, lodgepole pine, ponderosa pine, mixed conifer, and Jeffery pine forests with snags and

greater than 50 percent canopy closure. The range of the species extends from 4,000 to 8,000 feet in the Sierra National Forest.

The study area is within the known geographic and elevational range for this species. While potential forest habitat for these species is present in the vicinity of the project, there are no documented mesocarnivore dens and no Forest Service buffer areas near the project. There are two historical records of individuals in the vicinity of French Meadows reservoir, including one occurrence about 1 mile east of French Meadows reservoir, near the Forest Service station. However, this species is now thought to be absent from the central Sierra Nevada. No species-specific relicensing surveys were conducted for the Pacific fisher, the species was not documented during wildlife surveys, and there were no incidental sightings.

3.3.4.2 Environmental Effects

Layne's Ragwort

No federal or state listed plants species were identified in areas affected by operation and maintenance of the project during PCWA's special-status plant surveys. However, the potential exists that populations of Layne's ragwort could become established during the term of a new license. Both the proposed and the Alternative 1 VIPMPs include provisions for surveying for special-status plants, which would include Layne's ragwort, at 5-year intervals. PCWA's and the Alternative 1 VIPMP also include avoidance and protection measures for any special-status plants that are detected.

Our Analysis

The measures proposed in PCWA's and the Alternative 1 VIPMP would enable any new populations of Layne's ragwort to be detected and ensure that appropriate avoidance and protective measures are taken.

Valley Elderberry Longhorn Beetle

Elderberry plants, the host to the valley elderberry longhorn beetle, were only documented above 3,000 feet in elevation in the project vicinity; therefore, the valley elderberry longhorn beetle is unlikely to occur within the project. In the event that elderberry plants are documented within the project area in the future, the activities that have the potential to adversely affect the elderberry habitat include vegetation trimming or clearing and herbicide application.

No specific PCWA measure or agency condition has been developed for the valley elderberry longhorn beetle.

Our Analysis

Because the project area is unlikely to support elderberry plants, the valley elderberry longhorn beetle is unlikely to be present at or affected by the project. If

elderberry plants are identified in the project area below elevation 3,000 feet and could be adversely affected by project operation and maintenance activities, further coordination with FWS to identify further minimization measures (e.g., pre-activity survey, buffers) would be most protective for the valley elderberry longhorn beetle.

California Red-legged Frog

Based on the site assessments, field surveys, and consultation with FWS, it was determined that the rivers and reservoirs associated with the project do not represent California red-legged frog aquatic breeding habitat; however, suitable breeding habitat was identified by FWS at three off-channel ponds at Horseshoe Bar. No California red-legged frogs were identified during protocol-level surveys at the Horseshoe Bar off-channel ponds. No project activities are anticipated to occur near the off-channel ponds at Horseshoe Bar; therefore, the project is unlikely to affect the species or its habitat.

No specific PCWA measure or agency condition has been developed for the California red-legged frog.

Our Analysis

Potential California red-legged frog breeding habitat has been identified in only one area, and no California red-legged frogs were observed at that site during species surveys following the FWS survey protocol. Because no project activities would affect the California red-legged frog breeding habitat, it is unlikely that the species, if it occurs at the site in the future, would be affected by the project.

Pacific Fisher

The Pacific fisher is thought to be absent from the central Sierra, and as a result would unlikely be present at and affected by the project. In the event that the species does occur, under the proposed action (including construction of new facilities, routine maintenance, and/or non-routine recreation facility activities), the Pacific fisher would have the potential to be affected by noise and habitat loss or degradation from vegetation removal and by secondary poisoning as a result of rodent control measures.

Facility modification and construction activities (e.g., small diversion and outlet works modifications, new gages and weirs, and new facilities associated with the Hell Hole reservoir seasonal storage increase improvement) have the potential to create noise. PCWA proposes to minimize effects on wildlife by conducting activities outside the raptor breeding season (March 1 through August 31) to the extent possible. (The raptor breeding seasons almost entirely overlaps with the Pacific fisher breeding season, which is late February through mid-April.)

Project maintenance (e.g., road maintenance, noxious weed management, vegetation management [i.e., trimming by hand and with equipment, and use of herbicides and surfactants]) also has the potential to result in noise and habitat removal. PCWA proposes to incorporate protection measures associated with sediment

management and recreation activities, which would also minimize the risk of effects on Pacific fishers, should these activities occur. Protection measures in the Sediment Management Plan include specifications that all sediment management activities would be conducted from September 15 to February 15, which is outside of the fisher breeding season. Protection measures in the Recreation Plan include conducting ground-disturbing and construction activities outside of the raptor breeding season (which is similar to the Pacific fisher breeding season) when feasible. PCWA proposes to implement vegetation management and rodent control measures that include protection measures and monitoring as described previously in the bald eagle section.

No specific PCWA measure or agency condition has been developed for the Pacific fisher.

Our Analysis

Measures for pesticide and fumigant application and implementation of monitoring measures for rodent control, as described previously for bald eagle, would protect the Pacific fisher, a mammal that preys on other small mammals.

When possible, conducting activities that result in noise or habitat removal outside of the raptor breeding seasons would also reduce the risk of effects on breeding Pacific fishers, should these activities occur.

It is unlikely that a significant loss to Pacific fisher populations or suitable habitat would occur from habitat removal associated with vegetation management near facilities and hazard tree removal. Pacific fishers tend to occur in mature forest habitat and avoid edges where there is human activity. Vegetation management at project facilities, features, and recreation areas are limited to trimming of shrubs and herbaceous vegetation and cutting of overhanging limbs to provide safe access and maintain efficient operation. Hazard tree removal and fuels reduction (brushing and thinning) conducted as part of heavy recreation facility maintenance are restricted to the perimeter of facilities, features, and recreation areas and would be limited to removal of vegetation necessary to provide safe recreation opportunities and reduce fire risk. Construction and staging areas for modification or construction of existing facilities are located in already disturbed, graveled, or paved areas. Implementation of these activities is unlikely to result in a significant loss or degradation of habitat for the Pacific fisher.

If a new Pacific fisher sighting occurs near the project, further coordination with FWS to identify further minimization measures (e.g., pre-activity survey) would be most protective.

3.3.5 Recreation and Land Use

3.3.5.1 Affected Environment

Recreation

Regional Recreation Resources

Recreational resources in the region provide for a full range of activities, from tourist-based recreation associated with historical mining towns in the region, to rural and wilderness activities, such as hiking, fishing, and boating. The primary recreational sites in the American River drainage include the Forest Service lands, the towns of Auburn, Foresthill, and Georgetown and Folsom Lake. The numerous lakes and reservoirs in the eastern part of the region, which includes the project reservoirs, provide a variety of recreational opportunities and varying levels of developed facilities for camping and day-use activities. Paved roads and boat launches at the larger water bodies in the area provide opportunities for motorized boating use. Off-highway vehicle (OHV) use is also popular in the region. There are 12 designated routes or areas for OHV use in the region, most of which are on NFS lands or state lands.

Whitewater recreation is another popular recreational activity in the region. Within the American and Rubicon river drainages alone, there are at least 20 whitewater boating runs, most of which are rated class IV and V and provide high quality whitewater recreational opportunities in the spring. The most important whitewater recreation resource in the region occurs on the 19.1-mile reach of the South Fork American River downstream of the Chili Bar dam. This section of river is the most popular whitewater recreational run in California, with approximately 3,000 to 4,000 visitors per day on summer weekends (FERC, 2008).

Project Area Recreation Resources

All of the project developments provide recreational settings where visitors can enjoy fishing, camping, reservoir boating, whitewater boating, hiking, picnicking, and sightseeing. The upper elevations of the project include French Meadows and Hell Hole reservoirs where there are campgrounds, boat ramps, picnic areas, parking areas, scenic vistas, and an RV dump station. The high-elevation facilities are generally only accessible from late spring to early fall because inclement weather and snow prevent year-round use. Visitor use estimates show that most use occurs between Memorial Day and Labor Day. Consistent with recreational use patterns in the higher elevations of the region, use increases in the late spring, peaks during the summer, and declines during the fall. In general, recreation demand and facility use is not expected to substantially increase over time, primarily due to shifts in the visitor demographics, and declining participation rates in the types of recreation activities that occur associated with the project.

Recreational facilities associated with the Ralston and Oxbow developments are open year-round. Facilities at these lower elevations only provide for recreational day use that includes a picnic area, cartop boat access to Ralston afterbay, and whitewater boating access and parking.

Figures 11 through 14 show the locations of the project recreation facilities, including their location relative to the project boundary and land ownership. Table 24 lists all of the project's developed recreation facilities, by area, and describes the amenities provided. Except for the Indian Bar rafter access, for which California State Parks performs the facility operation and maintenance, the Forest Service performs facility operation and maintenance for all project recreation facilities. PCWA participates in a collection agreement with the Forest Service to provide funding for facility operation and maintenance.

PCWA's recreation facility condition inventory (PCWA, 2010c) indicates there are some deficiencies with regard to access roads, internal loop roads, site amenities (e.g., tables, fire rings), and signage. This report also indicates some recreation facilities do not meet accessibility guidelines. Except for group campgrounds, visitor use and capacity data indicate all of the project recreation facilities are underutilized on weekdays, weekends, and holidays. Whereas occupancy at the group campgrounds ranges from 10 percent on weekdays to 75 percent on weekends, occupancy at the remaining facilities ranges from 2 percent on weekdays to 43 percent on weekends.

French Meadows and McGuire boat ramps, located near French Meadows and McGuire picnic areas, respectively, provide the primary boating access to the reservoir. The French Meadows boat ramp is about 20 feet wide, approximately 600 feet long, extending from an elevation of 5,262 to 5,200 feet. The concrete ramp has three turn-around areas that may be used as water levels recede. The McGuire Boat Ramp is 20 feet wide and 800 feet long extending to 5,200 feet—the same elevation as the French Meadows boat ramp. The concrete surfaced ramp has four turn-around areas that can be used as the reservoir level recedes. Reservoir elevations for different water year types are provided in figure 4 in section 3.3.2. The reservoir elevation typically fluctuates between 5,260 and 5,190 feet with the peak usually occurring in late June.

Hell Hole boat ramp, located on the southwest end of the reservoir, provides the only boating access to Hell Hole reservoir. The Hell Hole boat ramp is about 25 feet wide, about 1,000 feet long, extending from an elevation of 4,638 to 4,530 feet. The concrete ramp is U-shaped with a widened turnaround area at the bend that may be used as water levels recede. Reservoir elevations for different water year types are provided in figure 5 in section 3.3.2. The reservoir elevation typically fluctuates between 4,630 and 4,500 feet with the peak usually occurring in late June. The upstream end of the reservoir becomes inaccessible or difficult to access when the reservoir level is below about 4,530 to 4,560 feet.

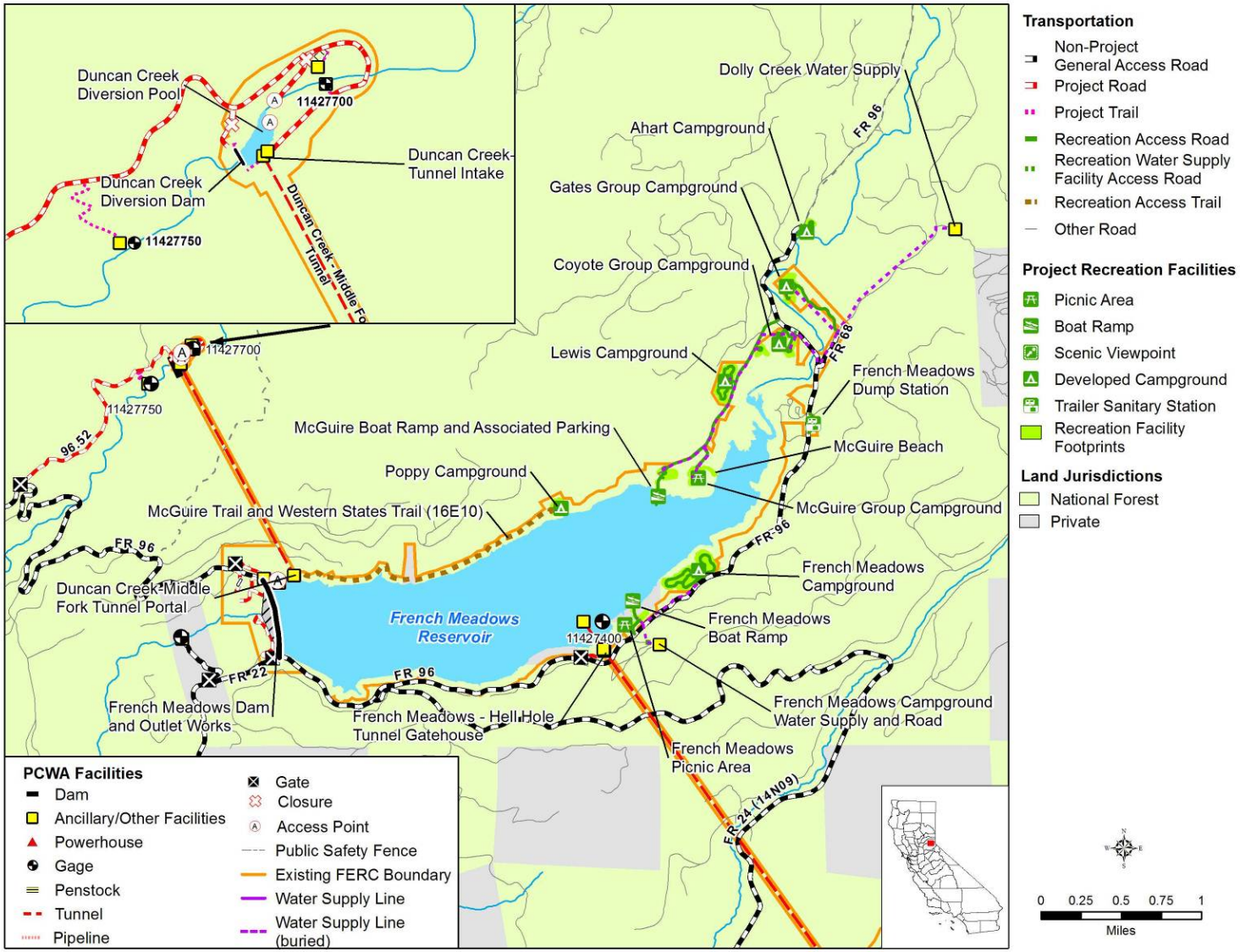

Figure 11. French Meadows reservoir, recreation facilities (Source: PCWA, 2011a, as modified by staff).

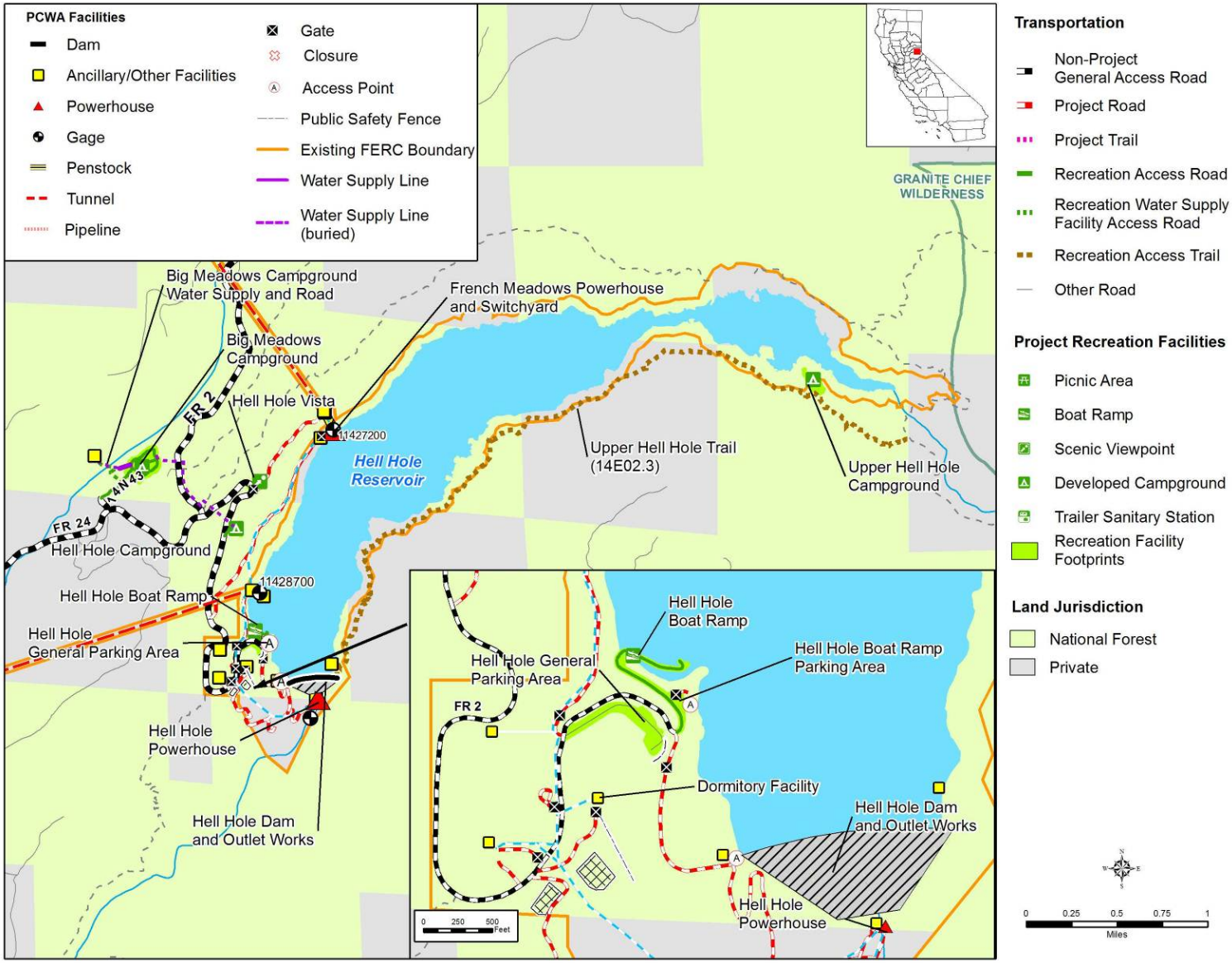

Figure 12. Hell Hole reservoir, recreation facilities (Source: PCWA, 2011a, as modified by staff).

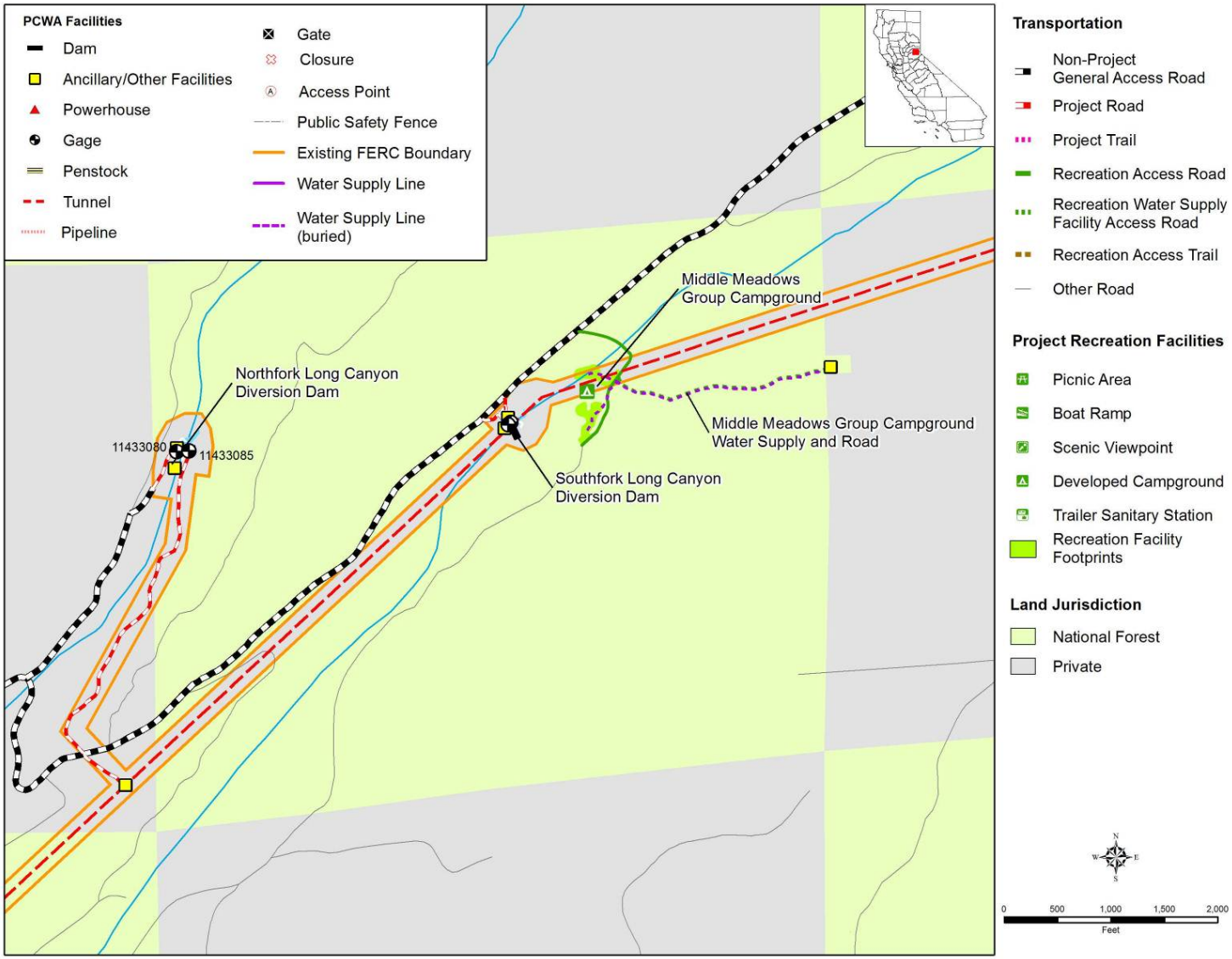

Figure 13. Long Canyon, recreation facilities (Source: PCWA, 2011a, as modified by staff).

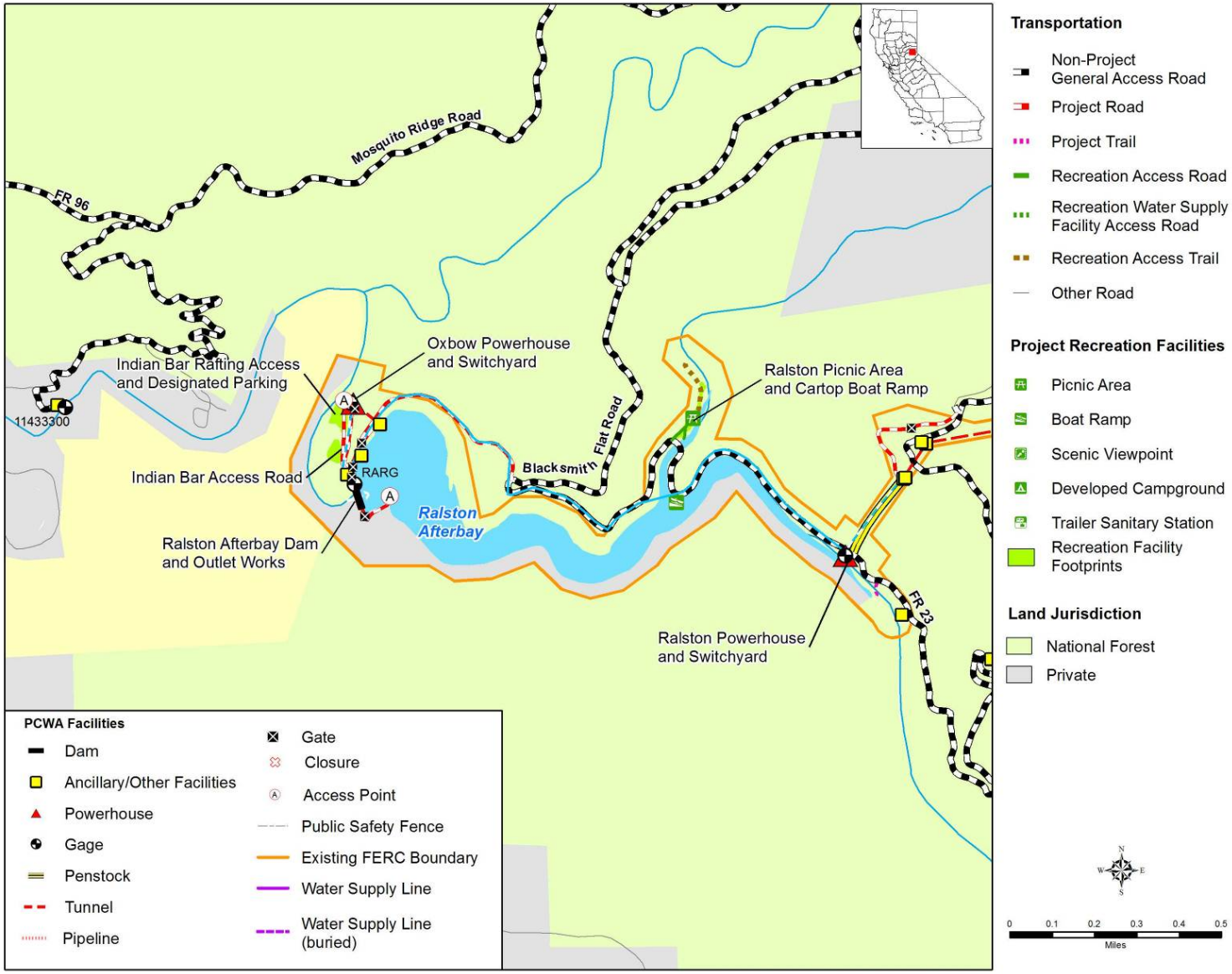

Figure 14. Ralston afterbay, recreation facilities (Source: PCWA, 2011a, as modified by staff).

Table 24. Project recreation facilities (Source: PCWA, 2011a).

Site Name/Facility Type	Amenities
French Meadows Reservoir[a]	
Ahart Campground	12 family campsites with parking; 2 vault restrooms; unpaved access roads; and no potable water.
Coyote Group Campground	4 group campsites (125 PAOT); vault and flush restrooms; and potable water.
Poppy Campground	12 family campsites accessible by boat or pedestrian trail, 2 pit toilets. No potable water at the site but there is potable water at the trailhead parking area for this site. Managed as a "pack-in/pack-out" campground.
French Meadows Campground	75 family campsites; vault and flush restrooms; and potable water.
Gates Group Campground	3 group campsites (125 PAOT); vault restrooms; and potable water.
Lewis Campground	40 family campsites; vault and flush restrooms; and potable water.
French Meadows Picnic Area, Boat Ramp, Parking Areas	4 picnic sites; boat ramp and parking area; vault and flush restrooms; and potable water
McGuire Picnic Area and Beach	10 picnic sites, parking area, flush restrooms, and potable water.
McGuire Boat Ramp, parking areas	Boat ramp and parking areas (McGuire and Poppy Trailhead), vault and flush restrooms
French Meadows RV Dump Station	Dump station
Hell Hole Reservoir	
Big Meadows Campground	54 family campsites; vault and flush restrooms; and potable water.
Hell Hole Campground	10 walk-in family campsites; vault restrooms; and potable water.
Upper Hell Hole Campground	13 family campsites accessible by boat or pedestrian trail and pit toilets.
Hell Hole Vista	1 picnic site, vault restroom.

Site Name/Facility Type	Amenities
Hell Hole Boat Ramp, parking areas	3 picnic sites, boat ramp, vault restroom.
Ralston Afterbay	
Ralston Picnic Area and Car-top Boat Launch	5 picnic sites, boat launch, vault restroom.
Indian Bar Rafting Access and parking	Boat ramp (hand launch, graded but otherwise unimproved), parking area (undesignated parking for about 9 or 10 vehicles), vault restroom.
Long Canyon	
Middle Meadows Group Campground	2 group campsites (75 PAOT); flush and vault restrooms; potable water

Notes: PAOT—people-at-one-time

[a] Facilities at this reservoir are operated and maintained by a Forest Service concessionaire.

Recreational Use

The river reaches associated with the project bisect rugged terrain with limited vehicle access. Therefore, recreation use is generally limited to areas in the immediate vicinity of the project facilities or to areas where NFS roads and trails provide access.

Recreational uses at the upper elevations of the project in the vicinity of French Meadows and Hell Hole reservoirs include camping at a developed site, reservoir recreation, fishing, day use along a river or stream, day use at a developed site and day use, or camping in undeveloped areas. The primary recreation activities at these reservoirs are camping in developed sites and reservoir fishing; camping in the French Meadows reservoir area is permitted only in the developed camping areas for resource protection. At Hell Hole reservoir the steep terrain and sparse road access generally limits dispersed use to one undeveloped area referred to as Grey Horse. More than 90 percent of the boating use is associated with fishing and non-motorized watercraft use (e.g., kayak, canoe); ski boats and personal watercraft use account for the remaining boating use. Most of the project recreational use, about 38,000 recreation visitor-days per year, takes place at these two reservoirs. The Duncan Creek diversion pool (less than 2 acres) is also located in this vicinity and receives less than 400 recreation visitor-days per year; all of this use is either dispersed day or overnight use that occurs in the vicinity of the diversion dam and impoundment.

The mid-elevation portion of the project includes Middle Fork interbay (less than 7 acres) and North and South Long Canyon diversion pools (each less than 2 acres) and, in general, the recreation use in this vicinity is very low. The Middle Fork interbay and the small diversion pools are too small to provide reservoir-based recreation

opportunities. Developed site camping is the most frequent use for visitors to Long Canyon, and river angling and whitewater boating access is the most frequent use for visitors to the Middle Fork interbay (using the reach downstream of the dam). The estimated visitor use at Long Canyon is 2,000 recreation visitor-days per year and the visitor use at the interbay is too low to estimate.

Ralston afterbay is located at the lowest elevation of the project. The area receives recreation use associated with the afterbay as well as the river reach downstream of the dam. Camping is prohibited at the afterbay so only day use activities such as picnicking, reservoir boating, angling, and river access occur in this area. Limitations of the boat ramp preclude launching motorized watercraft so only non-motorized boating use occurs on this 71-acre reservoir. The estimated recreation use at the Ralston afterbay picnic area is about 600 recreation visitor-days per year. PCWA estimates visitor use associated with the downstream access is 1,200 recreation visitor-days; however this estimate does not include the use attributed to commercial whitewater boating, which accounts for most of the use at the Indian Bar rafter access.

The project does not include any non-motorized trails for recreational use, but hiking occurs throughout the area on a variety of NFS trails and other non-system trails. Trails in the vicinity of the project are shown on figures 11 through 14. Most of the non-motorized trails within the Tahoe and Eldorado National Forests are considered multi-purpose and are used for hiking, mountain biking, and equestrian use; OHV use is restricted to designated routes.

Recreation in River Reaches

Whitewater Recreation

Occasional use (e.g., one or two runs per year) by advanced or expert boaters was documented on the bypassed reaches. Only one reach, the Rubicon River between Ellicott Bridge and Ralston afterbay, is boated with any regularity. Use patterns appear to be limited by various factors including remote access; steep gradient; narrow, boulder-strewn stream channels; lack of flow information; and limited road access in the spring because of snow. The bypassed reaches are not boated commercially. Table 25 summarizes the whitewater boating opportunities on the bypassed reaches.

The peaking reach extends from Oxbow powerhouse downstream to the high-water mark of Folsom reservoir, and it has two river segments that provide whitewater boating opportunities: (1) the Middle Fork American River from Oxbow powerhouse to the confluence of the North Fork American River; and (2) the North Fork American River from the confluence of the Middle Fork American River to Oregon Bar located on Folsom reservoir (table 26).

Table 25. Whitewater boating opportunities on the bypassed reaches (Source: PCWA, 2011a).

Reach	Class[a]	Boatable Range (cfs)	Optimum flow (cfs)
Rubicon River (RM 25 to Ellicott Bridge)	V	400–1,500	500–1,000
Ellicott Bridge to Ralston afterbay	V	400–3,000	500–1,500
Confluence of North and South Fork Long Canyon Creeks to confluence with Rubicon River	IV+ to V	200–600	300–500
French Meadows dam to Middle Fork interbay	V	215–450[b]	300–350[b]
Middle Fork interbay dam to Ralston afterbay	IV to V	(400–425)[c]–600[b]	450[c]
		(450–465)[b]–600[b]	550–550[b]

[a] The American Whitewater Scale of River Difficulty: Class I, Easy: Fast moving water with riffles and small waves; Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed or very violent rapids which expose a boater to added risk; Class VI, Extreme and Exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

[b] As measured at the take-out.

[c] As measured at the put-in.

Table 26. Whitewater boating opportunities on the peaking reach (Source: PCWA, 2011a, as modified by staff).

Reach	Class[a]	Boatable Range (cfs)	Optimum flow (cfs)
Tunnel Chute Run (Middle Fork American River from Indian Bar Rafter Access to Ruck-a-Chucky recreation area)	II–IV	800–2,500	1,000–1,250
Mammoth Bar Run (Middle Fork American River from Ruck-a-Chucky recreation area to Mammoth Bar)	I–II	500–2,500	800–1,200
Murderer's Bar Run (Mammoth Bar to confluence of North and Middle Forks American River)	II–III[b]	500–2,500	800–1,200
Confluence Run (North Fork American River from confluence with Middle Fork American River to Oregon Bar)	II–III	350–2,500	800–1,500

[a] The American Whitewater Scale of River Difficulty: Class I, Easy: Fast moving water with riffles and small waves; Class II, Novice: Straightforward rapids with wide, clear channels which are evident without scouting; Class III, Intermediate: Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe; Class IV, Advanced: Intense, powerful but predictable rapids requiring precise boat handling in turbulent water; Class V, Expert: Extremely long, obstructed or very violent rapids which expose a boater to added risk; Class VI, Extreme and Exploratory: These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability, and danger.

[b] The run has one class V portage and one class II/IV rapid.

Oxbow powerhouse is typically operated to follow daily power demand and to provide whitewater boating flows in the peaking reach. Except during high-flow times of the year, releases from the Oxbow powerhouse cause daily fluctuations in flows in the peaking reach of up to about 900 cfs (about 75 to 1,025 cfs). Daily peaking duration can be short (a few hours) or long (most of the day). In addition, the magnitude of off-peak flow can vary and there can be multiple peaks and declines in flow over the day. The peaking reach is boated privately and commercially; however commercial boating accounts for the vast majority of use (17,110 out of 25,683 boaters in 2007). During the summer (June through Labor Day), project operations at Oxbow powerhouse are

voluntarily modified[25] to accommodate commercial whitewater boating which require high flows (about 900+ cfs) for a minimum of about 3 hours, typically beginning at 9:00 a.m. to 10:00 a.m. If normal peaking operations at Oxbow powerhouse (based on power demand) are not projected to provide high-flow releases within the whitewater boating window (e.g., 9:00 a.m. to 12:00 p.m.), then the Oxbow powerhouse release pattern is modified to accommodate whitewater boating.

Runs on the peaking reach can be boated separately or in combination. Overnight dispersed camping along the river for both commercial and private use is accommodated on lands managed by California State Parks by permit; developed camping facilities are provided at Ruck-a-Chucky recreation area.

Angling

Angling occurs throughout the peaking reach and both ramping (rate of flow change of at least 40 cfs per 15 minutes) and high flows affect angling use in the peaking reach. The average number of ramping days is lowest in October. Ramping occurs less frequently in October because the project is typically shut down for maintenance. During the maintenance outage, flows in the peaking reach are reduced to between 75 and 150 cfs and are relatively stable. Ramping, as defined above, between 7:00 a.m. and 7:00 p.m. typically ranges from 1.5 to 2 hours and does not exceed 4 hours. The number of hours that ramping occurs is generally highest during critically dry and dry water year types and decrease as the water year types become wetter (table 27).

Table 27. Average number of days per month when peaking reach ramping occurs in different water year types when flows were less than 2,000 cfs (Source: PCWA, 2011a).

	Water Year Type[a]				
Month	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
	(average no. of days per month)				
Jan	15.3	21.8	24.5	11.3	18.3
Feb	8.8	12.5	20.3	9.0	16.0
Mar	11.5	1.38	16.0	21.8	11.0
Apr	6.3	17.8	17.8	17.5	11.3
May	7.3	16.8	23.3	22.5	24.3

[25] The existing license requires PCWA to coordinate with California State Parks and commercial whitewater boating representatives to make voluntary releases from Oxbow powerhouse that are suitable for whitewater boating from June through Labor Day.

	Water Year Type[a]				
Month	**Wet**	**Above Normal**	**Below Normal**	**Dry**	**Critical**
	(average no. of days per month)				
Jun	13.0	16.3	25.3	26.5	27.7
Jul	18.8	21.5	27.3	23.3	28.7
Aug	9.8	20.3	29.8	22.8	27.7
Sept	14.0	19.0	17.3	25.0	19.3
Oct	2.5	14.8	11.8	7.8	7.3
Nov	11.8	25.5	19.3	13.5	20.0
Dec	16.8	25.3	22.5	12.8	25.0

[a] n=4 for wet, above normal, below normal and dry water year types and n=3 for critical water year type.

High flows in the peaking reach decrease usable wading area and can make it difficult to wade and cross the river while fishing, and thus limit angling opportunities. At Fords Bar (RM 14) wading area begins to decline rapidly between 300 and 400 cfs. At Buckeye Bar (RM 4.7) this transition occurs between about 150 to 200 cfs. In both cases, the amount of wading area declines with increasing flow, until about 800 cfs, at which point usable area remains relatively constant through 1,500 cfs. The trail crossing study reports the easy threshold for crossing ranges from about 175 cfs to 275 at Mammoth Bar Crossing (RM 2.2) and Fords Bar, respectively; the moderate/difficult threshold ranges from about 375 to 550 cfs. These results differ from results of the angling study that reported the desirable range of flows is between 300 and 600 cfs. Other suitability results from the angling study include:

- 400 cfs is about the maximum for stream crossing;
- More experienced anglers may be able to fish at higher flows, with 1,000 cfs being the about the maximum for skilled, athletic anglers; and
- Between 800 and 1,000 cfs, access, wadeability, and fishability decrease, leading to lower fishing success.

Recreation events

The Western States Trail is used for two world-class endurance races: the Tevis Cup Equestrian Ride and the Western States 100-Endurance Run. Both races cross the Middle Fork American River downstream of Oxbow powerhouse at Ruck-a-Chucky Recreation Area or Poverty Bar. After crossing, both race routes traverse the south side of the Middle Fork American River to the confluence of the North Fork American River

where racers cross the river again. The existing license requires PCWA to modify project operations to the extent possible to reduce flow releases into the Middle Fork American River downstream of Oxbow powerhouse to facilitate river crossings during these two races.

Wild and Scenic Rivers

Reclamation identified two segments on the North Fork American River and one segment on the Middle Fork American River peaking reach as eligible for inclusion in the National Wild and Scenic Rivers system. Although only a portion of the segment of the Middle Fork American River is within the project boundary, project operations affect streamflow in the segment between Oxbow powerhouse to the confluence with the North Fork American River and the segment that extends downstream of this confluence to the diversion tunnel intake for the Auburn dam. Suitability studies have not been conducted and are not planned at this time. Regardless, federal agencies, including Reclamation, manage the river and the area within 0.25 mile either side of the river to preserve the values for which the river is considered eligible under the Wild and Scenic Rivers.

Three segments of the Rubicon River, from Hell Hole dam to Ralston afterbay, were found to be eligible and suitable for inclusion in the National Wild and Scenic Rivers system by the Forest Service; however none of these segments have been formally included in the National Wild and Scenic Rivers system. Regardless, Eldorado National Forest manages the Rubicon River, and a 0.25-mile corridor on each side of the river, to protect fisheries, which is the outstandingly remarkable value identified in its Wild and Scenic River eligibility and suitability studies. A small segment of the Rubicon River below Hell Hole dam (0.48 mile) and a small section (0.12 mile) of the Rubicon River upstream of Ralston afterbay are within the project boundary and project operation affects streamflow in the Rubicon River.

State Protected Areas

The Rubicon River, from Hell Hole reservoir to Ralston afterbay, is designated by the state of California as a Wild Trout Stream. California Fish and Game manages streams with this designation to preserve attractive stream trout fisheries, which are naturally sustained by wild strains of trout.

National Trails System

One national recreation trail, the Western States Trail, traverses the Middle Fork American River watershed in the vicinity of the project (see figure 11). The southern route of this trail passes near French Meadows dam, crosses Duncan Creek upstream of the Duncan Creek diversion dam, and then converges with the northern route near Robinson Flat. From Robinson Flat, the trail continues southwestward to the Foresthill area, where it descends into the Middle Fork American River canyon and eventually converges with the Middle Fork American River about 9.6 miles downstream of Ralston afterbay.

Auburn State Recreation Area

The Auburn State Recreation Area encompasses land along 40 miles of the North and Middle Fork American Rivers; about 900,000 people per year visit this area. The area has over 100 miles of hiking, biking, and equestrian trails that traverse the steep American River canyon. Primary recreational activities include hiking, swimming, boating, hunting, fishing, camping, mountain biking, gold panning, off-highway motorcycle riding, and horseback riding. Whitewater recreation is also very popular along both forks of the river. There are no project recreation facilities in the Auburn State Recreation Area. However, project operation affects flows in the peaking reach, which may affect stream-based recreation opportunities, primarily whitewater boating, angling, and stream crossing where Auburn State Recreation Area system trails intersect the Middle and North Forks of the American River.

Land Use

Land Use and Project Boundary

The project facilities are located almost entirely in Placer County. The county line between Placer and El Dorado Counties follows the southern shore of Hell Hole reservoir and Rubicon River for about 10 miles downstream of the dam. Land use within the project boundary is focused on hydropower generation and recreation. Project lands at French Meadows are within a state game refuge, primarily to protect habitat used by the Blue Canyon mule deer herd. Land use outside the project boundary is managed mainly for recreation, timber harvest, grazing, natural resource protection (e.g., management for designations for wilderness, wild trout stream, wild and scenic river), and to a lesser extent mining. The project area is heavily forested, rural in nature, and sparsely populated with no residential or commercial developments in the immediate vicinity of the project. The nearest population center is Foresthill (population 1,791), located about 4 miles west-northwest of Ralston afterbay.

Portions or all of some project facilities are located outside of the project boundary. In addition, all of the area that is currently withdrawn for hydroelectric power purposes is not required for project operation and maintenance. The existing project boundary encompasses 4,554 acres of land including 1,883 acres within the Tahoe National Forest and 1,385 acres within the Eldorado National Forest.

The peaking reach bisects Auburn Dam and Reservoir Project lands, which consist of federal lands and private lands reserved for the Auburn Dam and Reservoir Project (totaling 41,000 acres) that was authorized by Congress in 1965. Construction of the Auburn Dam and Reservoir Project, initiated by Reclamation in 1967, was halted in the 1980s. In 2008, the Water Board revoked Reclamation's water rights permits for the Auburn Dam; however, the Auburn Dam and Reservoir Project remains a Congressionally-authorized project. The Auburn Dam and Reservoir Project lands include 26,000 acres of public land managed by Reclamation and 15,000 acres of other public lands, managed by the U.S. Department of the Interior-Bureau of Land

Management (BLM), Forest Service, Corps, and private land. Land use planning and resource management on all federal lands within Auburn Dam and Reservoir Project lands remain with each agency, as appropriate. In 1979, by agreement with Reclamation, the state of California identified 26,000 acres of Auburn Reservoir and Dam Project lands as the Auburn State Recreation Area. California State Parks manages recreational use on these lands through a managing partner agreement with Reclamation, which includes the public land managed by BLM.

Applicable Land Regulation and Plans

The existing license includes a standard land use article that regulates land use activities within the project boundary. Land management planning documents that pertain to land use activities in the area surrounding the project include the Tahoe and Eldorado National Forest Land and Resource Management Plans (LRMP), Sierra Nevada Forest Plan Amendments, Placer County General Plan, and Auburn State Recreation Area Interim Resource Management Plan. The project does not have a shoreline management plan because there are no piers, boat docks or other permitted structures at the project reservoirs or diversion pools.

Tahoe National Forest Land and Resource Management Plan

The Tahoe National Forest LRMP provides direction for long-term land management that includes goals to: (1) ensure wise use and protection of Tahoe National Forest resources; (2) fulfill legislative requirements; and (3) address local, regional, and national issues. The project facilities and project boundary lie in four management areas where management emphasizes:

- Water-oriented recreation;
- Dispersed recreation along the Middle Fork American River;
- Safety for the forest visitor;
- Public sector facilities appropriate to the Recreation Opportunity Spectrum (ROS) classification to accommodate average weekend demand levels;
- Maintenance or improvement of visual quality; and
- Development of a management plan for the Western States National Recreation Trail during LRMP implementation.

The Tahoe National Forest LRMP recognizes the potential for hydroelectric power and contains standards and guidelines that allow for hydropower generation while protecting natural resources and meeting area-specific management objectives. Note that management direction regarding certain resources, for example timber and wildlife, have been revised as part of the Sierra Nevada Forest Plan Amendments as described later in this section.

Eldorado National Forest Land and Resource Management Plan

The Eldorado National Forest LRMP provides direction for long-term land management of the Eldorado National Forest and establishes management areas that stress predominant management themes, practices and prescriptions. The Rubicon River from Hell Hole dam to Ralston afterbay lies within a Wild and Scenic River management area that receives interim protection of its Wild, Scenic, or Recreational values until Congress makes a formal designation by law or disposes of the proposal. Standards and guidelines applicable to this designation exclude transportation-utility corridors.

Hell Hole reservoir is located in the High Country management area which includes lands located generally above 6,000 feet in elevation and characterized by natural crest-like Sierran landscapes; this area has a semiprimitive-motorized ROS classification. Management of this area stresses dispersed recreation, livestock forage, wildlife habitat, and snowpack retention and recommends that design, construction, and maintenance of projects appear subdued in this landscape. Applicable standards and guidelines specify minimal road construction, restricted use of access roads to project facilities, and providing instream flows that satisfy aesthetic and recreation needs where streams border this management area.

The North and South Fork Long Canyon Creek diversions are located in a management area that is managed to maintain viable populations of California spotted owls. Management direction for this area was revised and is described in the 2004 Sierra Nevada Forest Plan Amendments.

The area near Ralston afterbay, and along the Middle Fork American River and North and South Forks Long Canyon Creek has a visual foreground retention classification which does not allow major power projects that are incompatible with this classification.

Sierra Nevada Forest Plan Amendments

The 2001 and 2004 Sierra Nevada Forest Plan Amendments augment the Tahoe and Eldorado LRMPs and set forth the management goals and strategies related to five resource topics including: (1) old forest ecosystems and associated species; (2) aquatic, riparian and meadow ecosystems and associated species; (3) fire and fuels management; (4) lower westside hardwood ecosystems; and (5) noxious weed management. The record of decision describes in detail the management standards and guidelines relevant to these five resource topics.

Placer County General Plan

Activities on private land within Placer County are subject to the provisions contained in the Placer County General Plan (1994). The Placer County General Plan

provides goals, policies, and implementation programs in the following areas: land use, housing, transportation and circulation, public facilities and services, recreational and cultural resources, natural resources, agricultural and forestry resources, health and safety, and noise.

The Placer County General Plan identifies five land uses in the project vicinity including Agriculture, Resource Protection, Rural Residential, Timberland, and Urban uses. Although all five of these designations occur in the project vicinity, all of the project facilities are located on lands designated as Timberland which applies to mountainous areas where the primary land uses relate to the growing and harvesting of timber and other forest products (together with limited, low-intensity public and commercial recreational uses). Necessary public utility facilities are allowed uses on lands designated as Timberland.

Auburn State Recreation Area Interim Resource Management Plan

The Auburn State Recreation Area is situated downstream of the Ralston afterbay and generally extends from the Oxbow powerhouse to Folsom reservoir. Three broad planning goals are identified in the plan: (1) provide for health and safety of the public; (2) minimize and correct environmental damage caused by recreational use and development; and (3) allow and encourage active volunteerism for projects or programs where feasible.

Project Roads and Trails

There are 46 existing project roads and 8 existing project trails that provide access to project generation, communication, gaging, recreation, and ancillary facilities. Project roads and trails are listed in table 28.

Table 28. Project roads and trails (Source: PCWA, 2011a).

Project Roads	Project Trails
Duncan Creek Area	
Duncan Creek diversion intake road and diversion pool access point	Duncan Creek diversion dam north trail
Duncan Creek diversion dam road	Duncan Creek diversion dam south trail
Duncan Creek diversion pool road and access point	Photovoltaic poles and powerline to Duncan Creek gage near French Meadows trail
	Duncan Creek gage near French Meadows trail

Project Roads	Project Trails
	Duncan Creek gage below diversion dam access trail
French Meadows Area	
Duncan Creek—Middle Fork tunnel portal road and spillway access point	Middle Fork American River gage above Middle Fork powerhouse trail
French Meadows—Hell Hole tunnel gatehouse road	
French Meadows dam outlet works and south leakage weir road	
French Meadows dam staging area and spillway west access road	
French Meadows spillway east access road	
French Meadows dam north leakage weir road	
Middle Fork American River gage and weir below French Meadows dam road	
Hell Hole Area	
Hell Hole dam and powerhouse road and spillway southern access point	
Rubicon River gage and weir below Hell Hole dam road	
Hell Hole dam leakage weir road	
Hell Hole dam spillway northern access point	
French Meadows—Hell Hole tunnel portal road	
French Meadows powerhouse road	
Hell Hole—Middle Fork tunnel gatehouse road	
Dormitory facility road	
Hell Hole dam spillway discharge channel road	

Project Roads	Project Trails
Long Canyon Area	
North Fork Long Canyon diversion north road	
North Fork Long Canyon diversion south road	
North Fork Long Canyon diversion drop inlet road	
South Fork Long Canyon diversion and drop inlet access road	
North Fork Long Canyon crossing removable section north road and parking area	
North Fork Long Canyon crossing removable section south road	
Middle Fork Interbay Area	
Middle Fork interbay dam road	Passive microwave reflector station above Middle Fork interbay trail
Middle Fork interbay dam to powerhouse road	
Middle Fork powerhouse butterfly valve house road	
Middle Fork powerhouse penstock and butterfly valve house road	
Middle Fork powerhouse upper switchyard road	
Ralston–Oxbow Area	
Brushy Canyon adit road (project road segment is damaged and closed due to landslide)	Passive microwave reflector station above Ralston afterbay trail
Oxbow powerhouse Road	
Ralston powerhouse butterfly valve house road	
Ralston-Oxbow tunnel intake road	
Ralston afterbay road and boat ramp	

Project Roads	Project Trails
Ralston afterbay sediment removal access point	
Ralston afterbay dam road and afterbay access road	

Although road maintenance activities on project roads and trails are primarily conducted by PCWA, PCWA and the Forest Service have entered into various agreements related to the maintenance and use of project roads located on NFS lands. The existing license requires PCWA to maintain project-related roads cooperatively with the Forest Service. Currently, one agreement, executed on April 9, 2007, is in effect for five project roads. The agreement provides for formal meetings and informal consultation between PCWA and the Forest Service to discuss and agree on actions related to the regular maintenance of these project roads and coordinated assignment of maintenance responsibilities. The agreement also provides for the development of project agreements in which improvement of a road under the jurisdiction of one party is to be financed in whole or in part from funds or resources provided by the other party. The current agreement expired on December 31, 2011. PCWA has also undertaken road improvement projects in accordance with the provisions of project-specific Special Use Permits issued by the Forest Service.

Forty-six roads (totaling 19.7 miles) and eight trails (totaling 0.5 mile) are used for ongoing project operation and maintenance. Most of the inventoried roads, 10.73 miles, are in good condition, 1.82 miles are in poor condition and 7.23 miles range from good/fair to poor condition. PCWA did not evaluate conditions on 1.2 miles of these roads. No traffic safety concerns related to blind spots, poor sight distances, or inadequate signage were identified on the inventoried roads. PCWA identified a total of 18 project and public roads that are potentially used by the public to access dispersed concentrated use areas near the project. PCWA inventoried the trails it uses for operation and maintenance and determined they are in good condition except for one trail that is in poor condition (PCWA, 2008b).

Wildland Fire

Large, catastrophic fires have occurred in the project vicinity since 1908. Most recently (2001) the Star Fire burned across 17,500 acres of forest within the Eldorado and Tahoe National Forests and on private land. Fire management in the project vicinity is the responsibility of the Forest Service and local fire districts. The Forest Service uses two main strategies for landscape-level fuels management: (1) containing fires with linear fuelbreaks and defensible fuel profile zones; and (2) using a spatial arrangement of dispersed vegetation treatments and prescribed fires to interrupt the spread of fire.

3.3.5.2 Environmental Effects

Recreation

This section presents the environmental effects of: (1) the recreation plans filed by PCWA and the Forest Service (final condition no. 34); (2) funding for recreation facility operation and maintenance (final condition no. 35); (3) recreation improvements at Cache Rock (final condition no. 36); (4) improvements to Hell Hole administrative site (final condition no. 37); (5) reservoir minimum pool elevations and reservoir level objectives (final condition no. 38); (6) reservoir fish stocking (final condition no. 39); and (7) streamflow requirements below Oxbow powerhouse (final condition no. 40).

Recreation Plan

PCWA proposes to implement the Recreation Plan filed with the license application (Proposed Recreation Plan [PCWA, 2011a]) to ensure quality experience for recreation users while protecting natural and cultural resources. This plan states PCWA would be entirely responsible for all routine and heavy maintenance at project recreation facilities. Heavy maintenance items identified in the plan as well as reconstruction or removal of existing facilities would be accomplished within 6 years of license issuance. PCWA also proposes to reimburse the Forest Service for its administrative oversight associated with the project recreation facilities. Proposed new developments and changes to existing facilities include:

- removal of Upper Hell Hole Campground;
- reduction of Hell Hole Campground;
- reduction of Ralston Afterbay Picnic Area;
- reduction of Poppy Campground;
- consolidation of the McGuire Boat Ramp Parking Area and associated facilities;
- conversion of McGuire Picnic Area to a Group Campground;
- enhancements to Ahart Campground;
- enhancements to Indian Bar Rafter Access;
- development of a primitive use recreation site in the Duncan Creek Diversion area;
- formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat launch; and
- extension of French Meadows and Hell Hole boat ramps.

Forest Service preliminary condition no. 33 specifies that PCWA implement a Recreation Plan filed with its preliminary 4(e) conditions (Alternative 1 Recreation Plan

[PCWA, 2011c]). Provisions in this plan are similar to PCWA's Recreation Plan but, in general, it specifies later implementation dates, includes additional recreation facilities, and describes detailed actions PCWA would implement when reconstructing facilities. Table 29 summarizes notable recreation facility differences[26] between the two plans.

Forest Service final condition no. 34 contains the same wording as preliminary condition no. 33, but specifies implementing a revised version of the Alternative 1 Recreation Plan, dated November 2012. The Recreation Plan filed with the final 4(e) conditions specifies most of the same development as the Alternative 1 Recreation Plan however it does not include providing trail access development downstream of Middle Fork interbay and it includes providing a catwalk around the perimeter of the Middle Fork powerhouse, which was not previously proposed or recommended.

We analyze specific items in the recreation plans in the following categories: (1) recreation plan—implementation and plan organization; (2) recreation facility operation and maintenance, (3) facility removal, reduction, reconfiguration and construction; (4) trails and access developments; (5) water system developments; (6) boat ramp extensions; and (7) recreation management programs.

Table 29. Notable facility differences between the Proposed and Alternative 1[a] recreation plans (Source: PCWA, 2011a,c).

Proposed Recreation Plan	Alternative 1 Recreation Plan
Ahart Campground	
Maintain 12-site capacity.	Reduce from 12 to 11 sites.
French Meadows Campground	
Maintain 75-site capacity, replace restrooms and upgrade certain site components within 4 to 6 years.	Reduce from 75 to 70 sites with 6 sites converted to 3 double sites and redesign and reconstruct within 5 years.
Lewis Campground	
Maintain 40-site capacity and replace and upgrade certain site components within 2 to 6 years.	Reduce from 40 to 38 sites with 2 sites converted to 1 double site and redesign and reconstruct within 9 years.
Poppy Campground	
Reduce from 12 to 8 sites and redesign and reconstruct within 2 years.	Reduce from 12 to 8 sites and redesign and reconstruct within 13 years.

[26] The Alternative 1 plan contains numerous detailed treatments such as "construct drainage control measures" that we do not consider materially different from PCWA's Recreation Plan. Consequently, we do not present these types of differences in the table.

Proposed Recreation Plan	Alternative 1 Recreation Plan
Coyote Group Campground	
Upgrade selected site components within 3 to 4 years.	Redesign and reconstruct within 13 years.
Gates Group Campground	
Upgrade selected site components within 5 years.	Redesign and reconstruct within 11 years.
French Meadows Picnic Area and Boat Ramp	
Maintain configuration of 4 picnic sites and upgrade selected site components within 3 to 6 years.	Redesign and reconstruct with 2 of the 4 picnic sites relocated to be near the ramp parking area within 7 years.
Extend boat ramp to about 5,175 feet, or as far as possible, within 1 year.	Extend boat ramp to about 5,175 feet, or as far as possible, within 6 years.
McGuire Boat Ramp and Parking Area	
Consolidate parking areas for Poppy Campground and McGuire Boat Ramp, replace signage, reseal boat ramp and repair concrete turnaround within 3 to 4 years.	Consolidate parking areas for Poppy Campground and McGuire Boat Ramp, replace signage, reseal boat ramp and repair concrete turnaround within 13 years.
McGuire Picnic Area and Beach	
Convert picnic area to group campground with 2 25-PAOT sites within 4 years.	Convert picnic area to group campground with 1 25-PAOT and 1 50-PAOT site within 9 years.
French Meadows RV Dump Station	
No comparable measure in this plan.	Reconstruct the station within 4 years.
French Meadows North and South Shore Water Supplies	
Replace all water system infrastructure at French Meadows North and South water systems within 3 and 6 years, respectively.	Replace all water system infrastructure and access roads at French Meadows North and South water systems within 9 and 5 years, respectively.
Upper Hell Hole Campground	
Remove within 2 years	Remove within 7 years.
Hell Hole Campground	
Reduce from 10 sites to 8 sites within 2 years.	Potentially convert to group site or reduce from 10 sites to 7 sites within 9 years.

Proposed Recreation Plan	Alternative 1 Recreation Plan
Remove or potentially replace water distribution lines.	Provide reliable and adequate potable water source and delivery system.
Big Meadows Campground	
Install loop gates, replace 1 restroom. Drill well, install water supply lines supply and connect to existing distribution lines within 2 years.	Construct information kiosks, level some sites and replace some site components.
Middle Meadows Campground	
Replace recycling containers (within 5 years). Drill well and replace water storage tank, supply and distribution lines (within 6 years).	No comparable measure in this plan.
Hell Hole Boat Ramp and Parking Area	
Install barrier rock at lower parking area within 2 years.	Restore areas removed from parking area when it was reduced in size, chip seal, replace fencing within 7 years.
No comparable measure in this plan.	Provide potable water within 5 years.
Extend boat ramp to 4,485 feet, or as far as possible, within 1 year.	Extend boat ramp to 4,485 feet within 6 years and then extend to 4,455 feet, or as far as possible within 7 years.
Ellicott Bridge Parking Area	
No comparable measure in this plan.	Construct 6-car parking area with restroom and bulletin board within 14 years. This would be a new project facility.
Ralston Picnic Area	
Reduce from 5 to 4 sites and install paths, traffic barriers, and signage within 2 years.	Reduce from 5 to 3 sites and redesign and reconstruct within 5 years.
Indian Bar River Access	
Install an additional accessible, vault, pre-fabricated concrete restroom or modify the existing concrete vault restrooms to accommodate peak use within 2 years.	Install an additional accessible, vault, pre-fabricated concrete restroom or modify the existing concrete vault restrooms to accommodate peak use in consultation with the Forest Service within 4 years.

Proposed Recreation Plan	Alternative 1 Recreation Plan
Install a changing pavilion in a location to be determined in consultation with the appropriate land management agencies within 2 years.	Install a changing pavilion (minimum of 2-sided, gender assigned) in a location to be determined in consultation with the Forest Service within 4 years.
Install raft slide ramp within 2 years.	Install raft slide ramp and various signage about camping and parking regulations within 4 years.
Ralston Afterbay Sediment Access Point Boat Ramp	
Formalize boat ramp and parking area and install signage within 2 years.	Formalize boat ramp and parking area and install signage within 5 years (to be implemented after the first sediment removal).
Trail-related Actions	
Develop, install, and maintain trailhead markers at start of Upper Hell Hole, Poppy Trailhead (for Western States Trail) and along Western States Trail in the vicinity of French Meadows dam within 1 year.	Reconstruct and maintain Hell Hole Reservoir Trail (Forest Trail 14E02) and French Meadows Reservoir Trail (between French Meadows Campground and dam) for pedestrian use within 14 years. These would be new project facilities.
Extend Poppy Trail to the McGuire Boat Ramp Parking Area within 4 years.	Extend Poppy Trail (Forest Trail 16E10) to the McGuire Boat Ramp Parking Area and reconstruct this trail to Poppy Campground within 13 years. This would be a new project facility.
No comparable measure in this plan.	Upgrade existing trail to stream gage from near Duncan Creek diversion dam (Forest Trail 13E33) for pedestrian use within 3 years. This would be a new project facility.
No comparable measure in this plan.	Upgrade existing trail to stream gage from Ralston afterbay picnic area within 5 years. This would be a new project facility.
No comparable measure in this plan.	Construct a trail to provide pedestrian access to the Middle Fork American River below Middle Fork interbay dam within 3 years. This would be a new project facility.

Proposed Recreation Plan	Alternative 1 Recreation Plan
Develop a GIS-based trail map and post at kiosks within 1 year.	Develop a GIS-based trail map and post at kiosks within 3 years.

Notes: GIS–geographic information systems

PAOT–persons at one time

[a] The Recreation Plan filed with the final 4(e) conditions contains generally the same measures except that it does not include developing a river access trail downstream of Middle interbay dam but it does specify constructing a catwalk around Middle Fork powerhouse to provide pedestrian access to public land located upstream of the powerhouse.

Recreation Plan—Implementation and Plan Organization

PCWA's proposed Recreation Plan is very similar to the Alternative 1 Recreation Plan referenced in preliminary Forest Service condition no. 33. Whereas PCWA generally proposes implementing actions within 1 to 6 years, the Alternative 1 plan specifies delaying implementation for up to 14 years. The Recreation Plan filed with the Forest Service final 4(e) conditions has the same organization and implementation schedule as the Alternative 1 plan.

The timing and sequence of the construction activities associated with recreation facility modifications and construction of new facilities has the potential to disrupt recreational visitors. Therefore, PCWA's proposed and the Alternative 1 Recreation Plans would implement the following measures to minimize such disruptions:

- To the extent possible, construction activities would be timed to occur during the late summer or early fall, which is after the peak recreation season;
- Construction activities would not occur simultaneously. Instead, construction activities would be staggered over a 6-year period in the proposed plan and a 15-year period in the Alternative 1 plan;
- Most construction activities would occur over a relatively short period of time (e.g., less than about 4 weeks); and
- Wherever applicable, construction of new project recreation facilities would coincide with other project-related construction activities.

Our Analysis

PCWA's proposal would provide recreational benefits sooner than what would be provided implementing the Alternative 1 Recreation Plan or the Recreation Plan filed with the Forest Service final 4(e) conditions. Considering most recreation facilities are in

good condition the most notable effect would be delaying accessibility compliance. Staggering the sequence of recreation facility construction over a 6-year period (proposed action) or 15-year period (Alternative 1) would ensure that alternative project recreation facilities would always be available to recreation users, especially under Alternative 1. Appropriate timing and sequencing of construction activities would reduce disruptions in recreational use at the existing facilities.

The organization of all three plans makes it difficult to locate information about the recreation sites and, as they are written, would be inadequate to determine if PCWA is complying with the measures specified in the plan that may be included in a new license issued for this project. For example, all plans list Middle Meadows as a project facility but none of the plans describe the facility, capacity, or amenities provided. Further, developments proposed in the same general location are presented in separate sections of the plans based on whether an improvement is a change to an existing facility or a new facility. For example, section 4.3.18, *Ralston Picnic Area*, of the Alternative 1 and final 4(e) plans describes changes at Ralston picnic area; however, the proposed boat launch, which appears to be within 1,000 feet of the picnic area, is discussed in section 4.4.1, *Improvements at Select Dispersed Use Areas.* Further, information in the tables is not consistent with text. For example, the Alternative 1 and final 4(e) plans specify that PCWA should develop a water system at Ahart Campground; however, this system is not included on the list of water systems presented in table 1, *Project Recreation Facilities and Features*, which purports to show existing and any new recreation-related facilities. Although site information is provided in a relicensing report, the project recreation plan should present a comprehensive discussion of all project recreation developments that includes both existing and planned improvements at each site. In addition, the plan should contain all information needed for Commission staff to determine compliance with measures specified in the plan without having to refer to relicensing reports. Section 4.3.20 of the Alternative 1 and final 4(e) plans state "The road will be improved as specified in the PCWA's TSMP [Transportation System Management Plan], which is available in supporting document A of PCWA's final license application (PCWA, 2011a)." Because the Forest Service final 4(e) condition no. 44 specifies implementing a version of the Transportation System Management Plan filed with its conditions, referring to a superseded version of the plan introduces confusion as to where to locate this information. Instead of referring to the relicensing document, the recreation plan should describe the road improvement that is proposed.

Recreation Facility Operation and Maintenance

PCWA proposes to enter into a collection agreement to provide funding to the Forest Service for operation, maintenance, and administration of project recreation facilities. Preliminary Forest Service condition no. 34 and the Alternative 1 Recreation Plan also specify that PCWA should provide funding to the agency for these purposes. Final condition no. 35 and the Recreation Plan filed with the final 4(e) conditions contain this same specification.

Our Analysis

It is appropriate for PCWA to be responsible for operating and maintaining the facilities that support project recreation to provide safe and adequate public recreation facilities. Although the Recreation Plans in PCWA's proposal and Alternative 1 and filed with the final 4(e) conditions indicate that PCWA would enter into a collection agreement to provide funding for the agency to operate and maintain the project recreation facilities, this mechanism would not relieve PCWA of its responsibility and therefore would not be an appropriate measure to include in the Recreation Plan. Because it would only be appropriate for PCWA to operate and maintain project recreation facilities, and Cache Rock (see final Forest Service condition no. 36) and the Hell Hole administrative station (see final Forest Service condition no. 37) do not support project recreation, PCWA should not be responsible for operating and maintaining these facilities. It should also be noted that, as indicated in its funding calculations,[27] the Forest Service specifies that PCWA provide funding for law enforcement. This requirement would not be an appropriate measure because PCWA already provides this funding through public land use fees and county taxes that it pays for the project.

Facility Removal, Reduction, Reconfiguration, and Construction

Both PCWA's proposal and the Alternative 1 Recreation Plan would decommission Upper Hell Hole Campground; eliminate a few sites at Ralston afterbay picnic area and Hell Hole, Poppy, Ahart, and Lewis campgrounds; and convert McGuire picnic area to a group campground. In addition, the parking area for Poppy Campground would be removed, and parking for the campground would be provided at the McGuire boat ramp. The Recreation Plan filed with the Forest Service final 4(e) conditions specifies the same actions relative to facility removal, capacity reduction, reconfiguration and construction as the Alternative 1 plan.

These modifications and additions to existing project recreation facilities could create temporary, short-term disruptions in recreational activities during construction. As discussed previously in regard to the Recreation Plan, construction at the various facilities would be staggered to reduce overall disruptions and to ensure that alternative recreational facilities would be available at all times.

Our Analysis

Low occupancy data and the presence of sensitive resources support the need to decommission Upper Hell Hole Campground and eliminate a few sites at Ralston afterbay picnic area and Hell Hole, Poppy, Ahart, and Lewis campgrounds. Considering the increasing demand for group camping opportunities and the under-utilization of McGuire picnic area, reconstructing the site to provide group camping would be an

[27] Cost estimates provided in the Forest Service rationale document include funding for law enforcement.

appropriate action to meet visitor needs. All plans specify constructing two group camping sites at McGuire picnic area and beach but with different site capacities. Alternative 1 and final 4(e) Recreation Plans specify constructing one 25-people-at-one-time (PAOT) site and one 50-PAOT site and PCWA's plan specifies constructing two 25-PAOT sites. Because providing group camping opportunities is the need addressed by this measure, PCWA's plan provides the same benefit as the Alternative 1and final 4(e) condition Recreation Plans in terms of the number of sites specified. Because there is no information to precisely determine what group size needs to be accommodated PCWA's proposal for constructing two 25-PAOT sites should provide adequate initial capacity. Expanding the capacity at this site during the term of a new license could be considered on the basis of occupancy and monitoring results. These changes to the existing developed recreation facilities would slightly decrease developed capacity for day-use and family camping and increase capacity for group camping at the project.

There are two parking areas in the vicinity of McGuire boat ramp that are near a third parking area for Poppy Campground. Because the combined capacity of these parking areas is in excess of what is needed, PCWA proposes to remove the parking area for the campground and accommodate this use at the two parking areas for the boat ramp. Although development specified in the Alternative 1 and final 4(e) Recreation Plans would accomplish the same goal of consolidating parking near the boat ramp and connecting it by extending the Poppy campground access trail, the Alternative 1 and final 4(e) Recreation Plans specify additional details of site design such as signage, trash receptacle and restroom locations, and road widening to allow visitors to properly use the site. The Alternative 1 and final 4(e) condition Recreation Plans also specify restoration actions that would provide a more natural appearance to the area for visitors.

Trails and Access Developments

PCWA proposes to provide signage on existing trails that pass near the project and develop a trail map that would help visitors locate existing trails. The Alternative 1 and final 4(e) condition Recreation Plans specify that PCWA would also construct or upgrade and maintain trails at Hell Hole and French Meadows reservoirs, Duncan Creek diversion, Ralston afterbay picnic area, and Middle Fork interbay dam. The Recreation Plan filed with the final 4(e) conditions contains the same trail developments as the Alternative 1 Recreation Plan except for what is specified at Middle Fork interbay. The Alternative 1 Recreation plan specifies trail development to the river downstream of Middle Fork interbay in the vicinity of the dam. The Recreation Plan filed with the final 4(e) conditions does not include this development but it includes developing catwalk access around Middle Fork powerhouse that visitors could use to access public land located upstream of the powerhouse. During a teleconference, PCWA and Forest Service explained that, based on an engineering review, it would not be feasible to construct a suitable river access trail in the vicinity of the dam (FERC, 2013). They also explained that developing catwalk access around the powerhouse that is included in the Recreation

Plan filed with the final 4(e) conditions would fulfill the same objective of providing access to public land in the vicinity of the Middle Fork interbay.

All three plans include access developments at Indian Bar for whitewater boating users and at Ralston afterbay for launching boats in the reservoir. The Alternative 1 and final 4(e) condition Recreation Plans also specify that PCWA provide a paved parking area and a restroom at Ellicott Bridge (Forest Road No. 14N08 crossing of Middle Fork American River) that could be used by anglers and other river-based users of the bypassed reach.

These modifications and additions to existing project recreation facilities could create temporary, short-term disruptions in recreational activities during construction. As discussed previously in regard to the proposed and Alternative 1 Recreation Plans, construction at the various facilities would be staggered to reduce overall disruptions and to ensure that alternative recreational facilities would be available at all times.

Our Analysis

Providing hiking opportunities is an identified visitor need at the project and, although there are trails near and along project reservoirs used by project visitors, none of the trails are currently included in the project. Two existing trails included in the Alternative 1 and final 4(e) condition Recreation Plans, Hell Hole reservoir trail and Poppy trail, follow the project reservoir shorelines and connect project recreation facilities that are used by visitors to the project (see figure 12). The route of the French Meadows reservoir trail that is included in the Alternative 1 and final 4(e) condition Recreation Plans would similarly follow the reservoir shoreline providing visitors with views of the reservoir and shoreline access. Considering these three trails are or would be located within or immediately adjacent to the project boundary and because there are few trails near reservoirs to meet demand for hiking opportunities, it would be appropriate for PCWA to construct, improve, and maintain these trails as part of the project as provided for in the Alternative 1 and final 4(e) condition Recreation Plans.

The Alternative 1 Recreation Plan also specifies upgrading or constructing and maintaining three trails for public pedestrian access that provide river access to gages downstream of the Duncan Creek diversion dam, downstream of Middle Fork interbay dam, and upstream of Ralston afterbay. The final 4(e) condition Recreation Plan specifies developing the trails to the gages downstream of the Duncan Creek diversion dam and upstream of Ralston afterbay, but it does not include the trail downstream of Middle Fork interbay. Upgrading project trails for pedestrian access would enhance recreational access for visitors. Consequently, it would be appropriate for PCWA to construct or upgrade the trails at Duncan Creek. This trail accesses a project gage, however, and it would not be appropriate to construct a river access trail below Middle Fork interbay dam because it would not be suitable for public use. Although the trail upstream of Ralston afterbay does not access a project gage, it would provide for project visitor use. Because there is no trail development associated with the catwalk access around Middle Fork powerhouse, this measure would provide visitors an opportunity to

simply reach the other side of the powerhouse where they could potentially find locations for activities such as fishing, hunting, and hiking. Few visitors would likely use this catwalk because of low visitor use in this area; it does not appear to provide access to an identified or highly desired type of destination (e.g., river, shoreline).

Flows from the Oxbow powerhouse create suitable flows for commercial and private whitewater boating, and it would be appropriate for PCWA to provide facilities to accommodate this use at Indian Bar. Reconstructing the existing ramp, constructing an additional raft slide, and providing a changing pavilion and additional restroom, as proposed by PCWA and specified in the Alternative 1 and final 4(e) condition Recreation Plans, would accommodate this project-related recreation use. The signage provisions that are specified in the Alternative 1 and final 4(e) condition Recreation Plans would be appropriate measures to include at Indian Bar because the signs would foster proper visitor use at the site and enable regulation by appropriate law enforcement entities. Formalizing a boat launch at Ralston afterbay, as proposed by PCWA and specified in the Alternative 1 and final 4(e) condition Recreation Plans, would meet an existing need for trailered boating access to the reservoir. The Alternative 1 and final 4(e) condition Recreation Plan measure to include stabilization of the surface of the ramp in the design of this boat launch, would also minimize erosion.

Although the Forest Service attributes the need for providing a parking area and restroom at Ellicott Bridge to the project, this area is more than 8 miles downstream of Hell Hole reservoir. Because this site is not located in proximity to the project, it suggests there are other factors responsible for recreational use at Ellicott Bridge. Rivers and stream courses, by their nature, attract visitors regardless of how or why flows may fluctuate. Public road access, such as that provided by Primary Forest Route 2, makes it easier for visitors to access rivers and streams, which also contributes to the level of recreational use at Ellicott Bridge. In addition, flows at this location are primarily influenced by flows released by the hydropower development on the South Fork Rubicon River (Upper American River Project, FERC No. 2101) from November through May based on measured and modeled flows (see table 3.3.2-3) rather than by releases from the Middle Fork Project. Flows at Ellicott Bridge from June through October are generally not sufficient to support whitewater boating, a recreational activity identified with this location. Consequently, the need for this access development is predominantly driven by circumstances that are unrelated to the project, and it would not be appropriate for this to be a project recreation facility.

Water System Developments

PCWA identifies four water systems included in the project and proposes to drill new wells and install appurtenant system features at Middle Meadows and Big Meadows (including possibly Hell Hole Campground). The Alternative 1 Recreation Plan specifies that PCWA would develop a new water system at Ahart Campground, provide a reliable and adequate potable water source and delivery system for Hell Hole Campground, replace all infrastructure of the French Meadows North and South shore water supply

systems, and provide potable water at Hell Hole boat ramp. Whereas the PCWA Recreation Plan states PCWA recurrent heavy maintenance responsibilities include replacing potable water sources, the Alternative 1 plan does not specify that PCWA would have this continuing responsibility during the term of a new license. The Recreation Plan filed with the Forest Service final 4(e) conditions specifies the same actions relative to water system developments as the Alternative 1 plan.

These modifications and additions to existing project recreation facilities could create temporary, short-term disruptions in recreational activities during construction. As discussed previously in regard to the proposed and Alternative 1 Recreation Plans, construction at the various facilities would be staggered to reduce overall disruptions and to ensure that alternative recreational facilities would be available at all times.

Our Analysis

Relicensing studies and Forest Service comments indicate the existing water systems frequently fail, have insufficient capacity, and need improvements to improve reliability and restore functionality. Providing potable water at recreation sites at French Meadows reservoir is consistent with the level of development at recreation facilities that are developed in areas with rural and roaded natural ROS designations. Hell Hole reservoir has a semi-primitive motorized ROS classification, and providing potable water at recreation developments would be consistent with the general management direction of providing a range of recreation opportunities and experiences. Water systems are integral to the recreation sites they serve; however, the French Meadows North shore water supply system also provides water to a Forest Service administrative site (non-project facility).

Minimum Pool Elevations

Table 30 presents minimum pool reservoir elevations for French Meadows and Hell Hole reservoirs proposed by PCWA and specified in preliminary Forest Service condition no. 37 (Alternative 1). Final Forest Service condition no. 38 includes corrections to the ranges of dates, but minimum water surface elevations are the same as those contained in the preliminary condition. Existing minimum reservoir elevations are also listed for comparison.

Table 30. Minimum water surface elevations for French Meadows and Hell Hole reservoirs (Source: PCWA, 2011a, Forest Service, 2012a).

	No Action (WSE in feet)[a]		**PCWA proposal (WSE in feet)**		**Alternative 1 (WSE in feet)**	
Water Year Types	**Jun-Sept**	**Oct-May**	**Jun-Sept[b]**	**Sept[c]-May**	**Jun-Sept**	**Sept-May**
			French Meadows Reservoir			
Wet	5,200	5,180	5,208	5,152	5,220[d]	5,152[f]

	No Action (WSE in feet)[a]		PCWA proposal (WSE in feet)		Alternative 1 (WSE in feet)	
Water Year Types	**Jun-Sept**	**Oct-May**	**Jun-Sept[b]**	**Sept[c]-May**	**Jun-Sept**	**Sept-May**
Above normal	5,200	5,180	5,208	5,152	5,220[d]	5,152[f]
Below normal	5,200	5,180/ 5,152	5,200	5,152	5,220[d]	5,152[f]
Dry	5,200/ 5,157	5,152/ 5,120	5,200	5,152	5,200[e]	5,152[g]
Critical	5,157	5,120	5,157	5,152	5,175[e]	5,152[g]
Extremely critical	5,157	5,120	5,157	5,120	5,175[e]	5,120[g]
Hell Hole Reservoir						
Wet	4,482	4,451	4,530	4,451	4,530[b]	4,451[c]
Above normal	4,482	4,451	4,530	4,451	4,530[b]	4,451[c]
Below normal	4,482	4,451/ 4,402	4,530	4,402	4,530[b]	4,402[c]
Dry	4,482/ 4,404	4,402/ 4,341	4,482	4,402	4,485[e]	4,402[g]
Critical	4,404	4,341	4,482	4,402	4,455[e]	4,402[g]
Extremely critical	4,404	4,341	4,404	4,341	4,404[e]	4,341[g]

Note: WSE–water surface elevation

[a] The existing license requirement specifies storage volume in three categories of water year types based on forecast inflow to Folsom reservoir. Where water year types in the existing license overlap water year types used in the proposed measures, both of the applicable elevations are provided. Elevations provided for no action correspond to volumes listed in PCWA's instream flow requirement measure.

[b] Minimum pool requirements end on Labor Day.

[c] Minimum pool requirements begin on the day after Labor Day.

[d] Minimum pool requirements end on September 15.

[e] Minimum pool requirements end on September 1.

[f] Minimum pool requirements begin on September 16.

[g] Minimum pool requirements begin on September 2.

Our Analysis

As compared to existing operations, the minimum pools proposed by PCWA would:

- result in higher minimum summer water surface elevations in French Meadows reservoir during wet and above normal water year types;
- result in lower winter minimum water surface elevations in French Meadows reservoir during wet and above normal water year types (enhance capacity to accommodate spring runoff);
- result in higher winter minimum water surface elevations in French Meadows reservoir during critical water year types;
- result in higher minimum summer water surface elevations in Hell Hole reservoir during wet, above normal, below normal, and critical water year types;
- result in higher winter minimum water surface elevations in Hell Hole reservoir during critical water year types; and
- implement the summer/winter minimum pool elevation immediately after Labor Day instead of at the end of September.

The Forest Service condition would provide these same circumstances and also result in in higher minimum water surface elevations in French Meadows reservoir during below normal and critical water year types as compared to the existing license conditions. Whereas PCWA's proposal for minimum reservoir elevations transitions from summer to fall on Labor Day, the Forest Service condition transitions at different times based on water year type.

Based on operation model results for the period of record, both PCWA's proposed action and the Forest Service condition would result in relatively little change in the actual operational reservoir elevations/volumes as compared to existing operations, and these measures would not substantially affect surface area or water depth in French Meadows or Hell Hole reservoirs. Shoreline access to the reservoirs and exposed obstacles such as tree stumps and bedrock outcrops that appear as the water level in the reservoirs recede would be similar to what currently exists. Because little change is expected in reservoir habitat (see section 3.3.2, *Aquatic Resources*) and French Meadows and Hell Hole reservoirs would continue to be stocked, both measures would provide angling opportunities at these reservoirs similar to what currently exists. The 4,530-foot minimum water surface at Hell Hole reservoir during wet, above normal, and below normal water year types, as PCWA proposes and the Forest Service specifies would be sufficiently high to retain boating access to the upstream end of the reservoir during the recreation season in these water year types that is not provided by the existing license requirements.

The Forest Service also specifies higher minimum water surface elevations for French Meadows reservoir during the peak recreation season than what PCWA proposes. The Forest Service rationale for the condition states the agency's desire to maintain the reservoir level at French Meadows as high as possible during the recreation season to restrict encounters with physical hazards and to maintain reasonable access to the shoreline from developed recreation facilities. Even though the reservoir elevations specified by the Forest Service would presumably provide this desired condition, the agency has not provided any information indicating why PCWA's measure would not provide this same condition. Nevertheless, reservoir water surface elevations are a key factor in the functionality of boat ramps.

Boat Ramp Extensions

Both the PCWA and Alternative 1 recreation plans include measures to extend boat ramps at French Meadows and Hell Hole reservoirs. The French Meadows reservoir ramp would be extended up to 25 vertical feet which would allow launching boats until the reservoir is drawn down to about 5,175 feet. No extension is proposed or specified for the McGuire boat ramp. PCWA proposes to extend the ramp at Hell Hole reservoir 45 vertical feet to an elevation of 4,485 feet, and the Alternative 1 Recreation Plan specifies an additional extension to an elevation of 4,455 feet. However, PCWA states in its November 2011 supplemental filing that it does not know if there is sufficient slope or reservoir bed conditions at Hell Hole reservoir to extend the ramp and if conditions are found to be unsuitable, the ramp would only be extended as far as possible (up to the specified length). Similarly, the Alternative 1 Recreation Plan indicates it may not be feasible to extend the French Meadows ramp to the specified elevation of 5,175 feet. The Recreation Plan filed with the Forest Service final 4(e) conditions specifies the same actions relative to boat ramp extensions as the Alternative 1 Recreation Plan.

Our Analysis

At the French Meadows ramp, PCWA reports the ramp is currently functional when the reservoir is at or above elevation 5,200 feet. PCWA's November 2011 supplemental filing provides graphs of the water surface elevations for different water year types (appendix D) and tabular summaries (table 3.9-1) listing the percent of time, by water year type, that the ramps are functional during the primary recreation season as well as an extended recreation season (through November 1). We conclude that the tabular summaries oversimplify the existing conditions. For example, it appears that if the reservoir elevation was above 5,200 feet from Memorial Day through the end of August but then dropped below 5,200 feet at the end of the Labor Day weekend, the whole year would be categorized as not having boat ramps available during the recreation season when, in fact, the ramps would have provided access during all but a few days of the recreation season. Because the tabular summaries do not reveal sufficient detail, our analysis considers the graphs of water surface elevation that portray the relationship between reservoir elevation and boat ramp functionality. We consider our no-action alternative to correspond to the assumptions PCWA uses for its graphs labeled existing

conditions. Our analysis compares no-action reservoir levels to those represented by the graphs labeled "Alternative 1—Future Demand" and "Proposed Action—Future Demand" (PCWA, 2011a, appendix C2c).

The ramps at French Meadows reservoir currently provide boating access to the reservoir throughout the peak recreation season in all but critical and extremely critical water year types when the ramps are generally functional until the beginning of September and mid-July, respectively. The ramps are currently functional through the extended recreation season only in wet, above normal, and below normal water year types. During critical and extreme water year types, PCWA proposes and final Forest Service condition no. 38 specifies minimum water surface elevation during the peak recreation season of 5,157 feet and 5,175 feet, respectively. If the French Meadows boat ramp were extended to an elevation of 5,175 feet, the minimum water surface elevation specified in final Forest Service condition no. 38 would provide additional reservoir boating during the peak recreation season in critical and extreme critical water year types. If the boat ramp were extended to 5,175 feet, the boat ramp would not be functional if the reservoir reached PCWA's proposed minimum water surface elevation of 5,157 feet. Because PCWA's proposed Recreation Plan and Alternative 1 and final 4(e) condition Recreation Plans would extend the boat ramp, there would be greater boating access to the reservoir during the extended recreation season than what currently exists. However, the differences in terms of the minimum reservoir elevations and implementation dates between the measures are too subtle to determine the relative benefit as to the effects during the extended recreation season. As compared to the existing conditions, the measure in the Alternative 1 and final 4(e) Recreation Plans would provide additional boating access during the peak recreation season in critical water year types and during the extended recreation season there would be additional boating access in dry and critical water year types.

The ramp at Hell Hole reservoir currently provides boating access to the reservoir throughout the peak recreation season in all water year types. In general, the ramp is currently functional through the extended recreation season, in wet, above normal and below normal and dry water year types. In critical water years the ramp is available until about Labor Day and in extreme critical water years the ramp is available until around the beginning of August. If the Hell Hole boat ramp were extended to an elevation of 4,485 feet, as proposed by PCWA and specified as the first phase of extension in the Alternative 1 and final 4(e) Recreation Plan, the latter would provide additional reservoir boating during the peak recreation season in dry water year types at the lowest minimum water surface elevation but PCWA's proposal would not.[28] Extending the boat ramp to an elevation of 4,455 feet, as specified as the second phase of extension in the Alternative 1 Recreation Plan, would ensure additional boating access during the peak recreation season in critical water year types at the lowest minimum water surface elevation.

[28] We assume that a boat ramp extended to an elevation of 4,485 feet would not be functional at a minimum reservoir elevation of 4,482 feet.

Because both PCWA's proposal and the Alternative 1 plan would extend the boat ramp, there would be greater boating access to the reservoir during the peak and extended recreation season than what currently exists. However, implementing a second phase to extend the boat ramp to elevation 4,455 feet, as the Alternative 1 plan specifies, would ensure the ramp would be functional at the minimum water surface elevation during the peak recreation season in critical water year types whereas PCWA's proposal would not.

Evaluating measures to extend boat ramps should also consider the benefit in terms of the number of recreationists that would take advantage of the additional days of boating access and potential site constraints that may prevent extending the boat ramps. Because extending the boat ramps would generally provide additional access during the extended recreation season when recreation use is low and mainly in drier water year types, the benefit of extending the ramps may be marginal. Additionally, because both PCWA and the Forest Service state that it is not known if extending the ramps is even feasible, it would be premature to require PCWA to extend the ramps to only ensure access in drier water year types. As compared to the existing conditions, PCWA's proposal would provide additional boating access during the peak recreation season in critical water year types and during the extended recreation season there would be additional boating access in dry and critical water year types. If the Hell Hole boat ramp were further extended to an elevation of 4,455 feet, as specified in the Alternative 1 plan, there would be boating access during the peak and extended recreation seasons in all but extreme critical water year types when the ramp would be available until about the beginning of July. As compared to the existing conditions, the Alternative 1 plan would provide additional boating access during the extended recreation season in critical water year types.

These modifications to the existing boat ramps could create temporary, short-term disruptions in recreational activities during construction. In the proposed Recreation Plan, modifications of the French Meadows boat ramp would occur within 3 to 6 years of license issuance, and modifications to the Hell Hole boat ramp would occur within 1 year of license issuance. This staggering of construction would reduce overall disruptions to recreational visitors by ensuring that a ramp is available at all times at either French Meadows or Hell Hole reservoirs. Under the Alternative 1 and final 4(e) Recreation Plan, modifications of both boat ramps would occur in year 6 from license issuance. This would mean that both project reservoirs may be temporarily unavailable to recreational boaters unless the construction occurs sequentially within year 6 (i.e., construction at one boat ramp would not begin until construction at the other one is complete).

Reservoir Level Objectives

Forest Service preliminary condition no. 37 also specifies mid-summer reservoir elevations at French Meadows and Hell Hole reservoirs to maintain functioning facilities (e.g., boat ramps), support current and future recreational uses, and maintain aesthetic qualities. Forest Service final condition no. 38 specifies the same reservoir level objectives contained in preliminary condition no. 37 (Alternative 1). The specified

reservoir elevations (table 31) would be operational goals rather than compliance targets. If PCWA determines the specified projected elevations could not be met during any given year, the condition describes the detailed consultation process that would occur with the Forest Service including the possibility of requiring PCWA-funded measures such as additional patrols, shoreline protection from motorized use, and additional public information. PCWA would be required to prepare a report every 5 years that documents whether the mid-summer targets were achieved and provides the reasons for and time periods when the targets were not achieved. The report would be provided to the Forest Service, California Fish and Game, and Water Board and filed with the Commission.

Table 31. Reservoir level objectives specified in final Forest Service condition no. 38 (Source: Forest Service, 2012a).

	Reservoir Level Objective (feet) to be met by July 15 (unless otherwise noted)	
Water Year Type	**French Meadows Reservoir**	**Hell Hole Reservoir**
Wet	5,245	4,590
Above normal	5,245	4,580
Below normal	5,240	4,570
Dry	5,220	4,530
Critical	5,200	4,530
Extremely critical	None	4,450[a]

[a] Reservoir level objective to be met September 1.

Our Analysis

The mid-summer reservoir objectives specified in the Forest Service condition are similar to the water surface elevations that typically occur under existing project operations. Reservoir levels based on projected future demand are also similar to or greater than what is specified by the Forest Service. Because the mid-summer reservoir elevations would not be compliance targets, this measure would not have a predictable effect on reservoir boating access at French Meadows and Hell Hole reservoirs although the objectives may encourage PCWA to maintain higher mid-summer reservoir elevations which would improve conditions for boaters. Although the water surface elevations specified in the condition are objectives rather than compliance targets, the Forest Service specifies consequences if these elevations are not achieved. Because neither PCWA nor the Forest Service have identified any issues associated with low reservoir levels during the summer, implementing this measure could require agency consultation and PCWA could be responsible for actions before a project-related effect has even been identified. Further, requiring PCWA-funded actions listed in the condition such as patrols and shoreline protection from motorized uses would not meet the intended

purpose of the condition explained in the Forest Service rationale for the condition which is to support mid-summer reservoir-based recreation.

Recreation Management Programs

PCWA proposes to implement the following recreation management programs as part of its proposed Recreation Plan:

- Monitor and report on recreation use every 6 years, which is consistent with FERC Form 80 reporting using site occupancy data, vehicle counts, and self-registration data, as applicable. Provide use estimates.
- Incorporate specific actions included in the Recreation Plan when implementing recreation measures to avoid and protect resources.
- Disseminate real-time and most recent 14 days flow information for 10 gages via the internet (PCWA's website or California Data Exchange Center). Include notification of reservoir spill and pulse flow events, a matrix showing travel time for pulse flows at key locations, and links to other pertinent websites.
- Disseminate the most recent 6 months of weekly reservoir water surface elevation information at French Meadows and Hell Hole reservoirs via PCWA's website. Include representative photographs of reservoirs at various water surface elevations and whether the boat ramps are functioning at their current elevations. This element would be discontinued if the boat ramps are extended.
- Develop a brochure showing recreation facilities, roads, and trails available in the vicinity of the project, and provide the brochure (electronic and hard copies) to three Forest Service offices, Auburn and Georgetown Chambers of Commerce, and California Welcome Center in Auburn.
- Stock fish in Hell Hole and French Meadows reservoirs equivalent to 50 percent of California Fish and Game's annual management target or 50 percent of the historical average (2001 to 2009). PCWA would either acquire and stock fish from private hatcheries or reimburse California Fish and Game for its proportionate share of the stocking cost. Annual consultation meetings would include discussions of stocking targets, species, fish acquisition, and previous year accomplishment reporting.
- Annually consult with unspecified agencies within the first 60 days of the calendar year to review the status of the measures in the Recreation Plan and any available recreation use data.
- Consult with the Forest Service about providing new facilities or expanding existing facilities if occupancy reaches 75 percent on weekends from Memorial Day to Labor Day for 3 consecutive years. Also consider

demographic data, trend information, and visitor surveys to determine when facility enhancements would be necessary.

- Consult with unspecified agencies every 6 years to determine if it is necessary to update the Recreation Plan. If necessary, provide review, comment, and approval by unspecified agencies before filing the revised Recreation Plan with the Commission for its approval prior to implementation.
- Resolve any disputes related to the Recreation Plan in writing to PCWA and/or the Commission. If PCWA cannot resolve the dispute, it would notify the Commission.

The Alternative 1 Recreation Plan specifies similar management provisions with the notable differences summarized in table 32.

Table 32. Notable recreation management differences between the PCWA and Alternative 1 recreation plans (Source: PCWA, 2011a; Forest Service, 2011).

PCWA Recreation Plan	Alternative 1 Recreation Plan
Recreation Brochure	
Develop and provide electronic and color brochure with recreation resources in the vicinity of the project to three Forest Service offices, Auburn, Georgetown and Foresthill Divide chambers of commerce, and California Welcome Center. Develop in consultation the Forest Service and chambers of commerce.	Develop and provide electronic and color brochure with recreation resources in the vicinity of the project to the same entities as well as Reclamation and California State Parks. Develop in consultation with the same entities as well as BLM and Reclamation.
Water Surface Elevation Information	
Provide most recent 6 months of *weekly* water surface elevations for French Meadows and Hell Hole reservoirs.	Provide most recent 6 months of *daily* water surface elevations for French Meadows and Hell Hole reservoirs.

PCWA Recreation Plan	Alternative 1 Recreation Plan
Fish Stocking	
Plant or reimburse California Fish and Game for planting in Hell Hole and French Meadows reservoirs 50% of California Fish and Game annual management target or 50% of historical average stocked 2001-2009, whichever is less.	Plant or reimburse California Fish and Game for planting in Hell Hole and French Meadows reservoirs 100% of California Fish and Game annual management target or 100% of historical average 2001-2009, whichever is less.
Public Information About Operations Schedule	
No comparable measure proposed.	Post outage schedule for Middle Fork, Ralston, and Oxbow powerhouses by May 1 and final schedule by September 1.
No comparable measure proposed.	Post 24-hour predicted flows from Oxbow powerhouse based on predicted operation using California Independent System Operator schedule.
Threshold for New or Expanded Recreation Facilities	
If occupancy data reaches 75% on weekends at any recreation facility, initiate second year of monitoring. If second year monitoring reaches 75%, initiate a third year of monitoring. If occupancy exceeds 75% for 3 consecutive years, initiate discussions with the Forest Service about potential improvements to expand capacity.	If occupancy data reaches 75% on weekends at any recreation facility, initiate second year of monitoring. If second year monitoring reaches 75%, initiate a third year of monitoring. If occupancy exceeds 75% for 3 consecutive years *or if the occupancy rate in the third year is less than 75% and greater than 50% and there is a clear reason for the lower occupancy rate*, initiate discussions with the Forest Service about potential improvements to expand capacity.
Agency Consultation to Update Plan	
Consult to determine if it is necessary to update the plan every 6 years.	Consult to determine if it is necessary to update the plan—unspecified frequency.

The Recreation Plan filed with the Forest Service final 4(e) conditions specifies the same actions relative to recreation management programs as the Alternative 1 plan.

Our Analysis

Recreation Monitoring and Implementing Best Management Practices

Monitoring recreation use would document whether or not project visitor needs are met and recreation effects would be addressed. The schedule and monitoring elements proposed are consistent with the Commission's standard license requirement and would provide adequate information for reporting use, adjusting recreation management actions (e.g., implementation schedule for facility development), and determining if a Recreation Plan revision is necessary.

Applying BMPs and protection and avoidance measures as proposed by PCWA and specified in the Alternative 1 and final 4(e) condition Recreation Plans would protect environmental and cultural resources when constructing, operating, and maintaining recreation facilities.

Our Analysis

Providing Whitewater Boating Flow and Reservoir Level Information

Providing 14 days of previous stream flows and real-time flow data on the internet for 10 stream gages, as PCWA proposes and the Alternative 1 and final 4(e) condition Recreation Plans specify, would allow boaters to take advantage of suitable boating flows provided by the project and enable anglers to assess recent streamflow conditions. Because the streamflows are affected by special events, reservoir spill, and outages, providing as much advance notice of these occurrences, their duration, and expected travel time for flows would increase whitewater boating opportunities. This information would also benefit angling, hiking, and equestrian users because these visitors could plan trips to avoid times when there are high flows that increase stream crossing difficulty.

Providing French Meadows and Hell Hole reservoir elevations on the internet would allow visitors to know if the boat ramps are accessible before traveling to project reservoirs. These storage reservoirs are usually full in the late spring and then gradually recede during the summer. Because this trend is predictable and the reservoirs do not fluctuate on a daily basis, providing weekly reservoir elevation, as PCWA proposes, combined with providing example photographs of the ramps at various water surface elevations and informing the public whether the ramps are currently functional, would provide sufficient information to allow visitors to plan their trips. Collecting and reporting to the public daily water surface elevation information for the reservoirs, as the Alternative 1 and final 4(e) condition Recreation Plans specify, appears unnecessary because it would require more effort yet the information provided would not have a commensurate increased benefit to visitors. However, reporting daily reservoir water surface elevations in annual reports would enable Commission staff to confirm compliance with minimum water surface elevations that may be included in a new license.

Our Analysis

Providing Visitor Information

Visitors routinely use websites and visitor information stations to acquire information about developed recreation facilities and recreation resources to plan their visits. Providing a brochure for these venues that depict recreation resource information as PCWA proposes would increase visitor awareness of opportunities available at and near the project. Although PCWA proposes to provide electronic and hard copies to various agencies, the Alternative 1 and final 4(e) condition Recreation Plans specify developing the brochure in consultation with and providing the brochure to entities in addition to those identified in PCWA's Recreation Plan. Because the project has an extensive footprint and spans multiple land management jurisdictions it would be appropriate to consult with all affected agencies to develop the brochure. For the brochure to be useful, it would necessarily include non-project information for context and visitor orientation and should be available through the internet and at local visitor information stations. The PCWA, and Alternative 1 and final 4(e) condition Recreation Plans would meet this need but because the brochure would present non-project as well as project information, PCWA should not be entirely responsible for developing and providing copies of this brochure. Providing an electronic version that agencies can copy for visitors rather than having PCWA provide hard copies, would be an appropriate level of responsibility for PCWA considering the non-project aspects of the brochure. It would be appropriate to periodically review this information in consultation with affected agencies to determine if it needs to be updated. A revision period that coincides with the 6-year Form 80 monitoring frequency would meet the intent of increasing visitor awareness of project recreation resources.

Our Analysis

Fish Stocking

The Alternative 1 and final 4(e) condition Recreation Plans specify that PCWA stock or reimburse California Fish and Game for stocking fish at 100 percent of the California Fish and Game annual stocking target or the historical average of fish stocked in French Meadows and Hell Hole reservoirs. Because the reservoirs isolate fish populations and create angling opportunities for project visitors, it would be appropriate for PCWA to bear the entire responsibility for stocking fish. PCWA's proposal to provide partial stocking or funding would not fully address these project effects. Including a summary of the number, size, and species targeted for stocking, the number of each species actually stocked by location and the source of the stocked fish in the annual recreation report that would be filed with the Commission would enable the Commission to document compliance with the stocking provisions of the Recreation Plan.

Reporting and consultation is necessary for PCWA and resource management agencies to identify emerging problems or circumstances; coordinate plans for non-

routine activities; review and revise communication protocols; discuss operating plans and heavy maintenance for recreation facilities, fish stocking, flow measures, recreation monitoring plans and results; and discuss future schedules and planning for recreation facility design and construction. The PCWA and Alternative 1 and final 4(e) condition Recreation Plans include annual consultation components that would provide orderly recreation management at the project as well as on adjacent NFS lands that would benefit project visitors and minimize undesirable recreation effects on environmental and cultural resources.

Our Analysis

Providing New or Changed Recreation Facilities and Updating the Recreation Plan

Both PCWA and the Forest Service measures include thresholds for considering new or expanded recreation facilities. These measures are similar and would provide for additional capacity to accommodate project recreation at developed facilities, if needed in the future. From a compliance perspective, the provision in the Alternative 1 and final 4(e) condition Recreation Plans is ambiguous because it does not say what constitutes a "clear reason" in regard to determining whether the occupancy determined during a third year of monitoring would meet the threshold for initiating discussions with the Forest Service about changes to the project recreation facilities. Lacking a clear threshold, Commission staff would not be able to determine whether PCWA was complying with this aspect of the plan. PCWA's Recreation Plan approach is similar enough to the approach presented in the Alternative 1 and final 4(e) condition Recreation Plans to meet the intent of working with the agency to provide adequate capacity yet it also provides clarity that would be necessary for determining compliance with this element of the proposed plan.

PCWA's proposed Recreation Plan describes a clear approach for plan updates. However, the approach described in the Alternative 1 and final 4(e) condition Recreation Plans lacks the structure necessary for review, approval, implementation, and Commission staff determination of compliance with the provisions of the plan. For example, under the Alternative 1 and final 4(e) condition Recreation Plans, PCWA would consult annually about the need for facility changes, and any agreed-upon actions would be documented in an amendment to the plan that would be filed for Commission approval. The Alternative 1 and final 4(e) condition Recreation Plans also have a provision to consult on an unspecified schedule with unspecified agencies to determine if a plan revision is necessary. Implementing both of these approaches could result in overlapping timeframes such that PCWA could have a plan amendment awaiting Commission approval when PCWA and the agencies decide it is necessary to update the plan. An approach with specific timeframes, such as PCWA proposes based on a 6-year frequency, would allow sufficient time for reviewing monitoring data, discussing and recommending facility changes, and obtaining agency input and Commission approval. The ambiguity introduced by the approach contained in the Alternative 1 and final 4(e)

condition Recreation Plans could lead to misunderstandings, delayed implementation, disputes, and a Recreation Plan that is in a constant state of flux. Further, a clear and definitive process would allow Commission staff to determine if PCWA is in compliance with the measures specified in the plan.

Recreation Improvements at Cache Rock and Hell Hole Administrative Station

The Forest Service specifies that PCWA should provide funding to the agency to design and construct a restroom and information kiosk at Cache Rock in the peaking reach (final condition no. 36). Final Forest Service condition no. 37 specifies that PCWA should provide a work station and storage area that would be used for work associated with the Hell Hole recreation area and potentially shared occupancy with the Forest Service.

Our Analysis

The improvements the Forest Service specifies in these conditions do not appear to be related to the project. The Forest Service states the site at Cache Rock is used as a lunch stop by whitewater boaters and other river users who access the site by 4-wheel-drive access road. Although whitewater boaters may stop in this area for lunch, primitive camping at 10 designated sites and river use at this site would exist irrespective of the project. A 2011 Forest Service recreation opportunity guide (Forest Service, 2011b) directs visitors looking for gold panning and dredging opportunities to Cache Rock, which further indicates that use at this site includes non-project use. Because most of the recreational use at Cache Rock, as well as the effects associated with these uses, do not appear to be related to the project, the facility would not be a project recreation facility and it would not be appropriate for PCWA to provide funding for the improvement or its ongoing operation and maintenance.

Final Forest Service condition no. 37 specifies modifying the Hell Hole administrative station to provide administrative workspace and storage but the size, location, and required improvements would be specified at a later date through an agreement between PCWA and the Forest Service. The Forest Service rationale document indicates the agency seeks to expand the existing purpose of this facility to include space that could be rented by the public for recreational use. The Forest Service states that this condition is necessary because similar facilities on the Eldorado National Forest have high occupancy rates, and it would serve the visiting public that are looking for a recreation opportunity other than camping.

In a comment letter on the draft EIS, the Forest Service explains that the Hell Hole administrative site provides work space and storage to operate project recreation facilities. PCWA does not list this facility as one of its project facilities, it was not constructed as part of the project, the scope of the planned facility improvements is not specified, and final condition no. 37 states the facility may serve a shared purpose with the Forest Service. It should be noted that a shared purpose that would possibly include providing a public vacation rental property, as the Forest Service indicates in its rationale

document, appears inconsistent with managing the area for semi-primitive motorized use.[29] Guidance for the level of recreation facility development at this area is to have minimal site modification and rustic or rudimentary improvements that are designed primarily for protection of the site rather than the comfort of users. In addition, the Forest Service justification that high occupancy of overnight vacation rentals on NFS lands does not demonstrate a project-related recreational need or explain the project issue that such a facility would address. Because the measure lacks specificity and the site would serve non-project purposes, it would not be appropriate to include the Hell Hole administrative site, or any funding for the facility, in the project.

Whitewater Boating

PCWA proposes the release schedule in table 33 to provide flows downstream of Oxbow powerhouse for whitewater boating. The measure states that, when controllable by the project, whitewater boating flows would be superseded by flows that allow the Western States 100 and Tevis Cup races to proceed. In addition, PCWA would annually consult with race representatives to identify and provide flows suitable for adequate river crossing conditions for these events.

Preliminary Forest Service condition no. 39, which is also included in Alternative 1, is more detailed than PCWA's proposal and includes generally higher flows. The condition specifies that whitewater boating flows in above normal, dry, critical, and extremely critical water year types would be superseded by flows (when controllable by the project) that allow the Western States 100 and Tevis Cup races to proceed. Similar to PCWA's proposal, the Forest Service specifies that PCWA annually consult with race representatives to identify and provide flows suitable for adequate river crossing conditions for these events (when such flows are controllable by the project). One additional element of preliminary condition no. 39 not included in the proposed measure includes providing up to 2 unscheduled days for special whitewater flow events if requested by individuals, groups, or agencies by April 15 of each year. PCWA would respond to such requests by May 15 based on available water supply and demands, hydroelectric generation demands, and generating unit availability. A second additional element would entail coordinating with Wounded Warrior event representatives to provide steady flows for up to 5 days if PCWA is notified by June 1 that an event is scheduled based on PCWA's May 1 annual maintenance outage schedule and the outage schedule subsequently changes.

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[29] Although the Forest Service states in its draft EIS comment letter that it removed reference to having a portion of the facility available for public rental, the final condition did not reflect any such change, and the Forest Service did not provide any change to its rationale document that would indicate a change in the intended purpose of the facility. Consequently we assume this facility, as described by the Forest Service, would also serve non-project purposes.

Table 34 shows the flows specified for providing class IV boating opportunities in the peaking reach, and table 35 shows the flows specified for providing class II boating on the Confluence Run. Compliance would be assessed based on the hourly running average flow measured in 15-minute intervals. In the event of a forced or unplanned outage at the Middle Fork, Ralston, or Oxbow powerhouses, the whitewater boating flow release requirements would be suspended until the powerhouse(s) are returned to service.

Table 33. PCWA's proposed flow schedule to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse (Source: PCWA, 2012).

			Weekdays	**Weekends**	
Water year type[a]	**Flow[b] (cfs)**	**Duration (Time of day)**	**June 1–Labor Day**	**1st Saturday before Memorial Day–Labor Day**	**Labor Day–September**
Wet/above normal	800[c]	3 hours[d] (5 a.m.–8 a.m.)	--	Saturdays	--
	1,000	4 hours (8 a.m.–noon)	5 days per week	Saturdays, Sundays	Saturdays
Below normal	1,000	4 hours (8 a.m.–noon)	4 days per week	Saturdays, Sundays	Saturdays
Dry	900	4 hours (8 a.m.–noon)	3 days per week	Saturdays, Sundays	Saturdays
Critical	900	3 hours (9 a.m.–noon)	2 days per week	Saturdays, Sundays	Saturdays
Extremely critical	900	3 hours (9 a.m.–noon)	1 days per week	Saturdays	--

[a] Based on California DWR Bulletin 120, May forecast of unimpaired flow of the American River below Folsom Lake.

[b] As measured below the confluence of Middle Fork and North Fork of the Middle Fork American River near Foresthill, unless otherwise specified (USGS gage no. 11433300).

[c] Target flow at North Fork of the American River above American River pump station gage.

[d] Early release to provide flow downstream sooner in the day.

Table 34. Flow schedule provided in final Forest Service condition no. 40 and Interior 10(a) recommendation no. 5 to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse (Source: Interior, 2011; Forest Service, 2012a).

Water Year Type[a]	Flow[b] (cfs)	Duration (Time of day)		
Weekdays			**June 1–Labor Day**	**After Labor Day–September 30**
Wet	1,000	3 hours (9 a.m.–noon)	5 days per week (M–F)	4 days per week (T–F)
Above normal	1,000	3 hours (9 a.m.–noon)	5 days per week (M–F)	3 days per week (T, W, F)
Below normal	1,000	3 hours (9 a.m.–noon)	4 days per week (T–F)	3 days per week (T, W, F)
Dry	1,000	3 hours (8 a.m.–11 a.m.)	3 days per week (T, W, F) except for F before Labor Day and Memorial Day[c]	2 days per week (W, F)
Critical	1,000	3 hours (8 a.m.–11 a.m.)	2 days per week (W, F) except for Memorial Day[c]	--
Extremely critical	1,000	3 hours (8 a.m.–11 a.m.)	1 day per week (W)	--
Weekends			**Saturday before Memorial Day–Labor Day**	**After Labor Day–September 30**
Wet	1,000	4 hours (8 a.m.–noon)	Saturdays, Sundays	Saturdays, Sundays
Above normal	1,000	4 hours (8 a.m.–noon)	Saturdays, Sundays	Saturdays, Sundays
Below normal	1,000	4 hours (8 a.m.–noon)	Saturdays except for Western States 100 and Tevis Cup dates and Sundays	Saturdays, Sundays

Water Year Type[a]	Flow[b] (cfs)	Duration (Time of day)		
Dry	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates	Saturdays, Sundays
			Sundays except one Sunday[c] in July	
Critical	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates	Saturdays
			Sundays except one Sunday in July[c]	
Extremely critical	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates	--

[a] Based on California DWR Bulletin 120, May forecast of unimpaired flow of the American River below Folsom Lake.

[b] As measured below the confluence of Middle Fork and North Fork of the Middle Fork American River near Foresthill (USGS gage no. 11433300). The recreation flows for special events (e.g., Tevis Cup, Western States 100), when they occur, take priority over boating flows in below normal, dry, critical, and extreme critical water year types.

[c] One day used for providing class II boating on the Confluence Run.

Table 35. Flow schedule provided in final Forest Service condition no. 40 and Interior 10(a) recommendation no. 5 to support class II boating opportunities on the Confluence Run (Source: Interior, 2011; Forest Service, 2012a).

			Weekdays		**Weekends**	
Water Year Type[a]	**Flow[b] (cfs)**	**Duration (Time of day)**	**Memorial Day–Labor Day**	**Saturday before Memorial Day–June 30**	**July 1–Labor Day**	**After Labor Day–Sept 30**
Wet	800	5 hours (3 a.m.–8 a.m.)	--	--	Saturdays	2 Saturdays per month
Above normal	800	5 hours (3 a.m.–8 a.m.)	--	--	Saturdays	2 Saturdays per month
Below normal	800	4 hours (4 a.m.–8 a.m.)	--	2 Saturdays per month	2 Saturdays per month	1 Saturday per month
	1,000	3 hours (4 a.m.–7 a.m.)	--	Western States 100 date	Tevis Cup date	--
Dry	1,000	3 hours (4 a.m.–7 a.m.)	Memorial Day and F before Labor Day	Western States 100 date	1 Sunday in July and Tevis Cup date	--
Critical	1,000	3 hours (4 a.m.–7 a.m.)	Memorial Day	Western States 100 date	1 Sunday in July and Tevis Cup date	--
Extremely critical	1,000	3 hours (4 a.m.–7 a.m.)	--	Western States 100 date	Tevis Cup date	--

[a] Based on California DWR Bulletin 120, May forecast of unimpaired flow of the American River below Folsom Lake.

[b] As measured below the confluence of Middle Fork and North Fork of the Middle Fork American River near Foresthill (USGS gage no. 11433300).

Final 4(e) condition no. 40 and BLM's final 10(a) recommendation[30] modified preliminary condition no. 39 by eliminating class IV releases on Sundays during extreme critical water year types in the peaking reach.

P. Gibbs recommends the following measures to address the effects of flow fluctuations in the peaking reach: (1) providing stage gages at river crossings and a real-time flow gage at a point on the Middle Fork upstream of its confluence with the North Fork American River; and (2) providing funding for a bridge across the peaking reach or California State Parks staffing.

Our Analysis

Although PCWA does not provide recreation-specific flow schedules in the bypassed reaches, its proposed instream flows, described in section 3.3.2.2, *Aquatic Resources*, would maintain or enhance existing boating opportunities in the bypassed reaches. PCWA's proposed instream flows for the Rubicon River between Ellicott Bridge and Ralston afterbay would increase boating opportunities in the lower range of suitable boating flows (400–1,500 cfs) during above normal and wet water years compared to the existing condition; boating opportunities are not currently available during the drier years, and PCWA's proposal would not change this condition. PCWA's proposed instream flows for Long Canyon Creek would increase boating opportunities during wet water year types compared to existing conditions.

Implementing PCWA's proposed flows would maintain the existing level of boating opportunities in this reach during the wet water year type. If the project were operated under PCWA's proposed flow schedule flows would exceed the suitable boating flow range in above normal and below normal water year types during May and June due to the cumulative effect of spill events, accretion, increased minimum instream flows, and pulse flows that would be released from French Meadows reservoir and Duncan Creek.

PCWA's proposed instream flows would increase boating opportunities on the Middle Fork American River between Middle Fork interbay to Ralston afterbay during above normal and wet water years compared to the existing condition; boating opportunities are not currently available during the drier years, and PCWA's proposed instream flows would not change this condition. Additional boating opportunities that PCWA's proposed instream flows would provide in the bypassed reach would be further increased by other proposed measures including providing real-time flow, pulse and spill information. Flows specified in the agency conditions and recommendations (Alternative 1) would provide the same increase in boating opportunities on the bypassed reaches that PCWA's proposal would provide.

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[30] See BLM's letter dated January 24, 2013, that corrected its final 10(a) recommendation.

PCWA's proposed flow schedule for the peaking reach is properly focused on providing conditions to support Wild and Scenic River outstandingly remarkable values including whitewater boating, Western States Trail, and the fishery. PCWA proposes to formalize its currently voluntary commitment with a release schedule that would provide 800 to 1,000 cfs for 3 to 4 hours a day on various weekends and weekdays between June and September. Operating the project under PCWA's flow schedule would maintain existing commercial boating opportunities on the peaking reach (Tunnel Chute Run) and maintain or increase boating opportunities for private boaters on the three runs in the peaking reach (Mammoth Bar Run, Murderer's Bar Run, Confluence Run) that have lower difficulty in wet and above normal water years. Under PCWA's proposal, beginning on the first Saturday preceding Memorial Day through Labor Day in wet and above normal years, an 800 cfs flow as measured at the North Fork of the American River above American River pumping station would be released at the Oxbow powerhouse 3 hours earlier than under existing conditions. This early release would provide flow at the downstream runs earlier in the day, which would increase whitewater boating opportunities overall.

The release schedule PCWA proposes would maintain or enhance boating opportunities in the peaking reach as compared to the existing conditions. The greatest improvement would be the certainty created by the formalization of the schedule as a condition of a new license to provide flows that would, in turn, ensure the outstandingly remarkable value for whitewater boating in the reach would be maintained or improved.

In addition, PCWA proposes to annually coordinate with representatives of the Tevis Cup and Western States 100 races to identify and provide flows suitable for stream crossing conditions for these events (when such flows are controllable by the project). The Tevis Cup and Western States 100 event recreation flows, when they occur, would take priority over whitewater boating flows. This measure would formalize PCWA's existing voluntary practice, and this measure would ensure that, when within the control of the project, suitable flows would occur during these events. The measure would also ensure whitewater boating flows would not interfere with holding successful special events, which supports an outstandingly remarkable value of this eligible wild and scenic river reach.

Flows recommended and specified by the agencies in the peaking reach would be, in general, higher than PCWA's proposed flows, and the schedule is more detailed to maintain trail crossing opportunities, and accommodate commercial and private boating use. Because the proposed and Alternative 1 flow scenarios accommodate flow needs for special events (e.g., Western States 100), stream crossings would not be affected by the project during these events. Implementing the flows specified by the agencies would maintain existing commercial boating opportunities on the peaking reach (Tunnel Chute Run), maintain boating opportunities for private boaters on the Mammoth Bar Run, decrease opportunities on the Murderer's Bar Run, and increase opportunities on the Confluence Run, especially during below normal and critical water years. Similar to PCWA's proposal, the flows specified by the agencies would release water earlier in the

day and increase boating opportunities. Because the agencies specify more days of providing early-day releases of a longer duration, there would be more class II boating opportunities provided than if the project were operated under PCWA's proposed flow schedule.

Higher instream flows in the peaking reach could also affect other recreational uses related to the Western States Trail and fish, which also are outstandingly remarkable values of the reach. Considering recreational uses in the peaking reach occur primarily in the summer and fall months, the project effects during these seasons are particularly important. Although PCWA analyzes crossings using thresholds at the points where the crossing difficulty transitions from easy to moderate and moderate to difficult, we consider it most appropriate to only consider the lower flow threshold where crossings are considered easy or moderate. Families often visit the river, and people with different physical capabilities may need to cross the river. Therefore, the determinant flow should be the one at which the least capable person in a party could successfully cross the river. Consequently, we consider it appropriate to use river crossing thresholds that correspond to a low level of difficulty so that project effects are not underestimated.

Tables 36 and 37 present PCWA's estimated number of hours of each day when suitable flows at the easiest crossing threshold would be available at five key crossing locations from 7 a.m. to 7 p.m. during the summer and fall under the existing, PCWA proposed, and Alternative 1 flow schedules. Both PCWA and Alternative 1 flow schedules would reduce the time available for river crossing in the peaking reach from what exists under current project operation. Under both of these schedules there would be, on average, 1 to 2 fewer hours at each of the key locations when flows would be suitable for crossing. This represents a reduction of about 31 to 82 percent from the existing crossing opportunities. During the summer, there would be about 25 minutes to 2.5 hours a day when flows would be suitable for stream crossing.

In the fall, the PCWA and Alternative 1 flow schedules, as compared to the existing conditions, would have dissimilar and an overall reduced amount of time when flows would be crossable at the five key locations. Whereas the existing minimum flows in the fall provide crossing opportunities, some of the PCWA and Alternative 1 fall minimum flows exceed the easy thresholds for crossing (i.e., they would be greater than easy crossing thresholds of 175 to 275 cfs). These higher minimum instream flows would mostly be implemented during wet and above normal water year types so, in general, the greatest decrease in average time with suitable crossing flows would also occur during these water year types.

Table 36. Average (for all water year types) number of hours between 7 a.m. and 7 p.m. during the summer when flows are suitable for easy crossing (Source: PCWA, 2011b).

	Existing (avg. hrs/day)	PCWA (hrs/day)	Alt. 1 (avg. hrs/day)	Change (Existing – PCWA proposed)		Change (Existing – Alt. 1)	
				Avg. hrs/day	%	Avg. hrs/day	%
Fords Bar	3.4	1.5	1.6	-1.9	-56	-1.8	-52
Ruck-a-chucky	2	0.4	0.4	-1.6	-82	-1.6	-82
Poverty Bar	3.6	2.5	2.5	-1.1	-31	-1.1	-31
Mammoth Bar	3.4	2.2	2.2	-1.2	-35	-1.2	-35
Coffer Dam	1.7	0.8	0.8	-0.9	-52	-0.9	-52

Table 37. Average (for all water year types) number of hours between 7 a.m. and 7 p.m. during the fall when flows are suitable for easy crossing (Source: PCWA, 2011b).

	Existing (avg. hrs/day)	PCWA (hrs/day)	Alt. 1 (avg. hrs/day)	Change (Existing – PCWA proposed)		Change (Existing – Alt. 1)	
				Avg. hrs/day	%	Avg. hrs/day	%
Fords Bar	7.3	6.8	6.5	-0.5	-6%	-0.8	-10%
Ruck-a-chucky	4.0	0.0	3.0	-4.0	-100%	-1.0	-26%
Poverty Bar	6.6	7.1	7.1	0.5	7%	0.5	8%
Mammoth Bar	6.1	4.2	6.4	-1.9	-31%	0.4	6%
Coffer Dam	3.7	0.6	3.8	-3.0	-83%	0.1	3%

The effects of reduced stream crossing opportunities during the summer and fall in the peaking reach would be reduced by implementing measures to provide real-time and projected flow information to the public, which would enable recreationists that use the crossings to plan their trips accordingly. Providing adjustment factors regarding predicted timing and magnitude of peaking reach flows immediately upstream of the confluence of the North Fork American River that can be applied to real-time flow information from USGS gage no. 11433300 (Middle Fork American River near Foresthill) posted on PCWA's website would provide recreational visitors with additional information for planning trips to the peaking reach. This effect could be further reduced by increasing public awareness by providing and periodically reviewing the adequacy of the existing signage at prominent points of public entry to the peaking reach (e.g., trailheads, parking areas); installing visual water level reference markers at the Western States Trail crossing in the peaking reach; and including easily understandable messages about peaking reach flow fluctuations in visitor brochures, websites, and publications.

Although the measure to construct a bridge across the peaking reach recommended by P. Gibbs would make the public's ability to cross the river independent of flow fluctuations, this measure would detract from the challenge of river crossings that contribute to the appeal of special events such as the Western States 100 and Tevis Cup, and other measures can readily be implemented to provide the public with information it can reference when deciding whether to cross the river. Providing funding for California State Parks, as P. Gibbs recommends, would not be appropriate because PCWA already supports the needs associated with law enforcement and emergency response through the public land use fees and county taxes that it pays for the project.

As discussed in section 3.3.2, *Aquatic Resources*, improved fish habitat provided by increased flows as PCWA proposes and the agencies specify, would likely improve angling in terms of there being more fish in both the bypassed and peaking reaches compared to existing conditions. Because the higher flows in the peaking reach could affect wading, PCWA evaluated the effects using a suitable range of flows both for wading and fishing and determined that implementing either flows proposed by PCWA or provided by the agencies would be similar to what currently exists. Because fish habitat would be improved and wading opportunities would be maintained in the peaking reach, conditions for angling would be improved over what currently exists by implementing either PCWA's proposed flows or the flows specified by the agencies. These flows would also maintain or improve the outstandingly remarkable value related to fish in both the Rubicon River and the peaking reach.

Because the flow-dependent recreational uses in the peaking reach have different suitable flow ranges, there could be user conflicts among whitewater boating, angling, and crossing the river by trails. PCWA's proposed flow schedule attempts to make the tradeoffs between user groups while maintaining or improving opportunities for whitewater boating. However the agencies' flow schedule refines PCWA's flow schedule to provide flows in the optimal boating range, as opposed to the suitable range, and increase number of boating days, yet schedule releases to create suitable conditions

for trail crossings at key times (i.e., races and special events) and locations. The flows specified by the agencies' also give greater consideration to the non-commercial boating opportunities in the peaking reach. The flow schedule provided by the agencies was developed in consultation with commercial and private boaters and it reflects flows (magnitude and schedule) that would minimize user conflicts while providing higher quality whitewater boating and suitable flows for a wider variety of recreational uses as compared to PCWA's flow proposal.

Ramping

PCWA's proposed ramping rates below Oxbow powerhouse are generally the same as what the agencies and Alternative 1 specify (see section 3.3.2, *Aquatic Resources*, table 17), except that the agencies do not include a 900 cfs release limit during the summer.

Our Analysis

Ramping rates proposed by PCWA and specified by the agencies would cause a large reduction in the ramping rate of Oxbow powerhouse flow releases (50 percent reduction of upramping rate and 41 percent reduction of the downramping rate). Reducing the ramping rate from Oxbow powerhouse would enhance recreation in the peaking reach by allowing recreationists to have more time to adjust their activities to changing flows and would provide better conditions for angling compared to what currently exists. A slower ramping rate would also reduce the potential for visitors to be stranded in the peaking reach. Implementing the agencies' and Alternative 1 ramping rate would provide optimum boating opportunities. The optimum flow for whitewater boating on this reach ranges from 1,000 to 1,250 cfs whereas implementing PCWA's proposed ramping rate with a 900 cfs upper limit on Oxbow powerhouse releases would provide flows that are less than optimal.

Land Use

This section presents the environmental effects of (1) changes to the project boundary; (2) PCWA's proposed and Alternative 1 Transportation System Management plans and (3) PCWA's proposed Fire Prevention and Suppression Plan. The Forest Service provided 18 preliminary 4(e) conditions that we consider standard, administrative, and/or legal in nature and are not specific environmental measures. The basis for these measures is to achieve consistency with forest plans and comply with various agency policies and applicable laws and regulations. Some of these conditions also relate to more specific resource measures (e.g., annual consultation with the Forest Service, protection of Forest Service special-status species, and pesticide use on NFS lands) that are already analyzed in applicable resource sections. The remaining administrative conditions are not addressed in this EIS. California Fish and Game submitted some of these same conditions as section 10(a) and 10(j) recommendations.

Changes to the Project Boundary

PCWA proposes to increase the area within the project boundary to include: (1) proposed project facilities; (2) existing facilities that are necessary for project operation and maintenance; and (3) all existing and proposed project recreation facilities, roads, and trails as shown in tables 24, 28, and 29. PCWA also proposes to remove lands from the project by reducing tunnel corridor and reservoir shoreline buffers widths from 200 feet to 100 feet.

The boundary changes in Alternative 1 would include PCWA's proposed changes and be expanded to encompass additional recreation facilities specified in the Alternative 1 Recreation Plan (see table 29).

Our Analysis

PCWA's proposed changes to the project boundary would decrease the area within the project boundary by 404 acres. The proposed project boundary would encompass 4,150 acres of land including 1,746 acres within the Tahoe National Forest and 1,306 acres within the Eldorado National Forest. The remainder of project lands would be located on PCWA-owned land, private land, or public land managed by BLM (3.75 acres).

The proposed boundary encompasses specific buffer areas around each project facility or feature. These buffer areas were established based on a detailed review of project operation and maintenance activities, and include all of the area necessary for operation and maintenance of project facilities, including vegetation management. The proposed project boundary provides a minimum 100-foot buffer area around the reservoirs, as measured from the maximum operation level inundation footprint and includes sufficient area that ensures public access to the shoreline, protects riparian and other shoreline resources consistent with various project plans, and protects water quality. This shoreline buffer width would be consistent with Commission regulations that the boundary be located no more than 200 feet (horizontal) from the maximum water surface elevation. The tunnel corridor widths would be reduced from 200 feet to 100 feet because operation and maintenance activities only occur within the tunnel alignment where the tunnel coincides with features that are located above ground (e.g., surge tanks, penstocks, and powerhouses). This width would be sufficient to meet operation and maintenance needs at these locations along the tunnel corridors. Proposed changes to the project boundary are listed in section 2.2.2, *Proposed Project Boundary.*

Alternative 1 would extend these same benefits and protections to additional lands associated with the additional recreation developments specified in the Alternative 1 Recreation Plan. PCWA does not provide the exact change in acreage of land that would be affected but reviewing the Alternative 1 recreation developments, there would be slightly more land included within the project boundary as compared to PCWA's proposed project.

Transportation System Management Plan

The Transportation System Management Plan included in Alternative 1 incorporates improvements included in the Alternative 1 Recreation Plan; synchronizes the implementation schedule with the Recreation Plan; updates the list of BMPs; and includes some minor wording changes. The Alternative 1 Transportation System Management Plan provides few modifications to PCWA's proposed plan, the most significant being the addition of recreational elements that synchronize the developments and schedule with the Alternative 1 Recreation Plan. Because we analyze the effects of recreation development earlier in this section, the analysis of the other content of proposed and Alternative 1 plans are similar enough that we do not analyze them separately. Additionally, Forest Service preliminary condition no. 43 states PCWA should finalize and implement the plan. We understand Alternative 1 addresses any outstanding needs the Forest Service may have had regarding the plan and, for efficiency, the analysis below is based on the Alternative 1 Transportation System Management Plan. Final 4(e) condition no. 44 revised the preliminary condition to specify implementing the Transpiration System Management Plan filed with the final 4(e) condition which is similar to the Alternative 1 plan except that it does not include a public recreation trail to Middle Fork American River in the vicinity of Middle Fork interbay dam and it includes providing a catwalk around Middle Fork powerhouse for access to public lands located upstream of the powerhouse.

The Transportation System Management Plan would incorporate 46 existing roads into the project and one new project road would be constructed. The plan would also incorporate 12 trails into the project and five new trails would be constructed; a catwalk for public access around Middle Fork powerhouse would also be constructed. PCWA would be entirely responsible for routine and deferred (or periodic) maintenance on all project roads and trails as identified on tables 1 through 5 in the plan. PCWA would also enter into a collection agreement to provide funding to the Forest Service for administrative oversight for project roads and trails that are located on NFS land. PCWA would conduct condition assessments on project roads and trails once every 5 years, as well as traffic counts on project roads at a frequency as determined in consultation with the Forest Service. PCWA will consult with land management agencies annually to discuss planned actions; results of condition assessments and traffic counts; and need for traffic counts and periodic plan updates. The plan states that any new project road or trail not identified in the plan that may be needed during the term of a new license would require environmental review prior to construction.

Our Analysis

The Transportation System Management System addresses the need for accessing project features as well project recreation facilities and it appropriately identifies the level of access that would be maintained through proper annual and long-term maintenance for each access route.

Providing funding to the Forest Service for administrative oversight of the roads and trails as specified in this plan would not be appropriate because PCWA already provides funding through public land use fees that it pays for the project. Performing regular condition assessments would provide essential information to determine maintenance needs. Because there is such a close relationship between the recreation facilities and transportation system it would be appropriate to synchronize the assessments for these two programs. Revising the 5-year frequency to coincide with the 6-year Form 80 reporting would provide all relevant monitoring information on the same schedule for evaluating future needs. Evaluating the need to update the plan would similarly benefit from adjusting it to a 6-year frequency rather than a 5-year frequency.

The plan appropriately recognizes there may be additional project roads or trails needed during the term of a new license. However, in addition to completing environmental review, as specified in the plan, for any new project road or trail, PCWA would need to file an amendment to the plan and receive Commission approval before construction.

Fire Prevention and Suppression Plan

The proposed Fire Prevention and Suppression Plan outlines the responsibility of PCWA and its contractor(s) for fire prevention and suppression activities; establishes reporting and attack procedures in the event of a fire in the vicinity of the project; and ensures that fire prevention and suppression techniques are carried out in accordance with applicable regulations. PCWA would consult with the Forest Service: (1) annually to discuss current fire suppression and preparedness; and (2) every 5 years regarding the need to revise the plan. Measures and procedures identified in the plan apply to all lands and facilities within the project boundary. The plan would be implemented after Commission approval.

Forest Service final condition no. 45 includes a revised Fire Prevention and Suppression Plan with minor text changes to PCWA's plan, but no substantive changes.

Our Analysis

Implementing a Fire Prevention and Suppression Plan as PCWA proposes would improve planning, management and coordination of wildfire protection and prevention measures that could reduce wildfire occurrence in the vicinity of the project. Provisions in the plan and annual consultation with the Forest Service could also improve suppression efforts thereby minimizing damage caused by wildfires that may occur in the project vicinity. Because fire-related circumstances would likely change over the term of a new license, it would be appropriate to periodically review the plan, as PCWA proposes, to determine if the plan should be revised.

3.3.6 Cultural Resources

3.3.6.1 Affected Environment

Section 106

Section 106 of the NHPA as amended requires the Commission to take into account the effects of licensing a hydropower project on any historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) a reasonable opportunity to comment if any adverse effects on historic properties are identified within the project's area of potential effects (APE).

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. In this document, we also use the term "cultural resources" to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register. Cultural resources need enough internal contextual integrity to be considered historic properties. For example, dilapidated structures or heavily disturbed archaeological sites may not have enough contextual integrity to be considered eligible. TCPs are a type of historic property eligible for the National Register because of their 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).

Section 106 also requires that the Commission seek concurrence with the California State Historic Preservation Officer (California SHPO) on any finding involving effects or no effects on historic properties. If TCPs have been identified, section 106 also requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

If existing or potential adverse effects have been identified on historic properties, the applicant needs to develop an HPMP to seek to avoid, reduce, or mitigate the effects. Potential effects that may be associated with a hydroelectric project include any project-related effects associated with the day-to-day operations and maintenance of the project after issuance of a new license. During development of the HPMP, the applicant should consult with the Commission, Advisory Council, California SHPO, Native American tribes, and Forest Service. In most cases, the HPMP would be implemented by execution of a PA that would be signed by the Commission, Advisory Council (if it chooses to participate), California SHPO, and other consulting parties.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed new license within a project's APE. The APE is determined in consultation with the California SHPO and is

defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. In this case, the APE for the Middle Fork 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 for the proposed project is defined as the land within 200 feet of the existing project boundary and encompassing the following:

- project facilities and features;
- project recreation facilities or features; and
- proposed project facilities or features, or disturbance areas (e.g., construction and staging areas), associated with the Hell Hole Seasonal Storage Increase Improvement area.

The proposed project area above project tunnels is excluded from the APE because there are no surface activities associated with the project anticipated in this area.

PCWA consulted with the Tahoe National Forest, the Eldorado National Forest, Native American Tribes, and members of the Cultural Resources Technical Working Group to define the APE. The California SHPO concurred with this definition (letter from M.F. Donaldson, SHPO, California State Parks, Sacramento, CA, to A. Fecko, Resource Planning Administrator, PCWA, Auburn, CA, February 23, 2010).

Cultural History Overview

The cultural chronology of this part of the Sierra Nevada was initially proposed by Heizer and Elsasser in the early 1950s (Heizer and Elsasser, 1953, as cited by PCWA, 2010d). These researchers defined two archaeological complexes for the region stretching back nearly 4,000 years. The Martis Complex (2,500 to 1,500 years before present [BP]) was characterized by a preference for basalt as a raw material for bifaces and rough projectile points, base finger-held drills or punches, a rare use of chert and obsidian for stone tools, the use of manos and metates, and an emphasis on the hunting of large game. The Kings Beach Complex, which emerged about 1,300 years ago, and was characterized by a preference for obsidian as a tool stone and the rare use of basalt, the production of small projectile points, the absence of drills, the use of bedrock mortars for food processing, and a shift to a reliance on seed processing and fishing.

Subsequent research attempted to build upon and refine the Martis and Kings Beach Complex chronology. Elston (1971, as cited by PCWA, 2010d) identified a "pre-Martis" culture called the Spooner Complex (7,000 to 2,000 BP) that represented habitation of higher elevations within the Sierra Nevada by groups relocating from the western Great Basin during the Altithermal. Elston also recommended a revision of the larger Martis Complex into two phases. Phase 1 (3,000 to 2,000 BP) was characterized by Elko series, Martis series, and Sierra stemmed triangular projectile points. During

Phase 2 (2,000 to 1,500 BP), smaller stemmed and triangular points were more common with an increased use of chert and obsidian toolstone. Additionally, Phase 2 was characterized by the introduction of bedrock mortars and a decrease in the use of manos and metates.

In 1977, Elston and others suggested additional refinement of the Martis Complex into three phases (Elston et al., 1977, as cited by PCWA, 2010d). Early Martis (4,000 to 3,500 BP) was characterized by contracting stem Elko and Martis series projectile points. Middle Martis (3,500 to 2,500 BP) was represented by Steamboat points and Late Martis (2,500 to 1,500 BP) was characterized by notched and eared Martis and Elk series points. Later research however, again suggested two phases: Early Martis (5,000 to 3,000 BP) and Late Martis (3,000 to 1,500 BP).

A more recent chronology for the western Sierra Nevada was proposed by Jackson and Ballard (1999, as cited by PCWA, 2010d). These researchers identified three periods dating from 3,200 BP to 250 BP. The Early Sierran Period is characterized in the western Sierra by dart points and the introduction of the bow and arrow, millingslabs and handstones, a decrease in obsidian production, and the onset of an acorn-based economy at about 2,000 BP. The Middle Sierran Period (1,400 to 600 BP) saw the widespread use of the bow and arrow in both California and the Great Basin and small Gunther Series projectile points. Technological toolkits for acorn processing included both boulder and bedrock mortars, millingslabs, and handstones used as pestles. The Late Sierran Period (1,000 to 250 BP) was characterized by an intensive specialized use of the western Sierra Nevada. While the acorn-based economy was still strong, there was a diminished focus on seeds, hunting of large and small fauna, seasonal use of middle and higher elevation resources, and year-round occupation of lower elevation sites. During this time, Gunther Series projectile points were generally abandoned, and Desert Series points were introduced.

The project area is located within the ethnographic territories of the Hill Nisenan (or Southern Maidu) and the Washoe. At the time of European-American contact, the Nisenan occupied the drainages of the Yuba, Bear, and American Rivers and the lower reaches of the Feather River, from the Sacramento River east to middle and high elevations of the Sierra Nevada. The Washoe inhabited the area east of the crest of the Sierra Nevada to Carson Valley, and from the Walker River north to Honey Lake (PCWA, 2011) but traveled to the western Sierras to gather resources.

Nisenan tribelets were governed by a chief or headman with political control over villages within the tribelet. Foothill and mountain tribelets had up to 300 people and each had its own specific land boundaries. Villages were generally located below 2,500 feet in elevation but close to a water source. Families stayed in the villages during the winter months, but smaller groups traveled to higher elevation base camps to hunt and gather in the warmer seasons. The Nisenan practiced communal hunting drives for large game, and exploited salmon runs through the use of snares, traps, and nets. Acorns were stored in granaries. Key resources such as acorns, salmon, and deer were “ritually managed” to

ensure success and equal distribution. Typical Nisenan structures were conical bark houses with thatched roofs.

Washoe community structure consisted of a village or "bunch" of varying size. Winter camps were the basis for a bunch, but nearby villages could be included as well. Two lodging structures were common: a conical winter house like that used by the Nisenan, and a summer brush house, often similar to a windbreak. Unlike the Nisenan, the household was the main economic and political unit, and bunches did not control natural resources. Instead, individual families had certain inherited rights to plant gathering locations, fishing traps, and hunting of certain animals.

The Washoe calendar was divided into 3 seasons or "years": the fishing year, the gathering year, and the hunting year. The fishing year began in early spring when small groups would travel to Lake Tahoe to fish. Some in the party would later bring fish back to the winter village. As the weather warmed, other villagers would move to the lake, and by late June, most Washoe would be found there. This was a time of great social interaction. The gathering season started in the summer with individual family units moving toward the western slope of Sierra Nevada lowlands to gather plant resources. Plant gathering required almost constant movement of family groups. By the end of summer, some family groups had moved back to the lake while others continued to exploit plant resources and hunt deer while waiting for the onset of the acorn harvest. The gathering year ended with the pinõn harvest, which was a main winter staple. The pinõn harvest brought many families back together again and was a time of ceremonial activity. The hunting year began in late summer and lasted until first snow. Communal drives for large game including deer and antelope were organized; smaller game such as rabbits, birds, and other animals were also taken.

Although the Nisenan and the Washoe were different in their organizational structure, there were several similarities. Both groups exploited seasonal resources and had similar flaked and ground stone tool technologies including knives, arrow and spear points, clubs, arrow straighteners, scrapers, pestles, bedrock mortars, metates, pipes, and charms. Both also constructed semi-subterranean earth lodge roundhouses for ceremonial use and communal gatherings. The Nisenan and the Washoe frequently interacted for trade and ceremonial purposes, but also conflicted over territories and resources. However, while sometimes hostile, their relationship was generally described as friendly.

The first expeditions by Euro Americans into the area were either trappers or other men exploring the area, and Spanish explorers. Spanish exploration of the Central Valley did not begin until the late 1700s and did not reach the Sierra Nevada until the early 1800s.

In the 1840s, Sutter's Fort on the Sacramento River was the main historic settlement in the area, although individual ranches were located on the Bear River. The discovery of gold at Sutter's Mill on the American River in 1848 led to the "gold rush" in northern California and a major increase in population. Shortly thereafter water diversion

structures were common, followed by drift mining and hydraulic mining. Hydraulic mining activities were halted in 1884 due to environmental impacts.

During the 19th century, the French Meadows and Hell Hole areas were primarily used for seasonal grazing by ranchers residing in the Central Valley. Logging also occurred at French Meadows and in the Forest Hill Divide area, but was limited in the vicinity of Hell Hole because of its remoteness and inaccessibility. Until the construction of the Forest Hill and Mosquito Ridge roads in the early 20th century, there was no logging in areas of higher elevation in the project vicinity.

Hydroelectric development in the region began in the late 1800s with the construction of the Folsom powerhouse on the American River in 1895. The increased need for water and power in California resulted in the California State Water Resources Act in 1945, and the creation of the Nevada Irrigation District and ultimately the PCWA in 1957. Construction of the project began in 1963 but in 1964 the uncompleted Hell Hole dam breached. The project was completed in 1967.

Previous Cultural Resources Investigations

In preparation for the pre-application document, PCWA researched archival, unpublished literature and published sources that provided information about previous cultural resource surveys undertaken within the project area. Existing information was also obtained from the Forest Service, Eldorado National Forest, Tahoe National Forest, California Historical Resources Information System, United Auburn Indian Community, Shingle Springs Rancheria, Washoe Tribe of Nevada and California (Washoe Tribe), Todd Valley Miwok-Maidu Cultural Foundation, Colfax-Todd Valley Consolidated Tribe, and the Placer County Historical Society (PCWA, 2007b).

According to research undertaken for the project pre-application document (PCWA, 2007b), previous cultural resource studies of the project area have been limited. The earliest were a study conducted for the project in 1965 (Rackerby, 1965, as cited by PCWA, 2007b) and studies for the Auburn Dam Project. A total of 87 previously recorded archaeological sites were identified in the project vicinity including 47 prehistoric sites, 35 historic-era sites, 3 sites with both prehistoric and historic components, 1 cemetery, and 1 site identified as "uncertain (historic?)." A total of 41 of these sites were located on lands administered by the Tahoe National Forest, 37 were situated on lands administered by the Eldorado National Forest, and the remaining sites were located on other privately owned lands. The prehistoric sites consisted of lithic scatters and bedrock mortars, although midden sites and one petroglyph site was also identified. The historic-era sites generally consist of foundations, ditches, and mining sites.

Identified Resources

Archaeological and Historic-Era Resources

Between 2006 and filing of its final license application, PCWA conducted record searches and annual fieldwork to document archaeological and historic-era resources within the project APE. A series of reports was prepared that provided details of these efforts and study results. Two inventory reports were filed with PCWA's Pre-Application Document (2005 and 2006 study reports), and two inventory reports were filed with the license application (2007 and 2008 study reports). Two additional reports contained the results of National Register evaluations (PCWA, 2010d, 2011g). In its application, PCWA identified a total of 44 archaeological and historic-era properties within the project study area 2011a). These resources include prehistoric archaeological sites, historic buildings, structures, objects, and sites, and isolated artifacts. However, PCWA stated that only 34 of these resources are situated within the boundaries of the APE; the other 10 are located in the vicinity of the project, but outside of the APE (PCWA, 2011a). In May 2011, PCWA affirmed that only 34 properties were located within the APE (2011e), but of these, one was determined to be of recent origin (PL-02) and another was a natural feature (FS-05-17-54-228), bringing the total count of archaeological and historic-era resources in the APE to 32 properties. In November 2011, PCWA identified five more resources within the APE (FS-05-03-53-372, FS-05-03-55-684, FS-05-03-55-689, FS-05-03-55-690, and FS-05-17-54-495) bringing the total site count to 37 properties (PCWA, 2011d).

Table 38 describes the 37 archaeological and historic-era resources documented within the APE, including 31 sites and/or features (4 newly identified and 27 previously recorded), five isolated finds, and the Middle Fork American River Hydroelectric Project system features. The four newly identified sites are primarily mining debris and features, but also include a fire ring of unknown age. The 27 previously recorded sites include Native American lithic scatters, bedrock mortar sites, petroglyph sites, historic roads and ditches, and other historic mining-related resources. Isolated finds include a total of four lithic flakes (three at a single location), one piece of unifacially worked basalt, a basalt core, and a historic mining adit (PCWA, 2011d).

In its initial National Register evaluation report (PCWA, 2010d), PCWA identified 17 resources that it believed could be potentially affected by project operation and maintenance activities (PCWA, 2010d). Two of these resources (FS-05-03-53-64 and FS-05-03-53-65) had been previously determined to be eligible for listing on the National Register by the Forest Service, and a third site (FS-05-17-54-370) had been determined ineligible. PCWA evaluated the remaining 14 archaeological sites to determine if they were eligible for listing. These sites included five Native American sites, one Native American site with a historic component, and eight historic-era resources. Of these, two sites (FS-05-03-55-682, and FS-05-03-55-201) were recommended as eligible for listing (PCWA, 2010d). The remaining 12 sites were recommended as ineligible.

Table 38. Archaeological and historic-era resources located within the Middle Fork American River APE (Source: PWCA, 2011d, as modified by staff).

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
FS-05-03-53-64	P	Native American site: bedrock mortars and flake scatter	Eldorado National Forest	Determined eligible (per Forest Service)	Recreation use (trampling, vandalism, collection, damage); recreation maintenance activities	Public and employee education, monitoring, consultation, avoidance
FS-05-03-53-65	P	Native American site: 13 bedrock mortars, 3 milling slicks, petroglyphs, dense lithic scatter	Eldorado National Forest	Determined eligible (per Forest Service)	Recreation use (trampling, vandalism, collection, damage); recreation maintenance activities	Public and employee education, monitoring, consultation, avoidance
FS-05-03-53-371	H	Historic dirt road and bridge footings	Eldorado National Forest	Unevaluated	None	None
FS-05-03-53-372	H	Remains of historic mining settlement	BLM	Recommended ineligible; pending California SHPO consultation	Project operation and maintenance activities	None
FS-05-03-53-373	H	Remains of historic road	Eldorado National Forest	Unevaluated	None	None

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
FS-05-03-53-374	H	Historic mining ditch	Eldorado National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-03-53-375	P	Native American site: bedrock mortar and lithic scatter	Eldorado National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-03-55-201	P	Native American site: bedrock milling features with pestles. Flake scatter originally recorded but could not be relocated during 2008 surveys.	Eldorado National Forest	Determined eligible (June 22, 2010)	Recreation use (trampling, vandalism, collection, damage); recreation maintenance and removal activities; trail maintenance	Public and employee education, monitoring, consultation, avoidance
FS-05-03-55-681	PH	Native American site; sparse lithic scatter and tobacco tin	Eldorado National Forest	Unevaluated	None	None
FS-05-03-55-682	P	Native American site: petroglyph	Eldorado National Forest	Determined eligible (June 22, 2010)	Recreation use (trampling, vandalism, collection, damage); removal of recreation facilities; wave action, deterioration	Additional survey, public education, monitoring, consultation, avoidance

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
FS-05-03-55-684	P	Reported Native American site; petroglyph	Eldorado National Forest	Unevaluated	Reservoir drawdown for operation and maintenance purposes (site could not be field-verified)	Additional survey
FS-05-03-55-689	P	Reported Native American site; lithic scatter, bedrock mortar, possible hearth feature	Eldorado National Forest	Unevaluated	Reservoir drawdown for operation and maintenance purposes (site could not be field-verified)	Additional survey
FS-053-55-690	P	Lithic and groundstone scatter, bedrock mortars, projectile points	Eldorado National Forest	n/a (included in FS-05-03-55-201, which is eligible for listing)	See FS-05-03-55-201	n/a
FS-05-17-54-06	P	Native American site: Lithic scatter	Tahoe National Forest	Unevaluated	None	None
FS-05-17-54-116	P	Native American site: lithic scatter and bedrock mortars (Combined with FS-05-17-54-370)	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
FS-05-17-54-370	P	Native American site: lithic scatter (Combined with FS-05-17-116)	Tahoe National Forest	Determined not eligible (per the Forest Service)	n/a	None
FS-05-17-54-400	P	Native American site: bedrock mortars and lithic scatter	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-17-54-445	H	Historic Lambert Ditch	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-17-54-466	H	Historic mining site	Tahoe National Forest	Unevaluated	None	None
FS-05-17-54-467	P	Possible Native American site; ambiguous housepit	Tahoe National Forest	Unevaluated	None	None
FS-05-17-54-468	P	Possible Native American site; previously identified as a natural feature, re-evaluated in 2008 and determined to be a possible mortar.	Tahoe National Forest	Unevaluated	None	None

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
FS-05-17-54-476	H	Historic Ralston Ditch	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-17-54-478	H	Historic mining ditch	Tahoe National Forest	Recommended ineligible; pending California SHPO consultation	Recreation	None
FS-05-17-54-479	H	Remains of historic road	Tahoe National Forest	Unevaluated	None	None
FS-05-17-54-480	H	Historic mining ditch	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-17-54-481	H	Historic stream diversion dam	Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None
FS-05-17-54-495	H	Historic mining ditch	Tahoe National Forest	Evaluation in progress	Road maintenance and trail upgrades	To be determined; interim employee education, avoidance, monitoring

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
PL-03	H	Historic mining site consisting of tailings piles, several trash scatters, and building foundations	Private property	Unevaluated	Gage maintenance	National Register evaluation
PL-15	H	Historic can and debris scatter (isolated artifacts)	Tahoe National Forest	Unevaluated	None	None
PL-19	U	Old fire ring; age unknown	Eldorado National Forest	Unevaluated	Trail maintenance	National Register evaluation
PL-20	H	Historic mining ditch	Eldorado National Forest	Determined not eligible (June 22, 2010)	n/a	None
ISO-01	P	Native American isolate: basalt core	PCWA	Unevaluated	None	None
ISO-02	P	Native American isolate: basalt uniface	PCWA	Unevaluated	None	None
ISO-04	P	Native American isolate: basalt flake	Tahoe National Forest	Unevaluated	None; located in previously disturbed area	None

Resource Number	Type[a]	Description	Land Jurisdiction	National Register Status	Potential Project Effects as Identified by PCWA	Proposed Site Treatment
ISO-05	H	Historic isolate: mining adit	Tahoe National Forest	Unevaluated	None	None
ISO-06	P	Native American isolate: three chert flakes	Eldorado National Forest	n/a (included in FS-05-03-55-201, which is eligible for listing)	See FS-05-03-55-201	n/a
MFP	n/a	Middle Fork American River Hydroelectric Project	Eldorado National Forest and Tahoe National Forest	Determined not eligible (June 22, 2010)	n/a	None

[a] P = Prehistoric, H = Historic, PH = Prehistoric/Historic, U = Unknown.

In June 2010, the California SHPO concurred with all of these recommendations but inadvertently excluded site FS-05-17-54-480 in its list of ineligible resources (letter from M.W. Donaldson, California SHPO, California State Parks, Sacramento, CA, to A. Fecko, Resource Planning Administrator, PCWA, June 22, 2010).

In its initial National Register evaluation report, PCWA (2010d) also evaluated the eligibility of the Middle Fork Project system facilities. PCWA concluded that because the system was constructed in the 1960s, it is not a distinctive example of hydroelectric design or construction, and is not associated with the engineering work of a significant individual, the system does not meet the criteria necessary to be eligible for listing on the National Register as a historic district, nor are its individual components eligible (PCWA, 2010d). In its June 2010 letter, the California SHPO concurred.

In its subsequent National Register evaluation report (PCWA, 2011g), PCWA evaluated two additional resources (FS-05-03-53-372 and FS-05-17-54-478) that could be potentially affected by project operation and maintenance activities and recommended that they are ineligible. PCWA states that a copy of the evaluation report will be provided to the California SHPO for review and that concurrence with these recommendations will be requested.

In its final HPMP (PCWA, 2012), PCWA stated that National Register evaluation of an additional resource (FS-05-17-54-495) is currently in progress and that two other resources (FS-05-03-55-690 and ISO-06) were determined to be within the boundaries of FS-05-03-55-201, which is eligible for listing.

The remaining 17 resources within the APE remain unevaluated and potentially eligible for listing on the National Register.

Potential Traditional Cultural Properties

Through written correspondence and meetings, PCWA consulted with a total of seven tribes throughout the relicensing process to obtain their input and to identify any particular locations of concern. These tribes included the Auburn Rancheria (United Auburn Indian Community), Colfax-Todds Valley Consolidated Tribe, Washoe Tribe, Shingle Springs Rancheria, Miwok Tribe of El Dorado Rancheria, T'si-Akim Maidu, and Todds Valley Miwok-Maidu Cultural Foundation. The Colfax-Todds Valley Consolidated Tribe identified one location within the APE that is of traditional importance to the tribe (letter to PCWA, Auburn, CA, from L.L. Suehead, Chairwoman, Colfax-Todds Valley Consolidated Tribe, Auburn, CA, filed May 13, 2011). This area was described as sacred, and is currently being used by some tribal members. In September 2010, PCWA and the Colfax-Todds Valley Consolidated Tribe conducted a site visit to identify the location of this resource and to discuss any potential project-related effects.

The United Auburn Indian Community of the Auburn Rancheria (Auburn Rancheria) expressed concern with regard to archaeological site FS-05-03-55-682 (letter to A. Fecko, Resource Planning Administrator, PCWA, Auburn, CA, from M. Guerrero,

Cultural Resources Specialist, Auburn Rancheria, Auburn, CA, filed May 13, 2011). The tribe also expressed concern about potential effects on lifeways, cultural sites, and landscapes that may be of traditional importance (letter to A. Fecko, Resource Planning Administrator, PCWA, Auburn, CA, from G.S. Baker, Tribal Administrator, Auburn Rancheria, Auburn, CA, filed July 25, 2011).

The Washoe Tribe expressed concern regarding archaeological resources that could be exposed during a reservoir drawdown for operation and maintenance purposes, but it did not identify any other specific locations of traditional use or concern (letter to B. Bell, PCWA, Auburn, CA, from D. Cruz, Tribal Historic Preservation Officer, Washoe Tribe, Gardnerville, NV, filed May 13, 2011).

PCWA states that, to date, no traditional plant gathering or collection areas of importance to Native American tribes have been identified in the project APE (PCWA, 2011d).

3.3.6.2 Environmental Effects

Project-Related Effects on Cultural Resources

Project-related effects on cultural resources within the APE are likely to occur from project operations and maintenance, use and maintenance of project roads, recreation, vandalism, and modifications or repairs to project facilities. Project effects are considered to be adverse when an activity may alter, directly or indirectly, the characteristics of a historic property that qualify the property for inclusion in the National Register. If adverse effects are found, such effects would need to be resolved in consultation with the California SHPO, and with other parties. PCWA identified several different types of project effects, most of which are related to recreational use.

The project vicinity is popular for recreational activities such as camping, hiking, fishing, horseback riding, picnicking, swimming, boating, hunting, and OHV and snowmobile use, and other activities. Recreational use can result in intentional vandalism of cultural features and the collection of artifacts. Inadvertent damage to cultural resources can also result from foot and vehicle traffic, both by visitors and maintenance personnel. There are 18 developed recreation areas within the project APE including campgrounds, day-use areas, and boat launch facilities. Improved hiking trails are also present. Sites in the vicinity of these areas, others located in proximity, and previously unidentified resources that may be located within recreation areas may also be affected by maintenance, rehabilitation, construction, and facility removal activities including the proposed removal of Upper Hell Hole Campground (see section 3.3.5, *Recreational Resources*).

Operation and maintenance of the project's hydroelectric facilities may also affect significant cultural resources. Hell Hole reservoir captures or diverts winter and spring runoff. During the summer, fall, and early winter, the reservoir is drawn down. Project operations are closely tied to spring runoff and can vary from year to year. However, the

reservoir generally reaches full capacity in June and is at its lowest elevation in December through February (see figure 5). Fluctuation in reservoir levels can result in erosion and deterioration of shoreline or submerged archaeological resources and/or petroglyph features. Further, these resources can be subject to vandalism when they are exposed during drawdown or low elevation periods.

In its final HPMP, PCWA identified four archaeological resources within the project's APE that are both eligible for listing on the National Register and are subject to project-related effects (FS-05-03-53-64, FS-05-03-53-65, FS-05-03-55-201[including FS-05-03-55-690 and ISO-06], FS-05-03-55-682; PCWA, 2012). Table 38 describes site-specific effects. All four of these sites are experiencing or are susceptible to recreational effects; two may be affected by removal of recreation facilities; and one is potentially affected by erosion, deterioration, and damage as a result reservoir fluctuation. Two additional sites (FS-05-03-55-684, FS-05-03-55-689) were reported to be within the APE but were inundated during field inspections in 2011 (PCWA, 2011d). These two sites remain unevaluated for the National Register, and their condition is unknown. An additional resource, FS-05-17-54-495, a historic mining ditch, would be affected by road maintenance and trail upgrades and is currently being evaluated for the National Register. Finally, in its comments on the draft EIS filed October 1, 2012, PCWA stated that operation of the project could affect two unevaluated resources (PL-03 and PL-19). Maintenance of a USGS gaging station could affect site PL-03, and trail maintenance could affect site PL-19. The remaining 26 archaeological resources within the project APE had either no project-related effects (13 sites), had been determined ineligible for the National Register (11 sites), or were recommended ineligible with California SHPO concurrence pending (2 sites).[31]

In its letter filed July 25, 2011, the Auburn Rancheria expressed concern regarding resources located within the reservoir drawdown zones during project operation and maintenance, wave action and deflation occurring along reservoir high water lines and commented that sites that are eligible for listing on the National Register within reservoir fluctuation zones are being adversely affected. The tribe stated that these properties would require data recovery as mitigation. Only one location of traditional cultural importance was identified by the Colfax-Todds Valley Consolidated Tribe. A detailed description of this resource was not provided, but potential project effects include the deposition of slide materials onto the site from adjacent project roads, the removal of

[31] In its June 22, 2010, letter, the California SHPO discusses 14 sites that were evaluated for listing on the National Register and two sites that were recommended as eligible. The letter states that "the remaining 12 sites are ineligible for the NRHP. They are as follows…" but inadvertently only lists 11 sites. Site FS-05-17-54-480 was recommended as ineligible in PCWA's letter, but it was not included in the California SHPO's list of ineligible resources. However, we agree with PCWA's recommendation that this site is not eligible for listing on the National Register.

hazard trees in the vicinity of the site, and recreational effects on this resource. Additionally, although participating tribes did not identify any locations within the project APE that are currently being used to gather plant resources for traditional use, routine management of vegetation and pests within the project area using herbicides and pesticides could also affect gathering areas that may be present, but have not yet been identified.

Historic Properties Management Plan

PCWA prepared a draft HPMP to address project effects in consultation with the Forest Service and participating tribes. Meetings to discuss the plan were held on June 2, 2010; June 25, 2010; and July 9, 2010. Comments on the draft HPMP were submitted by the Washoe Tribe, the Auburn Rancheria, the Colfax-Todds Valley Consolidated Tribe, and the Eldorado National Forest (filed May 13, 2011). PCWA revised the draft HPMP to reflect comments received and filed the revised draft HPMP with its license application. A second revised version of the draft HPMP was filed on May 13, 2011 (PCWA, 2011b). On August 5, 2011, the Forest Service issued preliminary 4(e) conditions for the project. Condition No. 41 calls for PCWA to finalize the HPMP and submit it for Forest Service approval. Upon completion of the plan, it would be included as part of the Forest Service final conditions. Additionally, Condition No. 42 provides requirements for unanticipated archaeological or paleontological discoveries that could be identified on NFS lands during project activities. On November 30, 2011, PCWA filed a draft final Alternative 1HPMP (PCWA, 2011d) prepared in consultation with the Forest Service. By letter filed January 17, 2012, the Tahoe National Forest and Eldorado National Forest approved the draft final Alternative 1 HPMP (and stated that it would be filed as a modified preliminary term and condition). No documentation of California SHPO concurrence on the draft final Alternative 1 HPMP had been received as of the issuance of this final EIS.

The draft final Alternative 1 HPMP was prepared in consideration of a document prepared in consultation with the Commission titled, *Guidelines for the Development of Historic Properties Management Plans for FERC Hydroelectric Projects* (FERC and Advisory Council, 2002). In addition to addressing Commission staff's four recommendations provided above in its draft final Alternative 1 HPMP, PCWA proposed to undertake a variety of general measures for implementing the HPMP and managing cultural resources including:

- appointment of an HPMP coordinator who would be responsible for overseeing implementation of the HPMP and coordinating consultation activities;
- development of public educational signs prepared in consultation with the Forest Service and Native American tribes and to be placed at project recreation facilities;

- implementation of annual employee education program, including cultural resources training, informational materials, and field meetings;
- implementation of design and planning measures intended to avoid affecting National Register-eligible resources;
- implementation of future cultural resources surveys during periods of low reservoir levels;
- implementation of a plan to monitor during ground-disturbing activities and monitor each resource within the APE every 5 years. Representatives of interested Native American tribes would be invited to participate in all monitoring activities;
- implementation of a site stewardship program with representatives of interested Native American tribes;
- implementation of protocols for the treatment of human remains that may be identified during project activities;
- implementation of a plan to address the treatment of inadvertent discoveries of cultural materials;
- procedures for pre-action environmental review of activities not addressed during the relicensing NEPA process;
- implementation of a plan to address paleontological resources that may be identified on federal lands;
- preparation of an annual progress report documenting HPMP implementation provided to the Tahoe National Forest, Eldorado National Forest, other land managers, and interested tribes;
- HPMP review and revision every 5 years in consultation with the Commission, Eldorado National Forest, Tahoe National Forest, the California SHPO, and interested Native American tribes;
- a process for dispute resolution; and
- A schedule for HPMP implementation.

In its draft final Alternative 1 HPMP, PCWA stated that all heavy maintenance and non-routine recreation facility activities in the vicinity of National Register-eligible sites FS-05-03-53-64, FS-05-03-53-65, FS-05-03-55-201, and FS-05-03-55-682 would be designed in consultation with the Forest Service and participating tribes to ensure avoidance of effects and that 30-foot buffer zones would be established around each resource.

The draft final Alternative 1 HPMP did not provide specific treatment for potential erosion at sites FS-05-03-55-682, FS-05-03-55-684, FS-05-03-55-689. However, PCWA

proposes to conduct a formal archaeological survey of Hell Hole reservoir once over the term of any new license and during periods of low water levels (4,544–4,445 feet mean sea level) to determine if these sites and any additional cultural resources may be present in areas typically submerged by the reservoir. Additionally, if reservoir levels extend below the lowest minimum pool elevation of 4,341 feet mean sea level, PCWA would also conduct additional surveys at that time.

In its draft final Alternative 1 HPMP (2011d), PCWA identified project-related effects on the location identified as culturally significant by the Colfax-Todds Valley Consolidated Tribe. To address these effects, PCWA proposed to (a) remove material from an adjacent road that was deposited on the site during a slide event, (b) implement a site monitoring program for project activities and improper recreational use, and (c) consult with the Forest Service prior to removing hazard trees in the vicinity of the location. Further, PCWA's Alternative 1 VIPMP (see section 3.3.3.2, *Terrestrial Resources*) includes a requirement to avoid spraying or otherwise affecting any traditional plant gathering areas if they are identified in the future.

In the draft EIS, we recommended that PCWA revise its draft final Alternative 1 HPMP to include: (1) requirements for National Register evaluation of all currently unevaluated resources subject to unavoidable project-related effects. These effects would include those associated with reservoir drawdowns for operation and maintenance purposes (i.e., FS-05-03-55-684 and FS-05-03-55-689); recreation activities, including trail maintenance and alignment (PL-03 and PL-19); and road construction (FS-05-03-55-495) and documentation of California SHPO concurrence with all National Register recommendations[32]; (2) a plan for assessment of project effects on any properties that are determined to be eligible for listing on the National Register; (3) a plan for the curation of any recovered archaeological materials; and (4) a plan to develop mitigation measures in consultation with the California SHPO, Forest Service, and participating tribes for all eligible properties where effects are adverse. On September 21, 2012, PCWA filed a final HPMP that addressed all of our recommendations from the draft EIS (PCWA, 2012). No documentation of California SHPO concurrence on the final HPMP has been received as of the issuance of this final EIS.

Our Analysis

The general treatment measures provided in PCWA's final HPMP (PCWA, 2012), including avoidance and monitoring of significant cultural resources, public and employee education, consultation, curation, and reporting, are all adequate to ensure that most cultural resources within the project APE are appropriately managed and protected throughout the term of any license issued for the project. Additionally, PCWA's proposed plans to further identify cultural resources within the project APE, evaluate

[32] In its October 2012 comments on the draft EIS, PCWA clarified project effects at these sites; this EIS reflects those clarifications in table 38 and in the text as appropriate.

them for listing on the National Register, and develop any necessary mitigation measures to resolve any project-related adverse effects on eligible properties are also adequate.

Archaeological resources within or along the shorelines of project reservoirs may be adversely affected by erosion or damage as a result of fluctuating reservoir levels and/or exposure during drawdown periods. PCWA identified three archaeological sites as subject to potential effects associated with reservoir drawdowns for operation and maintenance purposes at Hell Hole reservoir (FS-05-03-55-682, FS-05-03-55-684, and FS-05-03-55-689). One of these sites is known to be eligible for listing on the National Register, and two are unevaluated because they were submerged during field studies. PCWA proposes additional surveys of areas that may be exposed during reservoir drawdown for operation and maintenance purposes in its final HPMP. If any resources are identified during the Hell Hole reservoir survey, they would be evaluated for listing on the National Register according to the final HPMP. PCWA also proposes to evaluate two additional sites (PL-03 and PL-19) for National Register eligibility, and site FS-05-17-54-495 is currently being evaluated. For any site within the APE that is determined eligible for listing on the National Register, the final HPMP states that appropriate mitigation measures would be developed in consultation with the California SHPO, Forest Service, and tribes for any project-related adverse effects. Any resources that are subject to project-related effects, including those that may be recorded below the high water line at project reservoirs, should be evaluated for the National Register, which may include test excavation. If test excavation is required at any site within the project APE, the final HPMP includes a plan for the curation of recovered materials. Pursuant to section 106, project effects on eligible sites must be assessed, and measures to resolve adverse effects must be developed in consultation with the California SHPO, and as appropriate, the Forest Service, BLM, and participating tribes. If site FS-05-17-54-495 is determined to be eligible for listing on the National Register, this site would also require an effects assessment and development of treatment measures if effects are adverse. We find PCWA's approach to resolving any project-related adverse effects on eligible properties, specified in the final HPMP, to be acceptable. Implementing the final HPMP would ensure compliance with section 106.

In its draft Alternative 1 HPMP and final HPMP, PCWA recommends that two sites (FS-04-17-54-372 and FS-05-17-54-478) are not eligible for listing on the National Register; however, no documentation of California SHPO concurrence regarding these recommendations is provided. PCWA states that a copy of the evaluation report will be provided to the California SHPO for review and that concurrence with these recommendations will be requested. Upon completion of California SHPO consultation in this regard, PCWA states that it will forward copies of California SHPO correspondence to the Commission. Receipt of California SHPO concurrence would ensure compliance with section 106 and would ensure that these two sites are treated appropriately.

On August 23, 2012, a draft PA was provided to PCWA, the California SHPO, the Advisory Council, the Forest Service, and the seven tribes who were consulted during

relicensing efforts (Auburn Rancheria [United Auburn Indian Community], Colfax-Todds Valley Consolidated Tribe, Washoe Tribe, Shingle Springs Rancheria, Miwok Tribe of El Dorado Rancheria, T'si-Akim Maidu, and Todds Valley Miwok-Maidu Cultural Foundation. Prior to license issuance, the Commission intends to execute a final PA with the California SHPO that would require PCWA to implement the HPMP for the project. Execution of the PA and implementation of the final HPMP would ensure that adverse effects of the project on cultural resources would be appropriately resolved under section 106.

3.3.7 Aesthetic Resources

3.3.7.1 Affected Environment

The landscape of the Middle Fork American River watershed is rural and characterized by steep canyons and rugged terrain with dense forests and woodlands. Aesthetic resources include alpine lakes, rivers, streams, forested areas, wilderness areas, rivers, scenic forest routes, hiking trails, developed campgrounds, vista points, picnic areas, boat ramps, and special interest areas.

Lands affected by the project are managed under the Forest Service Visual Management System. This system establishes three levels of sensitivity: Level 1 for primary travel routes and recreation use areas, where visitors are anticipated to have a high concern for the visual quality; and Levels 2 and 3 for areas that are not heavily used and where users have a moderate or low concern for visual quality. The Forest Service manages Sensitivity Levels 1 or 2 viewsheds for visual quality. PCWA identified 37 Forest Service managed viewsheds in the vicinity of the project and compiled and documented Visual Management System inventory information. PCWA also determined the existing visual condition (EVC) of project facilities as seen in the landscape from Forest Service-managed viewsheds. Based on EVC ratings range from I (ecological changes only), to V (landscape changes are strong and obvious) most facilities have an EVC of II (changes are not visually evident unless pointed out) to III (changes are noticed but do not attract attention and appear as minor disturbances) and a few facilities have EVCs of I and IV (changes may attract some attention but disturbances resemble natural patterns). Management areas described in this section refer to applicable Visual Quality Objectives (VQO):

- Retention—Management activities are allowed, but not evident.
- Partial retention—Management activities may be evident, but not dominate the landscape.
- Modification—Management activities may dominate, should appear natural.

Study report REC 5, *Visual Quality Assessment* (PCWA, 2008c) provides detailed information about the project aesthetic resources.

Duncan Creek Diversion Area

The topography in the Duncan Creek area is moderately steep and vegetation in the area is dominated by mixed conifer and pine stands with riparian species along the stream channel. Rock outcrops can be seen along the immediate perimeter of the Duncan Creek diversion pool. In 2001, the Star Fire burned 17,500 acres including the area in the immediate vicinity of the Duncan Creek diversion dam destroying trees and vegetation on the side slopes near the dam and altering the visual character of the landscape. The management area that includes the Duncan Creek diversion has a Modification VQO.

French Meadows Reservoir Area

The landscape surrounding French Meadows reservoir is characterized by moderately steep hillsides, which are densely vegetated. The reservoir and surrounding side slopes include granitic bedrock and willows occur along drainages. The Star Fire also burned through this area and the visual effects are still evident.

The management area that includes the French Meadows reservoir has a Retention VQO. Developed recreation facilities surrounding French Meadows reservoir are to be managed to meet the Partial Retention VQO.

Hell Hole Reservoir Area

Hell Hole reservoir is located in the rugged Rubicon River Canyon, which is characterized by steep and rocky slopes, vegetated with brush and mixed-conifers. The reservoir and surrounding side slopes are primarily composed of granite with areas of glacial deposits on the surrounding side slopes. The upper reaches of the reservoir transition into a river canyon environment.

The management area that includes the Hell Hole reservoir has a Retention VQO. Developed recreation facilities surrounding Hell Hole reservoir are to be managed to meet the Partial Retention VQO.

Long Canyon Creek Area

The landscape in the vicinity of the two diversion dams is characterized by U-shaped valleys created by glaciers. Vegetation along the North and South forks of Long Canyon Creek is dominated by mixed conifers and riparian species are found along the stream channel. All the above-ground project facilities associated with the North Fork and South Fork Long Canyon diversions are to be managed to meet the Partial Retention VQO.

Middle Fork Development

The landscape in the vicinity of Middle Fork interbay is moderately steep, entrenched, and confined by narrow V-shaped valleys. The vegetation is comprised of communities dominated by mixed conifer and with some hardwood vegetation on the surrounding hillsides; riparian species occur along the stream channel.

Middle Fork interbay dam and Powerhouse Road are in an area that is managed predominantly for the Modification VQO. The passive microwave reflector station above Middle Fork interbay is in an area managed for the Partial Retention VQO. Project facilities between the river and the Middle Fork powerhouse penstock and butterfly valve house are in an area managed for the Partial Retention VQO. Project facilities at and above the valve house are to be managed to meet the Modification VQO.

Ralston Development

The landscape in the Ralston area is characterized by moderate to steep slopes with elevations ranging from 1,600 to 4,000 feet. Steeply sloping hillsides are characterized by mixed brush hardwood stands and scattered conifers.

Project facilities within this area are managed for the Partial Retention VQO since they are within the foreground view of the Ralston Picnic Area and Ralston afterbay. To the south of the Middle Fork American River, which includes the confluence with the Rubicon River, project facilities are within an area which is to receive interim protection of its Wild, Scenic, or Recreational values until Congress makes a formal designation by law or disposes of the proposal. Lands within this area are to be managed to meet the Retention VQO.

Reservoir Levels

Typical reservoir annual operation results in the capture or diversion of water into Hell Hole and French Meadows reservoirs during the winter and spring (filling period), and drawdown of the reservoirs during the summer, fall, and early winter (release period). Project operation varies from year-to-year based on the timing and magnitude of spring runoff, which is influenced by the amount of the winter snow pack and temperature conditions, as well as precipitation (see figures 4 and 5). Despite the year-to-year variation, both reservoirs typically reach their maximum storage for the year in late spring or early summer. Reservoir levels begin to decline in the summer and continue to decline until the late fall or winter. Reservoir levels are typically at their lowest in January. French Meadows reservoir maximum and minimum operating water surface elevations are 5,262 feet and 5,125 feet, respectively. Hell Hole reservoir maximum and minimum operating water surface elevations are 4,630 feet and 4,340 feet, respectively. Although more shoreline is exposed as water surface elevations at Hell Hole and French Meadows reservoirs recede, this effect is diminished from farther distances where other factors such as lighting, cloud cover, air quality, and vegetation growth influence the view.

Middle Fork interbay water surface elevations typically remain near full pool. Ralston afterbay is primarily used as a regulating facility. As such, water surface elevations may fluctuate on a day-to-day or hour-to-hour basis throughout the year. In general, daily fluctuations at Ralston afterbay do not exceed 6 feet, except during the annual maintenance outage. During the maintenance outage the water surface elevation is considerably lower than under normal operating conditions. Photographs of Ralston

afterbay at high, intermediate, and low water surface elevations indicate there is very little difference between the photographs taken at high and intermediate reservoir levels.

3.3.7.2 Environmental Effects

This section describes the environmental effects on visual resources of the lands within and surrounding the project as well as project reservoirs.

Reservoir Levels

PCWA proposes to increase Hell Hole reservoir level by 6 feet and operate the project with new minimum pool requirements. During the recreation season, PCWA proposes minimum pool requirements at Hell Hole and French Meadows reservoirs that would be the same or higher than what occurs under existing operations. Both reservoirs would be operated within their historic range with minor changes,[33] occurring on a seasonal basis, depending upon water year type (see table 30). Alternative 1 (same provisions as final Forest Service condition no. 38) specifies higher minimum reservoir elevations at Hell Hole and French Meadows reservoirs than what PCWA proposes (see table 30).

Our Analysis

Because of its large size, raising the maximum elevation of Hell Hole reservoir by 6 feet would not be noticeably different from how the reservoir appears to visitors under existing operations.

Under PCWA's proposed operation the reservoirs would not be drawn down earlier in the season as compared to existing operations, regardless of water year type, and would generally remain higher for a longer period of time. Because higher reservoirs would reduce the time when visitors would see a sharply contrasting and unvegetated swath of land encircling the reservoir, this would improve visual resources as compared to existing operations. Alternative 1 specifies higher minimum reservoir elevations than PCWA proposes so this measure would further improve the reservoirs' appearance relative to PCWA's proposal.

Visual Resource Management Plan

PCWA proposes to implement a Visual Resource Management Plan that identifies and describes the measures that PCWA would implement over the term of the new license to maintain or improve the EVC of project facilities with respect to Forest Service objectives, standards, and guidelines. In addition, this plan describes how PCWA would consult and coordinate with the Forest Service when implementing future projects that have the potential to affect visual resources on NFS lands, including modification of existing project facilities or the construction of new project facilities. PCWA would conduct visual condition assessments every 5 years during the term of a new license and

[33] Including raising the maximum elevation of Hell Hole reservoir by 6 feet.

consult with the Forest Service annually to discuss measure implementation. PCWA would consult with the Forest Service and appropriate land management agencies every 5 years to determine a plan revision is necessary. Alternative 1 (same provisions as final Forest Service condition no. 41) also specifies implementing this plan.

Our Analysis

The EVC of most of the project facilities are consistent with established VQOs but some linear features such as dams and powerhouses are not consistent because they dominate the landscape. Through implementing the Visual Resource Management Plan, specific project features and facilities would be modified (e.g., painting, replacing fencing) to make them more consistent with established VQOs resulting in improved visual quality.

PCWA's proposed project includes new facilities and incorporates existing facilities within the project boundary that could be visible components of the project. These include 6-foot crest gates on Hell Hole dam, gages, communication lines; photovoltaic poles and powerlines; Hell Hole dam spillway control building and powerline, an access road to Hell Hole spillway gates, and trails for project access. Because locations have not been determined for some of the gages, photovoltaic poles and trails and because PCWA's proposed development has the potential to affect visual resources on NFS land, establishing a process to evaluate future activities in consultation with the Forest Service, as specified in the plan, would ensure new facilities are designed and constructed to be consistent with agency guidelines.

Regular condition assessments would provide necessary information to determine whether additional treatments would be necessary to achieve VQOs. Additionally, regular consultation about the appearance of project facilities could be included in the agenda of an annual consultation meeting when a broad range of resource topics are discussed. Revising the plan every 5 years, as specified in the plan, seems excessively frequent considering: (1) planned development would be thoroughly reviewed and approved by the Forest Service before implementation; and (2) the plan already identifies several specific actions that would be implemented. A 12-year period for conducting condition assessments and revising the plan would better reflect the periodic need for assessing visual resources and revising the plan.

3.4 NO-ACTION ALTERNATIVE

Under the no-action alternative the project would continue to operate as it has in the past. None of PCWA's proposed measures or the resource agencies' recommendations and mandatory conditions would be required. Sediment would continue to accumulate in the small diversion pools and require periodic removal. Sediment removed from Middle Fork interbay would not be used for gravel augmentation downstream of the interbay dam, and sediment augmentation downstream of Ralston afterbay dam, which currently occurs on a voluntary basis, could be discontinued. The storage capacity of Hell Hole reservoir would not be increased, which could eventually

result in difficulty in meeting increased future water demands. Minimum flows would continue to be either constant on a year-round basis or reflect slight seasonal changes that only marginally mimic the natural hydrograph depending on the stream reach. There would be no pulse flows in the bypassed reaches or scheduled whitewater boating releases in the peaking reach. Existing project-related recreation facilities would continue to be operated and maintained as they are currently. The continued operation of the existing Middle Fork Project facilities would continue to be of importance to water supply, recreation, generation of renewable energy, and minimization of atmospheric pollutants. The continued operation of the existing facilities under the no-action alternative would, on average, result in the annual generation of 1,039.1 gigawatt-hours of clean energy.

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4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Middle Fork American River Project's use of the Middle Fork of the American River for hydropower purposes to see what effect various environmental measures would have on the project's costs and power benefits. Consistent with the Commission's approach to economic analysis, the power benefit of the project is determined by estimating the cost of obtaining the same amount of energy and capacity using the likely alternative generating resources available in the region. In keeping with Commission policy as described in Mead, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.[34]

Our analysis includes: (1) an estimate of the cost of individual measures considered for the protection, mitigation and enhancement of environmental resources affected by the project, and (2) an estimate of the project power benefits for each of the licensing alternatives. To determine the net annual power benefit for each of the licensing alternatives, we compare project costs to the value of the power output as represented by the cost of a likely alternative source of power in the region. For any alternative, a positive net annual power benefit indicates that the project power costs less than the current cost of alternative generation resources and a negative net annual power benefit indicates that project power costs more than the current cost of alternative generation resources. This estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

Table 39 summarizes the economic assumptions and economic information we use in our analysis. Most of the information was provided by PCWA in its license application. We find that the values provided by PCWA are reasonable for the purposes of our analysis. Cost items common to all alternatives include taxes and insurance costs, net investment (the total investment in power plant facilities remaining to be depreciated), estimated future capital investment required to maintain and extend the life of plant equipment and facilities, relicensing costs, normal operation and maintenance cost, and Commission fees.

[34] See *Mead Corporation, Publishing Paper Division*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

Table 39. Parameters for the economic analysis of the Middle Fork American River Project.

Assumption	Value	Source
Period of economic analysis (years)	30	Staff
Current net investment[a]	$0	Staff
Current annual costs including operation and maintenance, and FERC fees[b]	$19,975,490	PCWA
Relicense application costs[c]	$52,100,000	PCWA
Term of financing (years)	20	Staff
Cost of capital (percent)[d]	6.25	PCWA
Discount rate (percent)[e]	8	Staff
Energy rate ($/MWh)[f]	37.69	PCWA
Capacity rate ($/kilowatt-year)[g]	36	PCWA

[a] The net investment was not provided in the license application, so it was not used in this analysis.

[b] Annual costs were derived from exhibit D, section 4(iv) of the license application.

[c] The cost to develop the license application was provided in exhibit D, section 5 of the license application.

[d] The cost of capital was in exhibit E, section 11, table 11-1 of the license application.

[e] The discount rate was not provided in the license application, and was therefore approximated by staff.

[f] The energy rate is the average of the on-peak ($41.66/MWh) and off-peak ($30.07/MWh) rates provided in exhibit D, section 8 of the license application.

[g] The capacity rate was provided in exhibit D, section 5 of the license application.

4.2 COMPARISON OF ALTERNATIVES

Table 40 compares the annual costs and annual power benefits for the three alternatives considered in this EIS: no-action, PCWA's proposal, the staff alternative, Alternative 1, and the staff alternative with mandatory conditions.

Table 40. Summary of annual costs and annual power benefits for the alternatives for the Middle Fork Project (Source: staff).

	No-Action	PCWA's Proposal	Staff Alternative	Alternative 1	Staff with Mandatory Conditions
Authorized installed capacity (MW)	223.753	223.753	223.753	223.753	223.753
Dependable capacity (MW)	223.753	223.753	223.753	223.753	223.753
Annual generation (MWh)	1,039,078	994,444[a]	985,877	985,877	985,877
Annual power value[b, c] ($/MWh)	$47,217,130 45.44	$45,534,870 45.79	$45,211,980 45.86	$45,211,980 45.86	$45,211,980 45.86
Annual costs ($/MWh)	$24,147,960 23.24	$26,232,510 26.38	$26,577,280 26.96	$26,684,410 27.07	$26,706,520 27.09
Power benefit (i.e., power value minus costs) ($/MWh)	$23,069,170 22.20	$19,302,360 19.41	$18,634,700 18.90	$18,527,570 18.79	$18,505,460 18.77

[a] The source of this value is a letter from PCWA filed with the Commission on June 15, 2011.

[b] The power value includes the energy rate of $37.69/MWh and the dependable capacity rate of $36/kilowatt-year.

[c] For each alternative, the capacity value does not change but the decrease in energy production of the alternatives causes a decrease in the dollar value of the power benefit. Although the power value decreases, the generation loss actually increases the power value rate ($/MWh).

4.2.1 No-action Alternative

Under the no-action alternative, the project would continue to operate as it does now. The project generates an average of 1,039,078 MWh of electricity annually. The annual power value of the project under the no-action alternative would be $47,217,130 (about $45.44/MWh). The average annual cost of producing this power would be about $24,147,960 (about $23.24/MWh), resulting in an average annual power benefit of $23,069,170 (about $22.20/MWh). In other words, the project produces energy at a cost that is less expensive than that of currently available alternative generation by $22.20/MWh.

4.2.2 PCWA's Proposal

Under PCWA's proposal, the project would generate an average of 994,444 MWh of electricity annually. The annual power value of the project under PCWA's proposal would be $45,534,870 (about $45.79/MWh). The average annual cost of producing this power would be about $26,232,510 (about $26.38/MWh), resulting in an average annual cost of $19,302,360 (about $19.41/MWh) less expensive than the likely alternative cost of power.

4.2.3 Staff Alternative

The staff alternative includes PCWA's proposal and has the same capacity and energy attributes. Table 41 shows the staff-recommended additions, deletions, and modifications to PCWA's proposed environmental protection and enhancement measures and the estimated cost of each. The project would continue to generate an average of 985,877 MWh of electricity annually. The annual power value of the project under the staff alternative would be $45,211,980 (about $45.86/MWh). The average annual cost of producing this power would be about $26,577,280 (about $26.96/MWh), resulting in an average annual cost of $18,634,700 (about $18.90/MWh) less expensive than the likely alternative cost of power. The staff alternative would reduce the power benefit by about $667,660 (about $0.51/MWh) compared to the project as proposed by PCWA.

4.2.4 Alternative 1

Alternative 1includes PCWA's proposal and has the same capacity and energy attributes. Table 41 shows the staff-recommended additions, deletions, and modifications to PCWA's proposed environmental protection and enhancement measures and the estimated cost of each. The project would continue to generate an average of 985,877 MWh of electricity annually. The annual power value of the project under Alternative 1 would be $45,211,980 (about $45.86/MWh). The average annual cost of producing this power would be about $26,684,410 (about $27.07/MWh), resulting in an average annual cost of $18,527,570 (about $18.79/MWh) less expensive

than the likely alternative cost of power. Alternative 1 would reduce the power benefit by about $774,790 (about $0.62/MWh) compared to the project as proposed by PCWA.

4.2.5 Staff Alternative with Mandatory Conditions

The staff alternative includes PCWA's proposal and has the same capacity and energy attributes. Table 41 shows the staff recommended additions, deletions, and modifications to PCWA's proposed environmental protection and enhancement measures and the estimated cost of each. The project would continue to generate an average of 985,877 MWh of electricity annually. The annual power value of the project under the staff alternative with mandatory conditions would be $45,211,980 (about $45.86/MWh). The average annual cost of producing this power would be about $26,706,520 (about $27.09/MWh), resulting in an average annual cost of $18,505,460 (about $18.77/MWh) less expensive than the likely alternative cost of power. The staff alternative with mandatory conditions would reduce the power benefit by about $796,900 (about $0.64/MWh) compared to the project as proposed by PCWA.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 41 shows the costs for each of the environmental mitigation and enhancement measures considered in the analysis. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

Table 41. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of continuing to operate the Middle Fork Project (Source: staff).

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
Environmental Compliance				
1. Hire additional environmental compliance staff	PCWA, Forest Service, California Fish and Game, staff	$0	$440,640	$440,640[c]
Geology and Soils				
1. Implement the Sediment Management Plan	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$5,770	-$40,840 (cost savings–net of savings and costs)	-$40,380[c]
2a. Implement the Geomorphology/ Riparian Monitoring Plan	PCWA	$0	$44,060	$44,060[c]
2b. Implement the Forest Service Geomorphology/ Riparian Monitoring Plan	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$51,290	$51,290[e]
3. Develop and implement an erosion control plan	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$10,000	$10,000	$10,800[e]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
4. Develop a plan to identify release points when flow conduits need to be drained	Forest Service, California Fish and Game, staff	$10,000	$0	$800[e]
5. Develop and implement a woody debris management plan	Forest Service, California Fish and Game, staff	$15,000	$1,000	$2,200[e]
Aquatic Resources				
1a. Implement the proposed Instream Flow and Reservoir Minimum Pool measure	PCWA	$2,622,830	$1,745,210 (includes $1,682,260 in lost generation [44,634 MWh])	$1,955,260[c]
1b. Implement the Alternative 1 Instream Flow and Reservoir Minimum Pool Measure	California Fish and Game, Interior (Alternative 1)	$2,622,830	$2,068,100 (includes $2,005,147 in lost generation [53,201 MWh])	$2,278,150[d]
1c. Implement the Forest Service Instream Flow and Minimum Pool Measure	Forest Service, staff	$2,622,830	$2,068,100 (includes $2,005,147 in lost generation [53,201 MWh])	$2,278,150[d]
2a. Implement the Flow and Reservoir Monitoring Plan	PCWA	$104,910	$125,900	$134,300[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
2b. Implement the Alternative 1 Streamflow and Reservoir Gaging Plan	Forest Service, California Fish and Game (Alternative 1)	$157,310	$130,090	$142,690[d]
2c. Implement the Alternative 1 Streamflow Gaging Plan, excluding three gages (Rubicon River above Ellicott Bridge, Rubicon River above Ralston powerhouse, and North Fork American River above the American River Pump Station)	Staff	$78,680	$123,800	$130,100[e]
3a. Implement the Water Quality Monitoring Plan	PCWA	$0	$23,610	$23,610[c]
3b. Implement the Forest Service Water Quality Monitoring Plan	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$24,110	$24,110[e]
4a. Implement the Water Temperature Monitoring Plan	PCWA, (Alternative 1)	$58,750	$45,320	$50,030[c]
4b. Implement the Forest Service Water Temperature Monitoring Plan	Forest Service, staff	$58,750	$45,320	$50,030[e]
5a. Implement the Mercury Bioaccumulation Monitoring Plan	PCWA	$0	$17,840	$17,840[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
5b. Implement the Forest Service Mercury Bioaccumulation Monitoring Plan	Forest Service, California Fish and Game (Alternative 1)	$0	$17,840	$17,840[e]
6a. Implement the Fish Population Monitoring Plan, including an entrainment study at Ralston and Oxbow powerhouses	PCWA	$61,900	$72,390	$77,350[c]
6b. Implement the Forest Service Fish Population Monitoring Plan	Forest Service, California Fish and Game, NMFS, staff (Alternative 1)	$35,670	$67,620	$70,480[e]
6c. Develop and implement an entrainment study plan for Ralston and Oxbow powerhouses	Forest Service, California Fish and Game, staff (Alternative 1)	$26,230	$5,250	$7,350[e]
7. Develop a spawning habitat improvement plan for the Middle Fork American River downstream of Ralston afterbay dam	Forest Service, California Fish and Game, Staff	$10,000	$0	$800[e, f]
8a. Implement the Benthic Macroinvertebrate Monitoring Plan	PCWA	$0	$5,880	$5,880[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
8b. Implement the Forest Service Benthic Macroinvertebrate Monitoring Plan	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$6,470	$6,470[e]
9. Annual reporting to the Commission of the status of anadromous fish restoration activities in the American River watershed	NMFS, staff	$0	$5,000	$5,000[e]
10. Develop and implement an aquatic invasive species management plan	Forest Service, staff	$5,000	$0	$400[e]
Terrestrial Resources				
1. Implement the proposed VIPMP	PCWA	$0	$167,950	$167,950[c]
2. Implement the Alternative 1 VIPMP	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$196,290	$196,290[d]
3a. Implement the Foothill Yellow-Legged Frog Monitoring Plan	PCWA	$0	$63,260	$63,260[c]
3b. Implement the Forest Service Foothill Yellow-Legged Frog Monitoring Plan	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$64,720	$64,720[e]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
4a. Implement the Western Pond Turtle Monitoring Plan	PCWA, staff	$0	$20,980	$20,980[c]
4b. Finalize and implement the Western Pond Turtle Monitoring Plan	Forest Service, California Fish and Game (Alternative 1)	$0	$21,790	$21,790[e]
5. Implement the Bald Eagle Management Plan	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$34,620	$34,670	$37,440[c]
6. Develop and implement a bear management monitoring plan	Forest Service, California Fish and Game, staff	$5,000	$0	$400[e]
7. Prepare biological evaluation if future project changes could disturb special-status species	PCWA, Forest Service, California Fish and Game, NMFS	$0	$0	$0[i]
Recreation Resources				
1a. Implement the proposed Recreation Plan	PCWA	(costs of each element itemized below)		
1b. Implement the Alternative 1 Recreation Plan as revised by the plan filed with the final conditions	Forest Service, California Fish and Game (Alternative 1 [as revised])	$0	$0	$0[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
1c. Revise and resubmit the Alternative 1 Recreation Plan consistent with the staff alternative for Commission approval	Staff	$6,000	$0	$480[e]
1d. Consult with agencies regarding the need to update the Final Recreation Plan every 6 years	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$0	$4,090	$4,090[e]
1e. Install permanent stage benchmarks at the Western States Trail Crossing	Staff	$2,000	$0	$160[e]
2. Improve the Duncan Creek Diversion Primitive Recreation Site	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$105,750	$0	$8,470[c]
3. Upgrade the existing trail to the stream gage near Duncan Creek diversion dam (Forest Trail 13E33) for pedestrian use within 3 years	Forest Service, California Fish and Game, staff (Alternative 1)	$19,940	$0	$1,600[d]
4a. Maintain the 12-site capacity of Ahart Campground and upgrade certain site components within 3 years	PCWA	$69,300	$0	$5,550[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
4b. Reduce the capacity of Ahart Campground from 12 sites to 11 sites within 11 years	Forest Service, California Fish and Game, staff (Alternative 1)	$230,810	$0	$18,480[d]
5a. Upgrade selected site components at Gates Group Campground within 5 years	PCWA	$0	$0	$0[g]
5b. Redesign and reconstruct Gates Group Campground within 11 years	Forest Service, California Fish and Game, staff (Alternative 1)	$194,010	$0	$15,540[d]
6a. Upgrade selected site components at Coyote Group Campground within 3 to 4 years	PCWA	$0	$0	$0[g]
6b. Redesign and reconstruct Coyote Group Campground within 13 years	Forest Service, California Fish and Game, staff (Alternative 1)	$209,830	$0	$16,800[d]
7a. Maintain the 40-site capacity of Lewis Campground and replace and upgrade certain site components within 2 to 6 years	PCWA	$0	$0	$0[g]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
7b. Reduce the capacity of Lewis Campground from 40 sites to 38 sites with 2 sites converted to 1 double site and redesign and reconstruct within 9 years	Forest Service, California Fish and Game, staff (Alternative 1)	$83,930	$0	$6,720[d]
8a. Convert the McGuire Picnic Area to a group campground with two 25-PAOT sites within 4 years	PCWA, staff	$347,070	$0	$27,800[c]
8b. Convert the McGuire Picnic Area to a group campground with one 25-PAOT site and one 50-PAOT site within 9 years	Forest Service, California Fish and Game (Alternative 1)	$447,070	$0	$35,800[e]
9a. Consolidate the parking areas at Poppy Campground Trailhead and McGuire Boat Ramp, replace signage, reseal the boat ramp, and repair the concrete turnaround within 3 to 4 years	PCWA	$173,320	$0	$13,880[c]
9b. Consolidate the parking areas at Poppy Campground Trailhead and McGuire Boat Ramp (detailed actions in addition to PCWA's proposal), replace signage, reseal the boat ramp, and repair the concrete turnaround within 13 years	Forest Service, California Fish and Game, staff (Alternative 1)	$184,990	$0	$14,810[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
10a. Reduce the size of the Poppy Campground from 12 sites to 8 sites and redesign and reconstruct within 2 years	PCWA	$5,460	$0	$440[c]
10b. Reduce the size of the Poppy Campground from 12 sites to 8 sites and redesign and reconstruct within 13 years	Forest Service, California Fish and Game, staff (Alternative 1)	$115,400	$0	$9,240[d]
11a. Extend Poppy Trail to the McGuire Boat Ramp Parking Area within 4 years	PCWA	$0	$0	$0[g]
11b. Extend Poppy Trail (Forest 16E10) to the McGuire Boat Ramp Parking Area and reconstruct this trail to Poppy Campground within 13 years	Forest Service, California Fish and Game, staff (Alternative 1)	$26,230	$0	$2,100[d]
12a. Maintain French Meadows Campground at a 75-site capacity, replace restrooms, and upgrade certain site components within 2 to 6 years	PCWA	$0	$0	$0[g]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
12b. Reduce the French Meadows Campground from 75 to 70 sites with 6 sites converted to 3 double sites, and redesign and reconstruct within 5 years	Forest Service, California Fish and Game, staff (Alternative 1)	$786,850	$0	$63,020[d]
13. Reconstruct the French Meadows RV dump station within 4 years	Forest Service, California Fish and Game, staff (Alternative 1)	$17,730	$0	$1,420[d]
14a. Extend the French Meadows Boat Ramp to about elevation 5,175 feet, or as far as possible, within 1 year	PCWA	$136,390	$5,460	$16,380[c]
14b. Extend the French Meadows Boat Ramp to about elevation 5,175 feet, or as far as possible, within 6 years	Forest Service, California Fish and Game, staff (Alternative 1)	$136,390	$5,460	$16,380[d]
15a. Maintain the French Meadows Picnic Area configuration of 4 picnic sites and upgrade selected site components within 3 to 6 years	PCWA	$0	$0	$0[g]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
15b. Remove all sites at the French Meadows Picnic Area and construct 2 new picnic sites near the ramp parking area within 7 years	Forest Service, California Fish and Game, staff (Alternative 1)	$31,470	$0	$2,520[d]
16. Reconstruct the French Meadows Reservoir Trail between French Meadows campground and dam for pedestrian use within 14 years	Forest Service, California Fish and Game, staff (Alternative 1)	$197,860	$0	$15,850[d]
17a. Replace all of the water system infrastructure at the French Meadows North water system (Dolly Creek Water Supply) within 3 years	PCWA	$0	$0	$0[g]
17b. Replace all of the water system infrastructure and access roads at the French Meadows North water system (Dolly Creek Water Supply) within 9 years	Forest Service, California Fish and Game (Alternative 1)	$78,680	$0	$3,150[e]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
17c. Replace the water system infrastructure and access roads associated with the French Meadows North water system only as necessary to provide water to Lewis campground; Gates group campground; Coyote group campground; McGuire picnic area; McGuire boat ramp; and French Meadows RV dump station within 9 years	Staff	$39,340	$0	$2,770[e]
18a. Replace all of the water system infrastructure at the French Meadows South water system within 6 years	PCWA	$0	$0	$0[g]
18b. Replace all of the water system infrastructure and access roads at the French Meadows South water system within 5 years	Forest Service, California Fish and Game, staff (Alternative 1)	$78,680	$0	$6,300[d]
19a. Remove the Upper Hell Hole Campground within 2 years	PCWA	$22,640	$0	$1,810[c]
19b. Remove the Upper Hell Hole Campground within 7 years	Forest Service, California Fish and Game, staff (Alternative 1)	$36,480	$0	$2,920[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
20. Develop, install, and maintain trailhead markers at the start of the Upper Hell Hole, Poppy Trailhead (for Western States Trail) and along Western States Trail in the vicinity of French Meadows dam within 1 year	PCWA	$0	$0	$0[g]
21. Reconstruct and maintain the Hell Hole Reservoir Trail (Forest Service Trail 14E02) for pedestrian use within 14 years	Forest Service, California Fish and Game, staff (Alternative 1)	$314,740	$0	$25,210[d]
22. Modify the Hell Hole Vista by replacing the picnic table and leveling the area around the picnic table within 13 years	Forest Service, California Fish and Game, staff (Alternative 1)	$25,030	$0	$2,010[d]
23a. At the Big Meadows Campground, install loop gates, replace 1 restroom, drill a well, install water supply lines, and connect the water supply lines to the existing distribution lines within 2 years	PCWA	$0	$0	$0[g]
23b. At the Big Meadows Campground, construct information kiosks, level some sites, and replace some site components within 9 years	Forest Service, California Fish and Game, staff (Alternative 1)	$156,370	$0	$12,520[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
24a. Reduce the size of the Hell Hole Campground from 10 sites to 8 sites within 2 years and repair or potentially replace the water distribution lines	PCWA	$3,550	$0	$280[c]
24b. Potentially convert to a group site or reduce the size of the Hell Hole Campground from 10 sites to 7 sites within 9 years and provide a reliable and adequate potable water source and delivery system	Forest Service, California Fish and Game, staff (Alternative 1)	$70,400	$0	$5,640[d]
25a. Extend the Hell Hole Boat Ramp to elevation 4,485 feet, or as far as possible, within 1 year	PCWA	$236,050	$2,360	$21,260[c]
25b. Extend the Hell Hole Boat Ramp to elevation 4,485 feet within 6 years, and then extend it to elevation 4,455 feet, or as far as possible, within 7 years	Forest Service, California Fish and Game, staff (Alternative 1)	$236,050	$2,360	$21,260[d]
26. Install barrier rock at Hell Hole lower boat ramp parking area within 1 year	PCWA	$0	$0	$0[g]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
27. Restore areas removed from the Hell Hole boat ramp parking area when it was reduced in size, chip seal, and replace fencing within 7 years	Forest Service, California Fish and Game, staff (Alternative 1)	$55,030	$0	$4,410[d]
28. Provide a potable water supply at the Hell Hole Boat Ramp within 5 years	Forest Service, California Fish and Game, staff (Alternative 1)	$37,140	$0	$2,970[d]
29a. Construct a trail to provide pedestrian access to the Middle Fork of the American River below the Middle Fork interbay dam within 3 years	California Fish and Game, (Alternative 1)	$262,280	$0	$21,010[d]
29b. Construct a catwalk around Middle Fork powerhouse to provide pedestrian access to public land upstream of the powerhouse within 5 years	Forest Service, staff (Recreation Plan filed with the final 4(e) conditions)	$262,280	$0	$21,010[e]
30a. Reduce the size of the Ralston Picnic Area from 5 sites to 4 sites and install paths, traffic barriers, and signage within 2 years	PCWA	$1,770	$0	$140[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
30b. Reduce the size of the Ralston Picnic Area from 5 sites to 3 sites and redesign and reconstruct within 5 years	Forest Service, California Fish and Game, staff (Alternative 1)	$26,120	$0	$2,090[d]
31. Upgrade the existing trail from the Ralston afterbay picnic area to the stream gage within 5 years	Forest Service, California Fish and Game, staff (Alternative 1)	$21,040	$0	$1,690[d]
32. Replace recycling containers (within 5 years), drill well and replace water storage tank, supply and distribution lines at Middle Meadows Campground (within 6 years)	PCWA, staff	$0	$0	$0[g]
33a. Formalize the Ralston Afterbay Sediment Access Point Boat Ramp and parking area, and install signage, within 2 years	PCWA	$7,870	$1,570	$2,200[c]
33b. Formalize the Ralston Afterbay Sediment Access Point Boat Ramp and parking area, and install signage, within 5 years (to be implemented after the first sediment removal)	Forest Service, California Fish and Game, staff (Alternative 1)	$21,480	$1,500	$3,290[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
34a. Enhance the Indian Bar Rafting Access by installing an additional, accessible, pre-fabricated concrete vault restroom or modify the existing vault restrooms to accommodate peak use within 2 years. Install a changing pavilion in a location to be determined with the appropriate land management agencies within 2 years. Reconstruct the existing boat ramp and install an additional raft slide ramp within 2 years	PCWA	$157,160	$0	$12,590[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
34b. Enhance the Indian Bar Rafting Access by installing an additional accessible, pre-fabricated concrete vault restroom or modify the existing vault restrooms to accommodate peak use in consultation with the Forest Service within 4 years. Install a changing pavilion (minimum of 2-sided, gender assigned) in a location to be determined with the Forest Service within 4 years. Reconstruct the existing boat ramp and install an additional raft slide ramp and various signage about camping and parking regulations within 4 years	Forest Service, California Fish and Game, staff (Alternative 1)	$193,400	$0	$15,490[d]
35. Construct a 6-car parking area at Ellicott Bridge with a restroom and bulletin board within 14 years	Forest Service, California Fish and Game (Alternative 1)	$104,910	$0	$8,400[d]
36. Install a toilet and kiosk at the Cache Rock recreation area as specified in Forest Service preliminary 4(e) condition no. 35	Forest Service, California Fish and Game	$35,000	$4,700	$7,500[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
37. Modify the Hell Hole administrative facility to provide the space needed at this time for administrative workspace and storage along with providing a recreation rental to serve the visiting public that are looking for a recreation opportunity other than camping as specified in Forest Service preliminary 4(e) condition no. 36	Forest Service, California Fish and Game	$50,000	$1,000	$5,000[d]
38a. Perform routine operation and maintenance as proposed	PCWA	$0	$78,680	$78,680[c]
38b. Perform routine operation and maintenance as recommended in Alternative 1	Forest Service, California Fish and Game (Alternative 1)	$0	$236,050	$236,050[d]
38c. Perform routine operation and maintenance as recommended in Alternative 1 without providing law enforcement funding	Staff	$0	$225,560	$225,560[e]
39. Perform heavy maintenance	PCWA	$0	$131,140	$131,140[c]
40. Perform Alternative 1 heavy maintenance	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$94,420	$94,420[d]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
41a. Provide recreation opportunity marketing materials (maps, brochures)	PCWA, Forest Service, California Fish and Game (Alternative 1)	$0	$8,920	$8,920[c]
41b. Provide recreation opportunity marketing materials (maps, brochures). PCWA would develop the maps and brochures and provide an electronic version to the agencies for their own use and distribution	Staff	$0	$4,780	$4,780[e]
41c. Revise and update the maps and brochures once every 6 years	Staff	$0	$410	$410[e]
42a. Conduct fish stocking in Hell Hole and French Meadows reservoirs on an annual basis during the term of the license equivalent to 50% of California Fish and Game's annual management target or 50% of the historical average stocking into the reservoir (2001-2009), whichever is less	PCWA	$0	$35,670	$35,670[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
42b. Conduct fish stocking in Hell Hole and French Meadows reservoirs on an annual basis during the term of the license equivalent to 100% of California Fish and Game's annual management target or 100% of the historical average stocking into the reservoir (2001-2009), whichever is less	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$61,900	$61,900[d]
43. Perform trail-related enhancements	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$15,740	$3,150	$4,410[c]
44. Conduct annual consulting and reporting	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$0	$12,590	$12,590[c]
45. Provide 6-year reporting	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$0	$5,040	$5,040[c]
46. Disseminate real-time flow and reservoir WSE information	PCWA, Forest Service, California Fish and Game, staff (Alternative 1)	$0	$21,510	$21,510[c]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
47. Conduct recreation use monitoring and reporting	PCWA, Forest Service, California Fish and Game, staff	$0	$28,450	$28,450[c]
48. Conduct visitor surveys and vehicle counts	Forest Service, California DF California Fish and Game, staff (Alternative 1)	$0	$4,720	$4,720[d]
Land Use				
1a. Implement the proposed Transportation System Management Plan with visual condition assessments every 5 years	PCWA	$2,203,180	$80,780	$257,220[c]
1b. Implement the Alternative 1 Transportation System Management Plan with visual condition assessments every 5 years	California Fish and Game (Alternative 1)	$2,203,180	$80,780	$257,220[d]
1c . Implement the Forest Service Transportation Management Plan with visual condition assessments every 5 years	Forest Service	$2,203,180	$80,780	$257,220[e]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
1d. Implement the Forest Service Transportation System Management Plan with visual condition assessments every 6 years	Staff	$2,203,180	$80,260	$256,700[e]
2a. Implement the Fire Prevention and Suppression Plan	PCWA	$0	$9,440	$9,440[c]
2b. Implement the Forest Service Fire Prevention and Suppression Plan	Forest Service, California Fish and Game, staff (Alternative 1)	$0	$9,440	$9,440[e]
3a. Expand the project area to include all facilities and lands necessary for operation and maintenance of the project (as described in the license application and associated exhibit G maps)	PCWA	$0	$0	$0[h]
3b. Expand the project area to include all facilities and lands necessary for operation and maintenance of the project (as described in Alternative 1)	Forest Service, California Fish and Game (Alternative 1)	$0	$0	$0[h]

Enhancement/Mitigation Measures	Entities	Capital Cost (2012$)[a]	Annual Cost (2012$)[a]	Levelized Annual Cost (2012$)[b]
3c. Expand the project area to include all facilities and lands necessary for operation and maintenance of the project (as described in the staff alternative)	Staff	$0	$0	$0[h]
Cultural Resources				
1a. Implement the HPMP as proposed in the license application	PCWA	$0	$43,940	$43,940[c]
1b. Implement the Alternative 1 HPMP as revised in November 2011	California Fish and Game (Alternative 1)	$0	$43,940	$43,940[d]
1c. Implement the final HPMP filed September 2012	Forest Service, Staff	$0	$43,940	$43,940[e]
Aesthetic Resources				
1a. Implement the Visual Resource Management Plan and conduct visual condition assessments every 5 years and revise the plan every 5 years	PCWA, Forest Service, California Fish and Game (Alternative 1)	$0	$9,970	$9,970[c]
1b. Implement the Visual Resource Management Plan and conduct visual condition assessments and revise the plan every 12 years instead.	Staff	$0	$9,550	$9,550[e]

[a] All capital and annual costs that were not in 2012 dollars were escalated to 2012 dollars for the purpose of this analysis. Annual costs typically include operational and maintenance costs and any other costs which occur on a yearly basis.

[b] All capital and annual costs were converted to equal annual costs over a 30-year period to give a uniform basis for comparing costs.

[c] Base 2010 costs were provided by PCWA in its license application filed May 12, 2011.

[d] Base 2010 costs were provided by PCWA in its supplemental filing dated November 30, 2011.

[e] Costs provided by staff; in some cases, these costs were based on similar costs provided by PCWA for proposed or Alternative 1 costs.

[f] The implementation cost for this measure is assumed by staff to be included in the costs for the Sediment Management Plan shown above.

[g] PCWA proposes to implement the measure, but did not assign a specific cost for the implementation. Despite the fact that no cost was provided by PCWA, the measure is included to provide comparison to what is included in Alternative 1.

[h] PCWA did not provide a cost to implement its proposed measure. Staff assumes that this will not be a significant cost to PCWA and the alternative measures would not be appreciably more expensive than what is proposed by PCWA.

[i] We have no basis to estimate a cost for this measure.

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5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPARISON OF ALTERNATIVES

In this section we compare the developmental and non-developmental effects of PCWA's proposal, PCWA's proposal as modified by staff, Alternative 1, and the no-action alternative.

We estimate the annual generation of the project under the four alternatives identified above. Our analysis shows that the annual generation would be 994,444 MWh for the proposed action; 985,877 MWh for the staff alternative and Alternative 1; and 1,039,078 MWh for the no-action alternative.

We summarize the environmental effects of the different alternatives in table 42.

Table 42. Comparison of alternatives for the Middle Fork Project (Source: staff).

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
Generation	1,039,078 MWh	994,444 MWh	985,877 MWh	985,877 MWh
Geology and Soils	Sediment, including spawning gravel, trapped in project impoundments; effects reduced somewhat by pilot augmentation program downstream of Ralston afterbay	Small diversion dam infrastructure improvements would pass sediment downstream of the three small diversion dams; sediment augmentation downstream of Middle Fork interbay and Ralston afterbay dams would enhance spawning and riparian habitat	Same as proposed action	Same as proposed action
	LWD collected at Hell Hole reservoir burned on site; small amounts removed from small diversion pools; woody debris that collects in Middle Fork interbay and Ralston afterbay periodically flushed downstream	Woody debris at small diversion dams would be passed downstream with infrastructure changes	Each project dam would be assessed for LWD downstream transport and feasible options implemented, which would enhance aquatic habitat	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
Aquatic	Recruitment to trout populations in the peaking reach of the Middle Fork American River low	Some enhancement of recruitment from gravel augmentation	Same as proposed action but spawning habitat in the Ralston afterbay bypassed reach would be enhanced with gravel placement or other measures	Same as proposed action
	Existing minimum flows in six bypassed reaches and the peaking reach would remain at current levels, which are relatively constant throughout the year	Minimum flows increased, with higher minimum flows during the spring trout spawning and incubation period; spring pulse flows would simulate unregulated high flows; protective downramping would result in enhanced trout populations and aquatic habitat	Similar to proposed action for bypassed reaches; generally higher minimum flows in the peaking reach would build on proposed project enhancements	Same as staff alternative

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
	Entrainment at the three small diversion tunnel intakes (Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek) would continue to be at about 1 percent of population annually; low entrainment would continue at French Meadows and the Hell Hole reservoir large tunnel intakes; entrainment rates at Middle Fork interbay and Oxbow powerhouse intakes are unknown	Entrainment at the three small diversion impoundments would be eliminated, would remain unchanged elsewhere; need for future entrainment protection may be identified with monitoring at Middle Fork interbay and Oxbow powerhouses	Same as proposed action	Same as proposed action

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
Terrestrial	Vegetation management and noxious weed control would occur within the fencelines of the Middle Fork, Ralston, and Oxbow powerhouses as regulated by state and federal agencies	Proposed VIPMP defines specific practices that would be used for vegetation management and weed control; provisions for surveying for and protecting special-status plants and wildlife during treatments; noxious weeds not at project facilities but within the project boundary could proliferate after a 2-year treatment program	Similar to proposed action, but more detail regarding management would serve to facilitate better protection of sensitive plants and wildlife, including those that may be important to Native Americans; noxious weeds within project boundary more effectively controlled	Same as staff alternative

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
	Stebbins phacelia populations, a special-status plant, would be adversely affected by recreation use and vegetation management in the vicinity of Hell Hole reservoir	Modifying and eliminating recreation facilities near Stebbins phacelia populations would reduce project effects on this species; revised Hell Hole water level management and increased storage capacity may adversely affect some populations during wet water years, but additional storage capability would ensure availability of water for environmental and consumptive flow releases during the summer	Same as proposed action	Same as proposed action
	Vegetation would remain unchanged by the project	Permanent loss of about 1.08 acres of riparian vegetation at peaking reach sediment augmentation sites and new project features; 0.24 acre of vegetation temporarily removed at Hell Hole dam	Similar to proposed action, but an additional 0.07 acre of vegetation permanently removed for new French Meadows reservoir trail	Same as staff alternative

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
	Bald eagles and osprey would continue to forage in project waters	Number of fish stocked in French Meadows and Hell Hole reservoirs could be reduced, adversely affecting bald eagle and osprey prey base	Fish stocking would continue at historic rates, maintaining the bald eagle and osprey prey base	Same as staff alternative
Recreation	Existing project recreation facilities would continue to serve the public but may not meet current demand or expectations	Proposed Recreation Plan would provide numerous enhancements and opportunities, and modify or eliminate some sites that are underutilized or that threaten sensitive species	Similar to Alternative 1 Recreation Plan, but includes improvements to the water system infrastructure and access roads at the French Meadows North water system (Dolly Creek Water Supply) that are only necessary to provide potable water to the project-related recreation facilities; staff alternative does not include new facilities at Ellicott Bridge	Additional enhancement compared to the proposed action that better address identified needs; time frame for recreation facility changes generally longer than proposed action

Resource	No-action Alternative	Proposed Action	Staff–recommended Alternative	Alternative 1
	Whitewater boating on the peaking reach would continue to opportunistically use peaking flows	Provides flows during specific time frames to support either Class II or IV boating and flow information dissemination to the public that would enhance boating opportunities	Refines flows that would create more optimal conditions instead of suitable conditions in the proposed action	Same as staff alternative
Cultural Resources	Eligible sites protected under existing license	HPMP that provides for protection measures of identified cultural resources	Implementation of the final HPMP	Implementation of the draft final Alternative 1 HPMP that addresses stakeholder concerns

5.2 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection of, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the Middle Fork American River Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our review of the environmental and economic effects of the proposed project and its alternatives, we selected the staff alternative as the preferred option. We recommend this option because: (1) issuance of a new hydropower license by the Commission would allow PCWA to operate the project as an economically beneficial and dependable source of electrical energy for the California electrical grid; (2) the 224 MW of electric energy capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance fish and wildlife resources and would provide improved recreation opportunities at the project when the water supply protection restrictions are no longer required.

Finally, for the reasons outlined in sections 5.2.3, we do not recommend certain conditions specified by the Forest Service in whole or in part. The conditions we are not recommending include providing biological evaluations for future project-related facility construction not covered in this EIS (condition no. 11), specific improvements at dispersed recreation sites (condition no. 36) and the recreation work station and storage facility (conditions no. 37). Conditions we do not recommend in part include: implementation of the Mercury Bioaccumulation Monitoring Plan (part of condition no. 28); three gages included in the Streamflow and Reservoir Elevation Gaging Plan (condition no. 32); portions of the Alternative 1 Recreation Plan (condition no. 34); specificity of how recreation facility operation, maintenance, and administration is funded (condition no. 35); reservoir levels to meet recreation objectives (condition no. 36); and the timing of visual condition assessments associated with the Visual Resource Management and Transportation System Management Plans (condition nos. 41 and 44). We recognize, however, that the Commission must include all mandatory conditions in any license.

In the following section, we make recommendations as to which environmental measures proposed by PCWA or recommended by agencies and other entities should be

included in any license issued for the project. In addition to PCWA's proposed environmental measures, we recommend additional environmental measures to be included in any license issued for the project. We also discuss which measures we do not recommend including in the license.

5.2.1 Measures Proposed by PCWA

Based on our environmental analysis of PCWA's proposal discussed in section 3 and the costs discussed in section 4, we recommend including the following environmental measures proposed by PCWA in any license issued for the project. Our recommended modifications to PCWA's proposed measures are shown in *italic*.

Geology and Soils

- Implement the Sediment Management Plan *but if sediment testing shows unacceptable levels of methylmercury, do not use that sediment for sediment augmentation.*
- Implement the Geomorphology/Riparian Monitoring Plan, *as modified by Forest Service condition no. 28.*
- Develop an erosion control plan, *as modified by Forest Service condition no. 46*.

Aquatic Resources

- Implement the proposed ramping rates downstream of French Meadows, Hell Hole, and Ralston afterbay impoundments, *as modified by Forest Service condition no. 24. During the first two spill events when downramping of spill flows occur at French Meadows and Hell Hole dams, PCWA should test its ability to manage spill flows on the declining limb of the spill event using the spillway, low-level outlet, and minimum flow outlet at French Meadows dam and the proposed new crest gates, modified low-level outlet, minimum flow outlet, and powerhouse at Hell Hole dam to provide the specified flow schedules. After the first two downramping events at French Meadows and Hell Hole dams, provide a testing report to the agencies and Commission documenting PCWA's ability to manage spill flows to provide the specified ramping rates and, if appropriate, make recommendations for ramping rate modifications.*
- Implement the following monitoring plans *as modified by Forest Service condition no. 28*: Water Quality; Water Temperature; Fish Populations; and Benthic Macroinvertebrates.
- *Develop an entrainment study plan as originally included in the Fish Populations Monitoring Plan but separated by Forest Service into standalone condition no. 29 (the details of the measure are nearly*

identical to those originally specified in PCWA's proposed Fish Population Monitoring Plan).

Terrestrial Resources

- Implement the VIPMP, *as modified by Alternative 1*.
- Implement the following monitoring plans, *as modified by Forest Service Condition no. 28*: Foothill Yellow-legged Frog and Western Pond Turtle.
- Implement the Bald Eagle Management Plan.

Recreation Resources

- Implement the following proposed recreation-related measures: (1) consult with agencies at 6-year intervals regarding the need to update the final recreation plan; (2) conduct recreation use monitoring and develop recreation summary reports every 6 years; (3) enhance the primitive recreation site at the Duncan Creek diversion within 3 years; (4) convert the McGuire picnic area to a group campground with two 25-PAOT sites within 4 years; (5) replace recycling containers, drill a well, and replace the water storage tank, supply, and distribution lines at Middle Meadows Campground within 5 years; (6) extend the Poppy trail *and reconstruct the existing Poppy trail within 13 years*; (7) conduct annual consultation with agencies and associated reporting; and (8) disseminate real-time flow and reservoir water surface elevation information to the public.

Land Use

- Implement the Transportation System Management Plan, *as modified by Forest Service condition no. 44, with visual condition assessments every 6 years instead of every 5 years to be consistent with the reporting intervals of the required Form 80 monitoring reports.*
- Implement the Fire Prevention and Suppression Plan, *as modified by Forest Service condition no. 45*.
- Adjust the project boundary to include the following facilities or areas:
  - Duncan Creek diversion intake road;
  - Trail to the gage below Duncan Creek diversion dam;
  - French Meadows campground water supply and road;
  - French Meadows reservoir north shore access road;
  - Gates campground and access road;
  - French Meadows North (Dolly Creek) water system;
  - Ahart campground;

- French Meadows-Hell Hole tunnel portal road;
- French Meadows powerhouse road and communication powerline;
- Hell Hole dam spillway discharge channel road;
- Hell Hole vista parking area, trail, and overlook;
- Hell Hole reservoir trail;
- Big Meadows campground and access road;
- Big Meadows campground water supply and access road;
- Hell Hole campground water supply;
- Hell Hole campground and access road;
- Southeast quarter of section 3 to accommodate storage increase;
- Middle Meadows group campground and access road;
- Middle Meadows campground water supply and access road;
- North Fork Long Canyon crossing sediment disposal area;
- Middle Fork interbay dam road;
- Middle Fork interbay sediment disposal area;
- Passive microwave reflector station and access trail;
- Middle Fork American River below interbay dam gage and access trail;
- Middle Fork powerhouse, penstock and butterfly valve house access road;
- Spoil pile at Middle Fork penstock;
- Brushy Canyon adit access road;
- Junction Bar augmentation area;
- Ralston-Oxbow tunnel intake to Ralston powerhouse communication line;
- Ralston Ridge sediment disposal area; and
- Passive microwave reflector station above Ralston afterbay and access trail.

- Adjust the project boundary to remove excess lands currently within the project boundary that are not necessary for operation and maintenance of the project (i.e., reductions in the area within the project boundary). Specific locations include:
  - Duncan Creek-Middle Fork tunnel corridor;

- French Meadows reservoir shoreline buffer;
- French Meadows-Hell Hole tunnel corridor;
- Hell Hole reservoir shoreline buffer;
- Hell Hole-Middle Fork tunnel corridor;
- Middle Fork interbay shoreline buffer;
- Middle Fork-Ralston tunnel corridor; and
- Ralston afterbay shoreline buffer.

Aesthetic Resources

- Implement the Visual Resource Management Plan, *except conduct visual condition assessments every 12 years instead of every 5 years to align with alternating 6-year reporting intervals of the required Form 80 monitoring reports and revise the plan every 12 years instead of every 5 years*.

5.2.2 Additional Measures Recommended by Staff

In addition to PCWA's proposed measures listed above, we recommend including the following staff-recommended measures in any license issued for the Middle Fork American River Project:

- a plan to identify release points and protocols to be followed when flow conduits need to be drained;
- a woody debris management plan that applies to downstream of all project dams;
- a modified Streamflow and Reservoir Gaging Plan;
- implementation of the Alternative 1 minimum flows shown in table 43;
- implementation of the Alternative 1 peaking reach minimum flows during outages;
- implementation of Forest Service pulse flows shown in tables 45 through 47;
- implementation of the Alternative 1 peaking reach whitewater boating flow releases shown in tables 48 and 49;
- implementation of the Alternative 1 minimum water surface elevation management regime at French Meadows and Hell Hole reservoirs shown in table 50;
- a spawning habitat improvement plan;
- annual reports on the status of anadromous fish restoration;

- expansion of the scope or the raptor nest surveys prior to construction;
- an aquatic invasive species management plan;
- a modified Recreation Plan;
- provision of public education and information about flow fluctuations in the peaking reach; and
- the final HPMP filed with the Commission on September 21, 2012.

Below, we discuss our rationale for our additional staff-recommended measures.

Identification of Release Points When Flow Conduits Need to Be Drained

PCWA must occasionally dewater project flow conduits to enable inspections and maintenance to occur and to address infrequent emergency situations. Forest Service condition no. 33 specifies that PCWA file a plan to evaluate penstock and other drainage structure emergency and maintenance release points to determine if improvements can be made to minimize potential adverse water quality effects when the release points are used. The conduit dewatering process could result in high flows of water passing over relatively stable upland or aquatic sites adjacent to the release points. This could result in erosion, destabilization of slopes, and aquatic habitat degradation, as discussed in section 3.3.1.2, *Geologic and Soil Resources*. It is uncertain whether there currently exist alternative release points that could be used to minimize potential effects when project flow conduits need to be drained. If there are, some release points may be better than others. During the public draft EIS meeting held on August 28, 2012, PCWA stated that it typically does not drain project tunnels except in emergency situations, and the last time the Middle Fork Project tunnel was drained was in 1974. PCWA stated that tunnels and penstocks are typically drained directly into project waters and not over land.[35] Depending on the protocols used during emergency or other conduit draining, there could be potential for erosion, fish, and wildlife effects, and a plan would help to identify such risks and develop proactive procedures that minimize such risks.

Therefore, consistent with Forest Service final condition no. 33, we recommend PCWA develop, in consultation with the Forest Service, Water Board, and California Fish and Game, a plan for Commission approval that evaluates penstock and other drainage structure release points to document whether or not options for dewatering release points are available for each project flow conduit and, if so, which option would minimize adverse effects. The plan should include provisions for assessing site-specific conditions associated with each option so that a proactive protocol of prioritizing release points can be developed that would minimize the potential for increased slope instability

[35] "Transcript of public meeting on: Draft Environmental Impact Statement, Middle Fork American River Hydroelectric Project, No. 2079-069." Tuesday, August 28, 2012, 9:10 A.M. -10:10 A.M., pages 15-18, issued on September 5, 2012.

or adverse effects on aquatic habitat. The benefits of such a plan would be worth the estimated levelized annual cost of $800.

Woody Debris Management Plan

Currently, PCWA conducts LWD management on an as-needed basis at all project impoundments except French Meadows reservoir. Forest Service condition no. 30 specifies that PCWA file an LWD management plan that describes existing locations of LWD collection by project facilities, describes potential options for moving LWD below project facilities and keeping it in the river corridor, and identifies suitable locations where PCWA can place LWD within the active channel for mobilization by high flow events. With the implementation of our recommended small diversion dam screening systems, PCWA would pass woody debris downstream of these three diversion dams and there would be no need for LWD management if the systems function as planned.

Currently, PCWA removes LWD from Hell Hole reservoir and typically burns it on site. Identifying alternatives to this practice that would improve the supply of LWD to the Rubicon River downstream of the dam could reduce air emissions associated with burning and provide an enhancement to channel morphology and associated habitat (as discussed in section 3.3.1.2, *Geologic and Soil Resources*). In the draft EIS, we concluded that LWD transport downstream of the three small diversion dams and Middle Fork and Ralston afterbay dams was unlikely to be necessary because existing or proposed measures already enabled LWD transport downstream of those dams, and the focus of a LWD management plan should be on Hell Hole dam. However, information provided by comments on the draft EIS indicates that the supply of LWD downstream of all project dams is less than would be expected in unregulated Sierra Nevada streams, and placing or passing LWD downstream of project dams should enhance aquatic habitat. Therefore, we find that the enhanced geomorphic processes and associated habitat benefits of LWD transport downstream of project dams would be worth the estimated levelized annual cost of $2,200 of developing and implementing an LWD plan. The plan should include the environmental benefits and environmental and financial costs of each option for placing LWD in the downstream active channels and include recommendations for which options should be implemented, for Commission approval, as appropriate.

Implement Alternative 1 Instream Minimum Flows

The Alternative 1 minimum flows (as specified in Forest Service condition no. 22) and our recommended minimum flows (table 43) are similar to PCWA's proposed minimum flows, with the exception of the peaking reach minimum flows (our recommended minimum flows are generally from 15 to 100 cfs higher than comparable months and water years under the proposed minimum flow regime) and minor differences associated with rounding.

Table 43. Staff-recommended minimum instream flows (cfs) by water year (Source: Forest Service, 2012a, as modified by staff).

Location	Water Year Type[a]	October	November	December	January	February	March 1-14	March 15-31	April	May1-14	May 15-31	June 1-14	June 15-30	July	August	September 1-15	September 15-30
Duncan Creek below Duncan diversion dam	E/C	4	4	4	4	4	4	9	13	13	13	7	7	ND[b]	ND[b]	ND[b]	ND[b]
	D	8	8	8	8	8	8	11	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
	BN	8	8	8	8	8	8	13	17	17	17	9	9	ND[b]	ND[b]	ND[b]	ND[b]
	AN	8	8	8	8	8	8	16	24	24	24	12	12	ND[b]	ND[b]	ND[b]	ND[b]
	W	8	8	8	8	8	8	16	24	24	24	12	12	ND[b]	ND[b]	ND[b]	ND[b]
Middle Fork American River below French Meadows reservoir dam	E/C	8	8	8	8	8	8	11	11	11	11	8	8	8	8	8	8
	D	9	9	9	9	9	9	11	13	13	13	11	11	9	9	9	9
	BN	10	10	10	10	10	10	11	13	13	13	12	12	10	10	10	10
	AN	11	11	11	11	11	11	15	20	20	20	16	16	11	11	11	11
	W	13	13	13	13	13	13	16	20	20	20	17	17	13	13	13	13
Rubicon River below Hell Hole reservoir dam	E/C	15	15	15	15	15	15	31	31	23	23	19	15	15	15	15	15
	D	20	20	20	20	20	20	35	35	35	35	28	20	20	20	20	20
	BN	20	20	20	20	20	20	42	42	42	42	31	20	20	20	20	20
	AN	25	25	25	25	25	25	55	55	55	55	50	40	30	30	30	30
	W	25	25	25	25	25	25	60	60	60	60	50	40	30	30	30	30
Middle Fork	E/C	12	12	12	12	12	12	16	18	18	18	12	12	12	12	12	12

Location	Water Year Type[a]	October	November	December	January	February	March 1-14	March 15-31	April	May1-14	May 15-31	June 1-14	June 15-30	July	August	September 1-15	September 15-30
American River below Middle Fork interbay dam	D	24	24	24	24	24	24	25	27	27	27	24	24	18	18	18	18
	BN	24	24	24	24	24	24	32	40	40	40	24	24	24	24	24	24
	AN	25	25	25	25	25	25	45	65	65	65	45	45	26	26	26	26
	W	25	25	25	25	25	25	47	65	65	65	47	47	34	34	34	34
North Fork Long Canyon Creek below North Fork Long Canyon diversion dam	E/C	2	2	2	2	2	2	6	6	6	2	2	2	ND[b]	ND[b]	ND[b]	ND[b]
	D	2	2	2	2	2	2	10	10	10	5	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	BN	2	2	2	2	2	2	7	10	10	10	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	AN	2	2	2	2	2	2	7	11	11	11	6	6	ND[b]	ND[b]	ND[b]	ND[b]
	W	2	2	2	2	2	2	7	11	11	11	6	6	ND[b]	ND[b]	ND[b]	ND[b]
South Fork Long Canyon Creek below South Fork Long Canyon diversion dam	E/C	2.5	2.5	2.5	2.5	2.5	2.5	5	6	6	6	3	3	ND[b]	ND[b]	ND[b]	ND[b]
	D	5	5	5	5	5	5	9	12	12	12	5	5	ND[b]	ND[b]	ND[b]	ND[b]
	BN	5	5	5	5	5	5	9	12	12	12	6	6	ND[b]	ND[b]	ND[b]	ND[b]
	AN	5	5	5	5	5	5	9	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
	W	5	5	5	5	5	5	9	14	14	14	7	7	ND[b]	ND[b]	ND[b]	ND[b]
Middle Fork American River below Oxbow powerhouse	E	90	90	90	90	90	90	100	100	100	100	100	100	100	100	100	100
	C	125	140	140	140	140	140	160	160	160	160	160	160	160	160	150	150
	D	140	145	145	145	145	145	210	210	210	210	210	210	200	200	160	160
	BN	165	185	185	185	185	185	290	290	290	290	245	245	245	245	200	200

Location	Water Year Type[a]	October	November	December	January	February	March 1-14	March 15-31	April	May1-14	May 15-31	June 1-14	June 15-30	July	August	September 1-15	September 15-30
	AN	165	225	225	225	225	225	375	375	375	375	300	300	300	300	250	250
	W	200	250	250	250	250	250	450	450	450	450	350	350	350	350	300	300
Middle Fork American River below Ralston afterbay dam	E	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	All other years	3	3	3	3	3	3	25	25	25	25	10	10	10	10	10	10

Notes: Grey-shaded cells indicate the minimum flow is the specified minimum flow or natural inflow to the bypassed reach, whichever is less

[a] Water year types: E = Extreme critical, C = Critical, D = Dry, BN = Below normal, AN = Above normal, W = Wet

[b] ND = no diversion. If July 1 inflow to the Duncan Creek diversion exceeds the May minimum instream flow requirement, then the July minimum instream flow requirement will be equal to the May minimum instream flow requirement or natural inflow, whichever is less. The intent is to avoid a large flow spike at the end of the diversion season on July 1.

Other differences between PCWA's proposed and our recommended minimum flows include the following:

- Our recommended measure specifies that minimum instream flows be released by 5 p.m. on specific dates, while PCWA proposes that minimum instream flows be released within 5 days of the dates specified in a new license. In both cases, exceptions would be allowed when access to the instream flow release infrastructure is restricted by weather or hazardous conditions.
- Our recommended measure states that hourly running average flow measurements would never be less than the thresholds specified in a new license, except as authorized in advance. PCWA would maintain instantaneous flows at all times to be no less than 90 percent of the required minimum instream flow and maintain daily average flows to be equal to or above the minimum instream flow and that daily average flows would at all times be no less than 90 percent of the required minimum instream flow. Deviations that are less than 10 percent of the required minimum instream flow would be corrected within 3 days of discovery by releasing the equivalent volume of under-released flow into the affected stream reach.

PCWA proposes that the instream flow releases specified in a new license would be provided within 30 days of license issuance at the locations where existing infrastructure and stream gages can provide and measure new releases. For locations requiring infrastructure modifications and/or new facilities, instream flow releases would be provided and monitored by PCWA within 30 days after completion of the required facility modifications. Our recommended measure specifies a similar schedule where existing infrastructure and stream gages can provide and measure new releases, but also specifies time frames where bypassed reach infrastructure modifications would be complete ranging from year 3 to 5 from license issuance. At locations where the minimum flows are higher than the capacity of the existing infrastructure, PCWA should implement the new flow requirement up to the maximum capacity of the outlet works until modification of the infrastructure is complete.

Minimum flows would be maintained or increased relative to existing conditions in all project-affected reaches under both the proposed and our recommended regime. In addition, minimum flows would vary by month and water year type under both action alternatives, better reflecting natural seasonal and year-to-year variability in the watershed. Under both alternative flow schedules, summer flows in wet and above normal water years would be higher than under existing conditions in all project-affected reaches. In summers of critical, dry, and below-normal water years, minimum flows would be increased or maintained in all bypassed and peaking reaches compared with existing conditions.

Minimum flow increases in the peaking and bypassed reaches in the wettest water year types would increase wetted stream perimeters, which may increase habitat area and habitat diversity for fish and aquatic invertebrates in some reaches. Increased edge habitat may improve rearing success of YOY fish in wet water years if shallow water or cover is available to increase their ability to avoid aquatic and terrestrial predation. Higher minimum flows should provide more area for aquatic macroinvertebrate communities that make up a large portion of the diet of trout and other fish.

The range of proposed minimum flows in the peaking reach would be from 75 to 450 cfs, whereas our recommended minimum flows would range from 90 to 450 cfs. However, many of our recommended minimum flows would be from 15 to 100 cfs higher than the comparable proposed minimum flows for comparable water years and time frames. For the reasons stated in the previous paragraph and in section 3.3.2.2, *Aquatic Resources*, this prevailing higher minimum flow would result in our recommended regime providing greater habitat enhancements compared with the proposed flow regime.

Typically, the period of snowmelt and high runoff occurs between April through mid-June in the Middle Fork basin. Providing flows that mimic the spring snowmelt pulse would benefit the aquatic community by helping to maintain a variety of seasonal life-history behaviors. Spring minimum flows would be substantially higher than under existing conditions in all water-year types under both PCWA's and our recommended minimum flow regimes, and would provide flow change that simulate those found under unregulated conditions during the seasonal snowmelt period. Both the proposed and our recommended minimum flow regimes would enhance flow conditions for spawning by resident trout during spring (mid-March through June). Higher spring flows may provide access to additional spawning or rearing habitat.

Precipitation in the Middle Fork watershed has high inter-annual variation; water year types tend to be either wet or dry, with few years receiving "average" precipitation. Under existing conditions, no provision is made for within-year or between-year variation in flows to reflect local seasonal changes. Many fish and aquatic macroinvertebrate species may use changes in flows as cues for behaviors such as spawning or movement into appropriate winter or summer habitat. Year-to-year variations in flows may maintain species diversity by benefiting certain species in wet years and others in dry years.

Our recommended and PCWA's proposed minimum flow regimes are designed to provide water temperatures that support hardhead in the 0.5 mile bypassed reach of the Middle Fork American River and 5.4 miles of the Rubicon River upstream of Ralston afterbay. Hardhead typically prefer warmer water temperatures than trout. We see no necessity for a 5-day grace period for releasing instream flows as PCWA proposed. If a new license specifies a date when the minimum flow to a project stream reach should change, PCWA should plan appropriately to ensure flows are released on

the designated day. It may not be feasible (e.g., because of difficulty in continuously monitoring gaging data, potential errors in reading flows, and time needed to adjust flow releases) for PCWA to maintain instantaneous flows above the minimum flows at all times, and compliance based on maintaining daily average flows above the minimum flows, as we recommend, would be achievable. Allowing daily average flows that are only 90 percent of specified instantaneous flows to be compensated by over-releases within 3 days to achieve the designated flow, as PCWA proposes, is inconsistent with the reasons for an instantaneous minimum flow (to ensure a constant base flow for aquatic habitat protection and enhancement). We consider it reasonable to have specific time frames for implementation of instream flow requirements where facility modifications and construction are needed and this would enhance Commission staff's ability to track compliance with interim minimum flows (those required until infrastructure modifications are complete) and permanent minimum flows.

The estimated levelized annual cost of $1,955,260 for implementing all of PCWA's proposed flow and reservoir minimum pool measures (which includes minimum flows, ramping rates, pulse flows, whitewater recreation flows, and maintaining minimum water surface elevations at French Meadows and Hell Hole reservoirs) would provide enhanced aquatic habitat and recreational opportunities. However, the benefits associated with increased enhanced aquatic habitat that would be provided by our recommended higher minimum flows (and other associated measures) would be worth the additional $322,890 estimated levelized annual cost.

Implement the Alternative 1 Peaking Reach Minimum Flows during Planned and Unplanned Powerhouse Outages

PCWA proposes minimum flows for a period of up to 30 days in the peaking reach of the Middle Fork American River during annual scheduled powerhouse maintenance. Such outage events would begin between the last Sunday in September through the end of October. Minimum flows would be the same as, or greater than, those under existing conditions. PCWA's proposed maintenance outage minimum flows in extreme critical and dry water years would be 75 cfs, but in below normal, above normal, and wet years, the minimum flows would be 110, 150, and 150 cfs, respectively. Under the proposed project, the same minimum flows would apply for up to 48 hours in the event of a forced or unplanned outage at the Middle Fork powerhouse and/or Ralston powerhouse (the delay allows release of water from upstream reservoir to reach this location and maintain the minimum flow requirements).

Our recommended outage minimum flows, consistent with Forest Service condition no. 25, make no provisions for modifying the peaking reach minimum flows specified in table 44 during planned outages. When unplanned outages at Middle Fork and Ralston powerhouses simultaneously occur from May through September for periods of less than 2 weeks, our recommended peaking reach minimum flow, consistent with Forest Service condition no. 25, would be as follows:

- If the Ralston afterbay water surface elevation is greater than 1,161 feet at the time of the outage, the minimum flow release would be 200 cfs or the minimum flow specified in table 43, whichever is less, until the elevation reaches less than or equal to 1,161 feet.
- If the Ralston afterbay water surface elevation is less than or equal to 1,161feet any time during the outage, the minimum flow release would be the October minimum flow specified in table 43.

When just Ralston powerhouse experiences an unplanned outage from June through September for up to a 2-week period, water would be released from the Middle Fork powerhouse and bypassed reach downstream of Middle Fork interbay to ensure compliance with the peaking reach minimum flows specified in table 44.

Table 44. Minimum flows in the peaking reach when Ralston powerhouse experiences an unplanned outage from June through September and Middle Fork powerhouse is operational (Source: Forest Service, 2012a, as modified by staff).

Water Year Type	June (cfs)	July (cfs)	August (cfs)	September (cfs)
Extreme critical	100	100	100	100
Critical	160	160	160	160
Dry	210	165	165	165
Below normal	245	190	190	190
Above normal	300	200	200	200
Wet	350	200	200	200

Minimum flows that would protect aquatic habitat during project operations would be similarly protective during planned and unplanned outages, and our recommended approach to maintaining minimum flows in the peaking reach during unplanned outages provides this level of assurance while allowing for some reductions during outages that occur between July through September to accommodate limitations of the project during a period when trout fry would have emerged from the gravel and become relatively mobile. PCWA's proposed minimum flows would be less than our recommended minimum flows during planned outages and, during unplanned outages, would be constant for up to 48 hours regardless of the timing of the outage. Such releases would not account for changes in flow releases during unplanned outages that may occur during the summer and could result in redd dewatering during June, when fry may still be in the gravel. If unplanned outages should occur outside the specified time frames, the peaking reach minimum flows specified in table 43 would apply. The costs

of implementing our recommended minimum flow measure are included in the costs presented for minimum flows in the previous section, and the benefits of increased protection of aquatic biota in the peaking reach that our recommended flows during powerhouse outages would be worth the associated costs.

Implement the Forest Service Pulse Flows

Forest Service condition no. 23 and our recommended pulse flow measure specify a schedule of pulse flows for each bypassed reach based on water year type (tables 45 through 47), downramping rates of pulse flows, compliance points, text periods, and reporting requirements.

Table 45. Staff-recommended pulse flow schedule for wet and above normal water years in Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek below diversion dams (Source: Forest Service, 2012a, as modified by staff).

	Water Year Type		
Location	**Wet**	**Above Normal**	**Action**
Duncan Creek below Duncan diversion dam	May 15	May 7	Release a minimum of 150 cfs or inflow, whichever is less
	May 16	May 8	Close diversion completely
	May 25	May 10	Release a minimum of 190 cfs or inflow, whichever is less (can reopen diversion)
	May 27	May 12	Reduce the flow to a minimum of 130 cfs or inflow, whichever is less
	May 30	May 15	Reduce the flow to a minimum of 90 cfs or inflow, whichever is less
	June 2	May 18	Reduce the flow to a minimum of 45 cfs or inflow, whichever is less
	June 6	May 22	Release the minimum instream flow requirement
North Fork Long Canyon Creek below North Fork Long Canyon diversion dam	May 15	May 1	Release a minimum of 50 cfs or inflow, whichever is less
	May 16	May 2	Close diversion completely
	May 25	May 4	Release a minimum of 35 cfs or inflow, whichever is less (can reopen diversion)
	May 27	May 6	Reduce the flow to a minimum of 21 cfs or inflow, whichever is less
	May 30	May 9	Release the minimum instream flow requirement

Location	Water Year Type: Wet	Water Year Type: Above Normal	Action
South Fork Long Canyon Creek below South Fork Long Canyon diversion dam	May 15	May 1	Release a minimum of 100 cfs or inflow, whichever is less
	May 16	May 2	Close diversion completely
	May 25	May 4	Release a minimum of 70 cfs or inflow, whichever is less (can reopen diversion)
	May 27	May 6	Reduce the flow to a minimum of 35 cfs or inflow, whichever is less
	May 30	May 9	Release the minimum instream flow requirement

Table 46. Staff-recommended pulse flow schedule for wet and above normal water years for the Middle Fork American River below French Meadows dam (Source: Forest Service, 2012a, as modified by staff).

Water Year Type: Wet	Water Year Type: Above Normal	Water Year Restrictions	Flow Release
May 15	May 7	Water year occurs in year 1 or 2 of any new license	Increase flows from the minimum instream flow release to a minimum of 200 cfs
May 15	May 7	Water year occurs after year 2 of any new license	Increase flows from the minimum instream flow release to a target man daily flow of 200 cfs ± 10%
May 16	May 8	Water year occurs in year 1 or 2 of any new license	Increase flows to a minimum of 400 cfs
May 16	May 8	Water year occurs after year 2 of any new license	Increase flows to a target mean daily flow of 400 cfs ± 10%
May 24	May 10	Water year occurs in year 1 or 2 of any new license	Reduce the flows to a minimum of 275 cfs
May 24	May 10	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 275 cfs ± 10%

Water Year Type			
Wet	**Above Normal**	**Water Year Restrictions**	**Flow Release**
May 26	May 12	Water year occurs in year 1 or 2 of any new license	Reduce flows to a minimum of 190 cfs
May 26	May 12	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 190 cfs ± 10%
May 29	May 15	Water year occurs in year 1 or 2 of any new license	Reduce flows to a minimum of 115 cfs
May 29	May 15	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 115 cfs ± 10%
June 1	May 18	Water year occurs in year 1 or 2 of any new license	Reduce flows to a minimum of 65 cfs
June 1	May 18	Water year occurs after year 2 of any new license	Reduce the flows to a target mean daily flow of 65 cfs ± 10%
June 5	May 22	Water year occurs in any year of any new license	Reduce flows to the minimum instream flow requirement

Table 47. Staff-recommended pulse flow schedule for wet and above normal water years for the Rubicon River below Hell Hole dam (Source: Forest Service, 2012a, as modified by staff).

Water Year Type		
Wet	**Above Normal**	**Flow Release**
May 15	May 1	Increase flows from the minimum instream flow release to a target mean daily flow of 200 cfs ± 10%
June 21	May 16	Reduce the flows to a target mean daily flow of 150 cfs ± 10%
June 23	May 18	Reduce the flows to a target mean daily flow of 90 cfs ± 10%
June 26	May 21	Reduce flows to the minimum instream flow requirement

Pulse flows downstream of Middle Fork interbay dam during wet years would consist of inflows (± 10 percent average daily flow) to the interbay, excluding discharge from the Middle Fork powerhouse, between May 15 and May 31 during wet water years

and May 7 and May 17 during above normal water years. If average daily inflows are greater than 155 cfs at the end of the pulse flow, Middle Fork American River inflows to the interbay would be passed downstream of interbay dam until average daily inflow is less than 155 cfs for 3 consecutive days (Forest Service, 2012a).

Our recommended pulse flow measure is similar to PCWA's proposed measure except that:

- during wet years, the pulse flow we recommend would begin on May 15, and PCWA's proposed pulse flow would begin on May 1;
- our recommended pulse flow measure includes additional details regarding the time of day to begin pulse flows and testing the ability to release the pulse flows during the first two pulse flow events downstream of French Meadows and Hell Hole reservoirs; and
- our recommended measure specifies that, within 1 year of license issuance, PCWA develop and implement a feasibility study to identify the maximum pulse flow between 200 and 600 cfs that can safely and reliably be released from the existing low-level outlet at Hell Hole dam.

We find in section 3.3.1.2, *Geologic and Soil Resources*, that both the proposed and staff-recommended pulse flow measures would increase sediment supply to the reaches downstream of the small diversion dams and improve sediment supply to the reaches downstream of Middle Fork interbay and Ralston afterbay dams. The increase in sediment supply would provide long-term channel geomorphology and aquatic and riparian ecosystem benefits to the three small dam bypassed reaches. The proposed and our recommended spring pulse flows specified for all bypassed reaches in May of wet and above normal years, combined with a more gradual rate of flow decline following the maximum peak flow release, would enhance the dynamics of riparian vegetation recruitment similar to what might occur in a comparably sized stream under unregulated conditions. The frequency of gravel bed mobilization and scour would be sufficient to maintain the channel geometry and minimize fine sediment accumulation in pools and spawning gravels.

Our recommended pulse flow measure specifies that during wet years, pulse flows would begin on May 15 instead of on May 1 (PCWA's proposal). This later initiation of pulse flows would provide more time for rainbow trout fry to emerge from the gravel prior to a planned high flow event, thus offering protection to incubating eggs. Our recommended measure as to the time of day when pulse flows would be released, would benefit whitewater boaters by providing trip-planning information. PCWA's proposal provides for an unspecified start of pulse flow events. Our recommended provision to conduct a feasibility study regarding the maximum pulse flow that can safely be released from Hell Hole dam would provide a reasonable balance between providing the environmental benefits of pulse flows and ensuring the safe operation of the dam is not compromised.

The estimated levelized annual cost for this measure is included in the costs presented for minimum flows and would be similar to the costs associated with PCWA's proposed pulse flow measure. We conclude that the extra protection and greater specificity of our recommended measure warrant any related minimal increased costs.

Implement the Alternative 1 Whitewater Boating Flows in the Peaking Reach

The Alternative 1 and staff-recommended whitewater boating flow measure, which is consistent with that specified in Forest Service condition no. 40, is more detailed than PCWA's proposed whitewater boating flow measure and includes generally higher flows. Table 48 shows the flows recommended for providing class IV boating opportunities in the peaking reach, and table 49 shows the flows recommended for providing class II boating on the Confluence Run (downstream of the confluence of the Middle Fork and the North Fork American River).

Table 48. Staff-recommended flow schedule to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse (Source: Interior, 2011; Forest Service, 2012a, as modified by staff).

Water Year Type[a] / Weekdays	Flow[b] (cfs)	Duration (Time of day)	June 1–Labor Day	After Labor Day–September 30
Wet	1,000	3 hours (9 a.m.–noon)	5 days per week (M–F)	4 days per week (T–F)
Above normal	1,000	3 hours (9 a.m.–noon)	5 days per week (M–F)	3 days per week (T, W, F)
Below normal	1,000	3 hours (9 a.m.–noon)	4 days per week (T–F)	3 days per week (T, W, F)
Dry	1,000	3 hours (8 a.m.–11 a.m.)	3 days per week (T, W, F) except for F before Labor Day and Memorial Day[c]	2 days per week (W, F)

Water Year Type[a]				
Critical	1,000	3 hours (8 a.m.–11 a.m.)	2 days per week (W, F) except for Memorial Day[b]	--
Extremely critical	1,000	3 hours (8 a.m.–11 a.m.)	1 day per week (W)	--
Weekends			**Saturday before Memorial Day–Labor Day**	**After Labor Day–September 30**
Wet	1,000	4 hours (8 a.m.–noon)	Saturdays, Sundays	Saturdays, Sundays
Above normal	1,000	4 hours (8 a.m.–noon)	Saturdays, Sundays	Saturdays, Sundays
Below normal	1,000	4 hours (8 a.m.–noon)	Saturdays except for Western States 100 and Tevis Cup dates	Saturdays, Sundays
Dry	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates Sundays except one Sunday[c] in July	Saturdays, Sundays
Critical	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates Sundays except one Sunday in July	Saturdays

Water Year Type[a]				
Extremely critical	1,000	3 hours (8:30 a.m.–11:30 a.m)	Saturdays except for Western States 100 and Tevis Cup dates	--

[a] Based on California DWR Bulletin 120, May forecast of unimpaired flow of the American River below Folsom Lake.

[b] As measured below the confluence of Middle Fork and North Fork of the Middle Fork American River near Foresthill (USGS gage no. 11433300). The recreation flows for special events (e.g., Tevis Cup, Western States 100), when they occur, take priority over boating flows in below normal, dry, critical, and extreme critical water year types.

[c] One day used for providing class II boating on the Confluence Run.

Table 49. Staff-recommended flow schedule to support class II boating opportunities on the Confluence Run (Source: BLM, 2011; Forest Service, 2012a, as modified by staff).

			Weekdays		**Weekends**	
Water Year Type[a]	**Flow[b] (cfs)**	**Duration (Time of day)**	**Memorial Day–Labor Day**	**Saturday before Memorial Day–June 30**	**July 1–Labor Day**	**After Labor Day–Sept 30**
Wet	800	5 hours (3 a.m.–8 a.m.)	--	--	Saturdays	2 Saturdays per month
Above normal	800	5 hours (3 a.m.–8 a.m.)	--	--	Saturdays	2 Saturdays per month
Below normal	800	4 hours (4 a.m.–8 a.m.)	--	2 Saturdays per month	2 Saturdays per month	1 Saturday per month

			Weekdays	Weekends		
Water Year Type[a]	**Flow[b] (cfs)**	**Duration (Time of day)**	**Memorial Day–Labor Day**	**Saturday before Memorial Day–June 30**	**July 1–Labor Day**	**After Labor Day–Sept 30**
	1,000	3 hours (4 a.m.–7 a.m.)	--	Western States 100 date	Tevis Cup date	--
Dry	1,000	3 hours (4 a.m.–7 a.m.)	Memorial Day and F before Labor Day	Western States 100 date	1 Sunday in July and Tevis Cup date	--
Critical	1,000	3 hours (4 a.m.–7 a.m.)	Memorial Day	Western States 100 date	1 Sunday in July and Tevis Cup date	--
Extremely critical	1,000	3 hours (4 a.m.–7 a.m.)	--	Western States 100 date	Tevis Cup date	--

[a] Based on California DWR Bulletin 120, May forecast of unimpaired flow of the American River below Folsom Lake.

[b] As measured below the confluence of Middle Fork and North Fork of the Middle Fork American River near Foresthill (USGS gage no. 11433300).

PCWA proposes to formalize its Oxbow powerhouse release schedule to provide 800 to 1,000 cfs for 3 to 4 hours a day on various weekends and weekdays between June and September. Operating the project under PCWA's flow schedule would maintain existing commercial and private boating opportunities on the peaking reach in the reach immediately downstream of Oxbow powerhouse and maintain or increase boating opportunities for private boaters on the Confluence Run in areas that have lower difficulty in wet and above normal water years. Under PCWA's proposal, beginning on the first Saturday before Memorial Day through Labor Day in wet and above normal years, an 800-cfs flow as measured at the North Fork of the American River above American River pumping station would be released at the Oxbow powerhouse 3 hours earlier than under existing conditions. This early release would provide flow at the downstream runs earlier in the day, which would increase whitewater boating

opportunities overall. The greatest improvement would be the certainty created by the formalization of the flow schedule as a condition of a new license.

Flows included in Alternative 1 and recommended by staff would be, in general, higher than PCWA's proposed flows, and the schedule is more detailed to maintain trail crossing opportunities and accommodate commercial and private boating use. Similar to PCWA's proposal, our recommended boating flow regime would release water earlier in the day and increase boating opportunities. Because we specify more days of providing early-day releases of a longer duration, however, there would be more class II boating opportunities provided under our recommended flow regime than under PCWA's proposed flow schedule.

Because the flow-dependent recreational uses in the peaking reach have different suitable flow ranges, there could be user conflicts among whitewater boating, angling, and crossing the river by trails. PCWA's proposed flow schedule attempts tradeoffs between user groups while maintaining or improving opportunities for whitewater boating. Our recommended flow schedule refines PCWA's flow schedule to provide flows in the optimal boating range, as opposed to flows in the suitable range, and increases the number of boating days. Our recommended measure adopts PCWA's and the Alternative 1 provisions that would supersede whitewater boating flow releases in below normal, dry, critical, and extremely critical water year types during Western States 100 and Tevis Cup races and ensures annual coordination with special event representatives to identify and provide flows suitable for river crossings during those events. We also recommend the Alternative 1 element that provides for coordination with Wounded Warrior event representatives to provide steady flows for up to 5 days during this event if: (1) PCWA is notified by June 1 that an event is scheduled based on PCWA's May 1 annual maintenance outage schedule; and (2) the outage schedule subsequently changes. Our recommended measures related to visitor education and awareness (discussed in following subsections) and ramping rates would reduce potential conflicts and would enable the project to be operated under a flow regime that supports both of the outstandingly remarkable values identified in the Wild and Scenic River eligibility study for the peaking reach (e.g., whitewater boating, fishery) and would also provide acceptable conditions for general river recreational use (e.g., swimming and hiking). Our recommended flows also give greater consideration to the non-commercial boating opportunities in the peaking reach. The Alternative 1 flow schedule was developed in consultation with commercial and private boaters, and it reflects flows (magnitude and schedule) that would minimize user conflicts while providing higher quality whitewater boating and suitable flows for a wider variety of recreational uses as compared to PCWA's flow proposal.

The estimated levelized annual cost for this measure is included in the costs presented for minimum flows. We consider the benefits of increased recreational boating opportunities to be worth the additional costs associated with this measure.

Implement the Alternative 1 Minimum Surface Elevation Management Regime at French Meadows and Hell Hole Reservoirs

Table 50 presents Alternative 1 and staff-recommended minimum pool reservoir elevations for French Meadows and Hell Hole reservoirs as specified in Forest Service condition no. 38.

Table 50. Staff-recommended minimum water surface elevations (feet) for French Meadows and Hell Hole reservoirs (Source: Forest Service, 2012a, as modified by staff).

	Water Surface Elevations (feet)	
Water Year Types	**Jun-Sept**	**Sept-May**
French Meadows reservoir		
Wet	5,220[a]	5,152[b]
Above normal	5,220[a]	5,152[b]
Below normal	5,220[a]	5,152[b]
Dry	5,200[c]	5,152[d]
Critical	5,175[c]	5,152[d]
Extremely critical	5,175[c]	5,120[d]
Hell Hole reservoir		
Wet	4,530[e]	4,451[f]
Above normal	4,530[e]	4,451[f]
Below normal	4,530[e]	4,402[f]
Dry	4,485[c]	4,402[d]
Critical	4,455[c]	4,402[d]
Extremely critical	4,404[c]	4,341[d]

Note: WSE—water surface elevation

[a] Minimum pool requirements end on September 15.

[b] Minimum pool requirements begin on September 16.

[c] Minimum pool requirements end on September 1.

[d] Minimum pool requirements begin on September 2.

[e] Minimum pool requirements end on Labor Day.

[f] Minimum pool requirements begin on the day after Labor Day.

As compared to existing operations, the minimum pools proposed by PCWA would:

- result in higher minimum summer water surface elevations in French Meadows reservoir during wet and above normal water year types;
- result in lower winter minimum water surface elevations in French Meadows reservoir during wet and above normal water year types (enhance capacity to accommodate spring runoff);
- result in higher winter minimum water surface elevations in French Meadows reservoir during critical water year types;
- result in higher minimum summer water surface elevations in Hell Hole reservoir during wet, above normal, below normal, and critical water year types;
- result in higher winter minimum water surface elevations in Hell Hole reservoir during critical water year types; and
- implement the summer/winter minimum pool elevation immediately after Labor Day instead of at the end of September.

Our recommended minimum reservoir level regime would provide these same benefits and would also result in higher minimum water surface elevations in French Meadows reservoir during below normal and critical water year types as compared to the existing conditions. Whereas PCWA's proposal for minimum reservoir elevations changes from summer to fall on Labor Day, the Forest Service condition changes at different times based on water year type.

Based on operation model results for the period of record, both PCWA's proposed action and our recommended measure would result in relatively little change in the actual operational reservoir elevations as compared to existing operations, and these measures would not substantially affect surface area or water depth in French Meadows or Hell Hole reservoirs. Shoreline access to the reservoirs and exposed obstacles such as tree stumps and bedrock outcrops that appear as the water level in the reservoirs recede would be similar to existing conditions. Because little change is expected in reservoir habitat and French Meadows and Hell Hole reservoirs would continue to be stocked, both measures would provide angling opportunities similar to what currently exists. The 4,530-foot minimum water surface at Hell Hole reservoir during wet, above normal, and below normal water year types, as PCWA proposes and we recommend, would be sufficiently high to retain boating access to the upstream end of the reservoir during the recreation season in these water year types that is not provided by the existing license requirements.

We recommend higher minimum water surface elevations for French Meadows reservoir during the peak recreation season than what PCWA proposes. This is consistent with the Forest Service rationale for this measure, which states the agency's

desire to maintain the reservoir level at French Meadows as high as possible during the recreation season to restrict encounters with physical hazards and to maintain reasonable access to the shoreline from developed recreation facilities. Reservoir water surface elevations are a key factor in the functionality of boat ramps; the higher the water level, the better access for recreational boaters via existing boat ramps on both reservoirs.

The estimated levelized annual cost for this measure is included in the costs presented for minimum flows. The cost of implementing both PCWA's and our recommended minimum reservoir surface elevation measure would be minimal; however, our measure would be more beneficial than PCWA's measure in terms of the potential enhanced recreational opportunities at French Meadows and Hell Hole reservoir. This benefit would warrant any such incremental cost.

Streamflow and Reservoir Gaging Plan

We recommend new instream flow requirements and minimum water surface elevation requirements for French Meadows and Hell Hole reservoirs. Streamflow and water surface elevation gages would be needed to document compliance with any such requirements in a new license. We find in section 3.3.2.2, *Aquatic Resources*, that both the proposed Flow and Reservoir Monitoring Plan and the Alternative 1 Streamflow and Reservoir Monitoring Plan could document compliance with designated streamflows and water surface elevations. The Streamflow and Reservoir Elevation Gaging Plan specified in Forest Service condition no. 32 is essentially the same as the Alternative 1 plan. Key differences between the proposed and our recommended plans include the following:

- Our recommended plan includes provisions for operating and maintaining the gages in accordance with applicable USGS protocols.
- Our recommended plan includes provisions to provide all 15-minute gage information to the agencies and the Commission upon request in a readily accessible electronic format, not just a single gage on the peaking reach as provided for in PCWA's proposed plan.

We prefer the concise approach taken in the Alternative 1 plan because it presents the basics of what is needed for flow and reservoir water level monitoring. PCWA's proposed plan would rely on 24-hour average flows and reservoir elevations. This approach could conceivably mask substantial variations of flow or water surface elevations within a 24-hour period. In addition, raw data would only be available upon request from a single peaking reach flow monitoring station.

We recommend a modified version of the Alternative 1 Streamflow and Reservoir Gaging Plan. The monitoring data reports should include the minimum and maximum stream flow values for each day in addition to the daily average values. This additional information, that could be collected at a nominal cost, would provide a basis for the Commission to decide whether to request files with the raw 15-minute time

interval data from PCWA to confirm compliance with instantaneous flow values that may be specified in a new license. The benefit of accurately documenting project-related required flows and water surface elevations for compliance purposes with our recommended streamflow gaging plan would be worth the estimated levelized annual cost of $130,100.

Development and Implementation of a Spawning Habitat Improvement Plan

Fisheries surveys indicate that recruitment of trout in the peaking reach is well below what would be expected in unregulated streams. This is likely because the quality of available spawning habitat is compromised by daily flow fluctuations. PCWA's proposed placement of spawning-sized gravel downstream of Ralston afterbay at Indian Bar and Junction Bar would increase spawning habitat in downstream reaches compared with existing conditions. Forest Service condition no. 26 specifies that within 1 year of license issuance PCWA develop a spawning habitat improvement plan for the Middle Fork American River downstream of Ralston afterbay dam after consultation with the Forest Service, California Fish and Game, Water Board, and other interested parties. Our analysis in section 3.3.2.2, *Aquatic Resources,* finds that additional benefits to trout spawning success and juvenile recruitment in the Middle Fork American River downstream of Ralston afterbay could likely be realized by strategic placement of gravel in the bypassed reach, because of the relatively stable flow regime compared to the peaking reach. This would enhance recruitment of trout populations in the peaking reach, because most trout reared in the bypassed reach would eventually move downstream to the peaking reach. We therefore recommend PCWA develop a spawning habitat improvement plan for Commission approval that lays out a specific approach to augment gravel in this bypassed reach, defines how implementation of this plan would be coordinated with our recommended Sediment Management Plan, and includes a provision for monitoring the effectiveness of this measure on trout spawning by conducting redd surveys or implementing other quantitative approaches. The expected increase in recruitment of trout populations in the peaking reach would be worth the estimated levelized annual cost of $800 to develop the plan, and the cost for implementing the plan would be built into the cost of the gravel augmentation component of the Sediment Management Plan.

Annual Reporting on the Status of Anadromous Fish Restoration

NMFS recommends that PCWA file a report with the Commission by December 31 of each year following license issuance on the status of reintroduction to the American River watershed of federally listed anadromous fish based on PCWA's participation in Reclamation's Fish Passage Steering Committee. The feasibility of restoring listed anadromous fish upstream of Nimbus and Fulton dams downstream of project is being evaluated and could occur during the term of a new license. In the draft EIS, we recommended that PCWA file an annual report on the status of reintroduction of federally listed anadromous fish into the American River watershed as recommended

by NMFS. After further analysis, as discussed in section 3.3.2.3, *Cumulative Effects on Central Valley Steelhead*, we find that, during periods where no new significant information is available, the filing of an annual report would represent unnecessary effort. Therefore, we now recommend that PCWA, in consultation with NMFS, monitor the status of restoration of California Central Valley steelhead in the American River watershed during the term of a new license and notify the Commission, as well as Reclamation, FWS, and California Fish and Game, in the event of likely restoration upstream of Nimbus and Folsom dams. This information would then be used to determine when it is appropriate to consider any needed changes to project facilities or operations to accommodate the restoration process. The value of keeping the Commission informed about pending ESA actions at the PCWA project would be worth the estimated levelized annual cost of $5,000.

Expanded Scope of Raptor Nest Surveys Prior to Construction

PCWA's proposed and the Alternative 1 Recreation and Transportation System Management Plans include a provision that, prior to recreation facility modification or construction that is planned during the raptor breeding season, a raptor nest survey be conducted by a qualified biologist to determine the presence of raptor nests within 500 feet of the construction site. No specific provisions are included in these plans to have the biologist also survey for the presence of other special status wildlife, by either direct observation or identifiable signs, that may occur within 500 feet of construction sites. The same factors that could result in disturbance of raptor nests near construction sites may also disturb other special status species of wildlife during their breeding seasons, which generally overlaps with the raptor breeding season. Therefore, we recommend, during the proposed raptor nest surveys, the trained biologist also document any evidence that other special status species of wildlife are present within 500 feet of the proposed construction site, and if so, consult with the Forest Service, FWS, and California Fish and Game regarding any protective measures that could be implemented. We recommend similar surveys be conducted prior to all project-related construction. This measure would not result in any additional costs over the proposed or Alternative 1 plans, and the extra level of protection of additional special status wildlife that this measure would provide is warranted.

Aquatic Invasive Species Management Plan

PCWA currently has provisions in place to manage invasive species in its Invasive Mussel Protection Plan referenced in the Alternative 1 VIPMP. This plan was developed in consultation with and approved by California Fish and Game. However, there is no evidence that the Forest Service was consulted during the development of the plan, and it was not filed with the Commission for approval. Although the plan, in combination with the Alternative 1 VIPMP, appears to include all the elements specified in Forest Service condition no. 48, developing an aquatic invasive species management plan after consultation with the Forest Service would ensure that the latest

Forest Service directives regarding management of resources on NFS lands are accommodated by the plan. We expect the effort to develop this plan to be minimal and the benefits of obtaining Forest Service and Commission input to the plan would be worth the estimated levelized cost of $400.

Revised Recreation Plan

The project provides numerous recreation opportunities, and PCWA appropriately proposes extensive development, reconstruction, and management support in its proposed Recreation Plan. However, we find in section 3.3.5, *Recreation Resources and Land Use,* that the proposed plan: (1) contains some discrepancies between tabular and narrative information; (2) presents separate descriptions of existing and planned development for individual sites; and (3) refers the reader to external information provided in relicensing reports. As written, the Commission could not approve the plan because it would not be possible to determine if PCWA's project recreation facility development and management were in compliance with the plan. The same issues are present in the Alternative 1 and final 4(e) condition Recreation Plans. Additionally, as discussed later in this section and in section 5.2.3, the scope of recreation measures we recommend is different from what the proposed plan contains. Consequently, we recommend PCWA revise, after consultation with the Forest Service and California State Parks, and resubmit the Recreation Plan to address shortcomings in the proposed plan and reflect the recreation measures, including schedule, that we recommend.

Individual recreation measures contained in the proposed recreation plan address the majority of project effects and meet identified recreation needs at the project. However, we also recommend including several elements contained in the Alternative 1 and final 4(e) condition Recreation Plans as well as incorporating a component that formalizes a monitoring and reporting process for bear-related incidents and evaluating existing and potential new measures for reducing interactions between humans and bears at project recreation facilities.

Implementation Schedule—Existing project recreation facilities and water systems will soon be in need of redesign and reconstruction to meet visitor needs, protect natural resources, and provide for public health and safety. We recommend an implementation schedule for the recreation facility development that is included in Alternative 1. Although developments would generally occur later as compared to PCWA's proposal, most of the facilities and water systems are in a functioning condition, and visitor needs are currently being met by the spectrum of facilities and their existing condition. We consider the slight visitor inconvenience caused by delaying implementation to be minor as compared to the benefit of delaying the capital expenditures.

Trails—There are numerous trails in proximity to the project, and there is a demonstrated demand for trail use by project visitors. It would be appropriate to

include certain trails within the project, because they provide access to project facilities and features. Requiring PCWA to construct, reconstruct, and maintain certain trails would provide additional trails for visitors and ensure the trails are properly maintained to minimize resource damage, such as erosion, and provide for visitor safety. Consequently, in addition to PCWA's proposal to extend the Poppy trail, we recommend PCWA construct or reconstruct, as appropriate, and maintain: (1) Poppy trail; (2) a trail to the gage near Duncan Creek diversion dam; (3) French Meadows trail between French Meadows Campground and French Meadows dam; (4) Hell Hole reservoir trail; (5) catwalk access around Middle Fork powerhouse; and (6) a trail to the gage upstream of the Ralston afterbay day use area.

Indian Bar Rafting Access—The existing facilities do not accommodate visitor needs for parking, boat launching, and changing clothes. In addition to PCWA's proposed actions to reconstruct the boat launch, install a supplemental slide ramp, and construct a changing pavilion, we recommend PCWA install signage as described in Alternative 1 because it would encourage proper visitor use of the parking area and allow appropriate agencies to enforce regulations. We anticipate this measure would reduce user conflicts (e.g., parking spaces unavailable to boaters when visitors use them for overnight camping) and protect natural resources at the site.

Water System Developments—Providing potable water at developed recreation sites at the project is consistent with amenities that are typically provided at Forest Service facilities with a development scale of 3 or higher. Visitor needs are currently not being met at these types of project recreation facilities, because some have no potable water or the existing water systems are insufficient. In addition to enhancing project water systems, as PCWA proposes, we also recommend PCWA develop and provide potable water at Hell Hole boat ramp and Ahart Campground as described in Alternative 1. This measure would benefit project visitors and provide a water source during the winter when Ahart Campground may still be available for public use.

Streamflow Information—Although whitewater boating use depends on the availability of sufficient flow in the peaking reach, it is also necessary for visitors to know the timing of these flows so they can plan their trips accordingly. Because the project affects both quantity and timing of flows, we recommend providing outage information and 24-hour predicted flows as described in Alternative 1. Providing this information would provide a commensurate benefit to whitewater boaters by enabling them to better plan their trips at little if any additional cost.

Marketing Materials—In order for visitors to take advantage of project recreation opportunities it is necessary for them to acquire accurate and up-to-date information to plan their trips. In addition to PCWA's proposal to develop a visitor brochure, we recommend PCWA also consult with BLM and Reclamation to prepare the brochure that provides information on project recreational opportunities and update this information every 6 years. These additional measures would have a small incremental cost (estimated annual levelized cost of $410) yet provide a significant benefit, because

they would ensure visitors are informed of the full range of project recreational opportunities, and the information they receive would be accurate and current. As a result, visitors would have more enjoyable trips because their planned trips would meet their expectations.

Stocking—Project dams without provisions for upstream passage isolate fish populations and create angling opportunities in project reservoirs. We recommend PCWA be entirely responsible for stocking fish in the project reservoirs, as specified in Alternative 1 and Forest Service condition no. 39. This measure would appropriately enhance angling opportunities and benefit project visitors and would be worth the estimated levelized annual cost of $61,900.

Other Project Facilities—In addition to the recreation facilities and development proposed by PCWA, we recommend the recreation management plan address development at a few other sites that is different from or in addition to what PCWA proposes and consistent with the Alternative 1 Recreation Plan.

- We recommend including French Meadows RV sanitation station as a project recreation facility that PCWA would reconstruct, operate, and maintain, because it supports project recreation use.
- We recommend reconstructing Big Meadows Campground as described in Alternative 1 because it would provide interpretive opportunities for visitors and improve the quality of the facility in terms of eliminating uneven ground and providing larger campsites.
- We recommend providing a loop access road and parking area, and new signage at Hell Hole campground. The additional facilities we recommend would allow visitors easier boat trailer access and parking and provide better site management. Although PCWA determined Hell Hole campground has low occupancy, there is insufficient information to determine if the facility could be redesigned and reconstructed to better meet recreational needs at the project such as group use. Consequently, we recommend PCWA conduct surveys to determine whether to convert the family campground to a group campground. This measure would provide information necessary to determine the best use of the site before committing project funding.
- We recommend PCWA restore areas at the Hell Hole boat ramp as described in Alternative 1. Unlike PCWA's proposal to place barrier rocks at this location, our recommendation provides for comprehensive restoration at the site that would allow vegetation to become reestablished and improve the appearance of the site with new fencing.

Our recommended recreation plan would have an estimated levelized annual cost of about $800,000, which is about $50,000 less than the estimated levelized annual cost of the Alternative 1 Recreation Plan but $350,000 more than the estimated levelized

cost of PCWA's proposed Recreation Plan. We conclude that the benefits of our recommended plan would be worth the cost because it would: (1) address project effects and provide for project visitor use such as providing project trails and modifying recreation facilities; (2) provide a comprehensive recreation management plan that the Commission can use to assess compliance with required recreation facility construction, reconstruction, and management; (3) protect natural resources at recreation developments; and (4) enhance recreation enjoyment for project visitors.

Provide Public Education and Information About Flow Fluctuations in the Peaking Reach

Because the staff alternative includes minimum instream flows that are higher than currently required and reduces the amount of time when flows would be suitable for easy river crossing in the peaking reach, we recommend increasing public awareness about flow fluctuations. Therefore, we recommend PCWA educate the public about flow fluctuations by incorporating information about flow fluctuations in the proposed visitor brochure and on PCWA's website (in association with providing real-time flow information), as discussed in the previous subsection. In addition, we recommend the existing signs located at prominent points of public entry to the peaking reach be periodically reviewed by PCWA for adequacy. We further recommend PCWA periodically assess the need for additional signage warning the public about potentially hazardous conditions that may be associated with peaking reach flow fluctuations. We also recommend PCWA include adjustment factors regarding predicted timing and magnitude of peaking reach flows immediately upstream of the confluence of the North Fork American River that can be applied to real-time flow information from USGS gage no. 11433300 (Middle Fork American River near Foresthill) posted on PCWA's website, which would provide recreational visitors with additional information for planning trips to the peaking reach. Finally, we recommend PCWA install and maintain permanent visual water level markers at river crossings in the peaking reach (such as numbered bolts anchored to rock in the channel) that visitors could use as reference points when they consider crossing the river. From these water level markers, visitors would be able to assess whether the water level at Western States Trail river crossings is rising or falling over time. Interpretive information regarding the location and intended use of the water level markers would be included in visitor brochures, project websites, and on-site signage. We recommend PCWA include these provisions for additional public education and information in our recommended revised Recreation Plan. We conclude that there would be little if any additional estimated levelized annual cost associated with these measures with the exception of installing reference water level markers at river crossing sites. We estimate that the estimated levelized annual cost associated with installing reference water level markers would be about $160 and the increased ability of the public to plan and participate in appropriate and safe recreational activities along the peaking reach warrant the cost associated with these recommended measures.

Final Historic Properties Management Plan

Most of the measures to protect cultural resources provided in the draft final Alternative 1 HPMP are acceptable. However, the draft final Alternative 1 HPMP did not fully describe the subsequent steps that would be undertaken to determine National Register eligibility of identified resources, assess project effects (including potential effects of trail improvement), and development of mitigation measures to resolve adverse effects. Additionally, evaluations for listing on the National Register and mitigation measures for adverse effects may require archaeological excavation, but no plan for the curation of recovered materials was provided. In the draft EIS we recommended minor revisions to the document that included: (1) requirements for National Register evaluation of all currently unevaluated resources subject to unavoidable project-related effects and documentation of California SHPO concurrence with all National Register recommendations; (2) a plan for assessment of project effects to any properties that are determined to be eligible for listing on the National Register; (3) a plan for the curation of any recovered archaeological materials; and (4) a plan to develop mitigation measures in consultation with the California SHPO, Forest Service, and participating tribes for all eligible properties where effects are adverse. On September 21, 2012, PCWA filed a final HPMP that addressed all of our recommendations from the draft EIS. Implementation of the final HPMP would have an estimated levelized annual cost of about $43,940, which is the same as the estimated levelized annual cost of the proposed and draft final Alternative 1 HPMP. We conclude that the benefits of implementation of our recommended final HPMP would be worth the cost because it would ensure that properties that are eligible for listing on the National Register are managed appropriately in the future in accordance with section 106.

5.2.3 Measures Not Recommended by Staff

Staff finds that some of the measures recommended by other interested parties would not contribute to the best comprehensive use of the Middle Fork American River water resources, do not exhibit sufficient nexus to project environmental effects, or would not result in benefits to non-power resources that would be worth their cost. The following section discusses the basis for staff's conclusion not to recommend such measures. Staff also no longer recommends a measure recommended in the draft EIS (expanding the geographic scope of sensitive plant surveys) based on evidence provided by PCWA in its comments on the draft EIS. We include the basis for this change in the staff alternative in this section.

Streamflow Gages on the Lower Rubicon and North Fork American Rivers

Two gages on the Rubicon River are included in the Alternative 1 Streamflow and Reservoir Gaging Plan that are not intended to document compliance with any specified flow measures. The primary purpose of both gages is to provide the public with real-time flow data that would be helpful for making decisions about traveling to

the Rubicon River for recreational purposes in the reach between Ellicott Bridge and the Ralston afterbay. Our recommended Streamflow and Reservoir Gaging Plan would provide for documentation of flows from Hell Hole dam and powerhouse to the Rubicon River as measured in the vicinity of the dam. PCWA has control over such flows during most circumstances. Flows on the Rubicon River at and downstream of Ellicott Bridge are not only influenced from project release from the Hell Hole development, but also from inflows from the South Fork Rubicon River. South Fork Rubicon River flows are heavily influenced by the operation of the Upper American River Hydroelectric Project (FERC No. 2101). We do not dispute the value to potential recreational visitors of having real-time flow information on the lower reach of the Rubicon River; however, we are unable to establish a nexus of these two gages to project purposes. Therefore, we do not recommend installation and operation of these two new gages in our recommended gaging plan.

Both the proposed and Alternative 1 monitoring plans provide for a gage on the North Fork American River which would also be used to disseminate real-time flow information to the public. As with the two gages on the Rubicon River, the value to potential recreational visitors to the peaking reach of having real-time data for flows in the North Fork American River is not disputed. However, project-related flows in the Middle Fork American River downstream of the Ralston afterbay development would be measured in the bypassed reach (downstream of the afterbay dam), the Oxbow powerhouse penstock, and at the existing USGS gage near Foresthill, downstream of the confluence of the Oxbow tailrace with the bypassed reach. We are unable to establish a need for this additional new gage on the North Fork American River, and we do not recommend its inclusion in our recommended gaging plan.

Mercury Bioaccumulation Monitoring

PCWA proposes to implement its Mercury Bioaccumulation Monitoring Plan that would provide data characterizing methylmercury concentrations in the muscle tissue of sportfish from French Meadows and Hell Hole reservoirs, Ralston afterbay, and the peaking reach. Forest Service condition no. 28 also specifies that this plan be implemented. PCWA's prefiling studies documented high concentrations of methylmercury in fish and crayfish from project waters. Elevated methylmercury levels in fish tissue have been reported throughout the Sierra Nevada region. PCWA does not propose any substantive changes to reservoir levels. Therefore, we do not expect any changes in methylmercury concentration levels in sportfish as a result of project operations. Although the information generated from implementation of this plan would provide appropriate agencies with data on whether or not to issue health advisories for anglers using project waters, bioaccumulation of mercury is not a project-related effect. Consequently, we conclude that the estimated levelized annual cost of $17,840 for implementation of this plan is not warranted.

Expanded Special-status Plant Survey Area

Both the proposed and Alternative 1 VIPMPs provide for surveys at 5-year intervals for special-status plants and mosses consistent with the methods in the special-status plants technical report (PCWA, 2008a). This report includes field survey methods and the geographic scope of surveys conducted in 2006 through 2008, and we interpreted this to include the geographic scope of future 5-year plant surveys. However, the area surveyed during the pre-application special-status plant surveys did not include a portion of the French Meadows Campground water supply facility access road. Consequently in the draft EIS we recommended that this access road be included in the survey area. However, in its comments on the draft EIS, PCWA states that it "has committed to conduct special-status plant surveys every 5 years at all project facilities identified in Table 5.1 of the Alternative 1 VIPMP, including the French Meadows Campground Water Supply Facility Access Road." Given this clarification it is evident that our recommendation in the draft EIS was redundant because PCWA's proposed and Alternative 1 VIPMPs include this access road in the area surveyed during the 5-year special status plant and moss surveys. Therefore, our recommendation to include this road in future sensitive plant surveys is no longer necessary.

Preparation of a Biological Evaluation or Biological Assessment for Future Construction of Project Facilities

Forest Service condition no. 11 specifies that PCWA prepare and submit a biological evaluation to the Forest Service for approval prior to taking actions to construct new project facilities on NFS lands that may affect Forest Service special-status species. NMFS and Interior make similar recommendations pertaining to federal and state special-status species. However, before construction of any new project feature not authorized by the license, PCWA may need to file with the Commission an application to amend its license. If appropriate, a biological evaluation or, if federally listed species could be involved, a biological assessment for special status species, could be developed as part of the license amendment proceeding. Consequently, we find that there is no need to include this measure as a condition of a new license for this project.

Recreation

Although we recommend PCWA be responsible for operating and maintaining project-related recreation facilities, we do not recommend PCWA be required to provide funding for Forest Service law enforcement, because PCWA already provides this funding support through land use fees and county taxes. Further, the Commission would have no way of ensuring any funding provided to the agency for law enforcement would be used for project purposes. Additionally, providing funding to the Forest Service for operating and maintaining the project recreation facilities through a collection agreement would not ensure these facilities would be properly operated and maintained. PCWA is ultimately responsible for operation and maintenance of project-

related recreation facilities. Accordingly, we do not recommend PCWA be required to enter into a collection agreement as specified in Forest Service condition no. 35.

We do not recommend the project include any development at Cache Rock as specified in Forest Service condition no. 36, at an estimated levelized annual cost of $7,500, because recreation use is related to dispersed camping and gold panning, which have no nexus to the project. Similarly we do not recommend installing a restroom and parking area at Ellicott Bridge as specified in the Alternative 1 Recreation Plan, at an estimated levelized annual cost of $8,400, because it is located more than 8 miles downstream of Hell Hole reservoir, and this site is used for river access that would exist irrespective of the project.

The Forest Service specifies in condition no. 37 that PCWA make improvements to an administrative facility at Hell Hole reservoir that would serve a shared purpose with the Forest Service. As described in its rationale document, the improvements are not consistent with the ROS classification associated with Hell Hole reservoir. Further, a "shared purpose" facility is beyond the scope of meeting a project need or addressing a project effect. Consequently, we do not recommend this measure because it lacks a clear nexus to the project.

At McGuire Picnic area, we recommend converting this site to a group campground with two group sites. However we only recommend constructing two 25-PAOT sites at an estimated levelized annual cost of $27,800, rather than the capacity specified by the Forest Service (one 25-PAOT and one 50-PAOT site; estimated levelized annual cost of $35,800) and included in the Alternative 1 Recreation Plan, because our recommended capacity should provide adequate initial capacity and additional capacity can be considered based on future monitoring. The benefits of the Alternative 1 approach would not be worth the associated costs.

Although we recommend PCWA develop visitor information that can be disseminated by various entities and agencies, we do not recommend PCWA be responsible for printing materials associated with this measure. The estimated levelized cost of developing and printing this marketing material would be $8,920. Instead we recommend PCWA consult with various entities to prepare electronic files to the agencies for their own use. The estimated levelized annual cost of our recommendation to develop the marketing material and provide it to appropriate agencies would be $4,780. Because the information in the materials needs to have a regional perspective in order to be an adequate information source for visitors to plan their trips, this level of information would obviously serve broader purposes than just the project. Accordingly, we consider it appropriate for PCWA to share the cost of this measure with others that would also benefit from using these materials. By providing the electronic information so others may use it, PCWA would bear its share of the cost of providing this information to the public.

We do not recommend PCWA be entirely responsible for the French Meadows North water system at an estimated levelized annual cost of $6,300. Because this

system also provides water to a Forest Service barracks, house, and trailer park that are used by non-project agency field staff, it is not appropriate for PCWA to bear all costs related to this water system. Instead, we recommend PCWA replace the water system infrastructure and access roads and fund operation and maintenance costs only as necessary to provide water to the following project-related recreation facilities: Lewis campground; Gates group campground; Coyote group campground; McGuire picnic area; McGuire boat ramp; and French Meadows RV dump station at an estimated levelized cost of $2,770.

We do not recommend establishing reservoir level objectives at Hell Hole and French Meadows reservoir to support recreation use as the Forest Service specifies in condition no. 38. The potential actions such as patrols and shoreline protection from motorized uses specified in condition no. 38 are not based on any identified project effect, and the benefit of this measure is speculative.

We do not recommend the measure in the Alternative 1 Recreation Plan to construct an access trail for public access downstream of Middle Fork interbay in the vicinity of the dam. PCWA's engineering analysis of the site revealed that it would not be feasible to construct a trail suitable for public use in this location. Consequently, for public safety reasons we do not recommend this measure.

5.3 UNAVOIDABLE ADVERSE EFFECTS

Minor amounts of sediment would enter the peaking reach, bypassed reaches, and project impoundments as a result of sediment removal from project impoundments, sediment augmentation, and construction associated with modified or new project facilities, even with implementation of erosion control measures, resulting in short-term effects on water quality and aquatic biota. Some fish mortality would likely occur from entrainment at the deep powerhouse intakes in French Meadows and Hell Hole reservoirs; although such effects would be long term, they would be minor because few fish occur at the depth of the intakes. Entrainment and fish mortality would also continue to occur at the Ralston and Oxbow powerhouses. This would represent a long-term effect that likely would be minor. With the proposed action, about 1.08 acres of riparian and upland vegetation would be permanently lost, most of which is associated with the sediment augmentation sites downstream of Ralston afterbay, and the remainder with construction of new project infrastructure and recreation facilities. The expected long-term aquatic and riparian habitat enhancement from sediment augmentation would mitigate much of this loss. An additional 0.07 acre of vegetation would be permanently lost under Alternative 1, the staff alternative, and the staff alternative with mandatory conditions because of an additional recreational trail included in these alternatives. Wildlife associated with this habitat would be permanently displaced, representing a long-term but minor effect. Project modifications in the vicinity of Hell Hole reservoir (i.e., removal of two campsites at Hell Hole Campground and the entire Upper Hell Hole Campground) would also result in the removal of some individual Stebbins' phacelia, a special-status plant. This loss of

individual plants would represent a long-term but minor effect, and would not likely adversely affect populations because these two proposed modifications are designed to reduce effects on these Stebbins' phacelia populations by reducing the likelihood of disturbance by recreational visitors. Removal of the Upper Hell Hole Campground would permanently displace those few recreational visitors that used this site, representing a long-term but minor effect. All action alternatives entail some construction, which would result in minor, short-term increases in traffic, noise, and visual disturbance during construction.

5.4 SUMMARY OF SECTION 10(j) RECOMMENDATIONS AND 4(e) CONDITIONS

5.4.1 Fish and Wildlife Agency Recommendations

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

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. In response to our REA notice, the following fish and wildlife agencies submitted recommendations for the project: NMFS (August 1, 2011) and California Fish and Game (August 5, 2011).

Table 51 lists the federal and state recommendations filed subject to section 10(j), and whether the recommendations are adopted under the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA and are addressed in the specific resource sections of this document and the previous section. All 19 of the recommendations that we consider to be within the scope of section 10 (j) are included in the staff alternative. Of the 44 recommendations made by California Fish and Game pursuant to section 10(j) of the FPA, 25 are not within the scope of section 10(j) and have been considered under section 10(a) of the FPA. Of those 25, 10 are administrative recommendations, identical to some of the Forest Service's 4(e) conditions that we consider to be administrative. With the exception of California Fish and Game's recommendations entitled, condition 1: *Consultation*, condition 11: *Protection of Forest Service Special-status Species*, and condition 15: *Pesticide Use Restrictions on NFS Lands*, we do not analyze these administrative recommendations in this EIS.

Table 51. Fish and wildlife agency recommendations for the Middle Fork American River Hydroelectric Project (Source: staff).

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
1	Annual consultation with land management and resource agencies	California Fish and Game (condition 1)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources	Included in the costs of several plans	Yes
2	Prepare and submit for Forest Service approval a BE prior to taking actions to construct new project features on NFS lands that may affect special-status species; NMFS adds BA to the documents that would be submitted to appropriate resource agencies for review and approval	California Fish and Game (condition 11); NMFS (recommendation 1)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	No basis to estimate cost	No; new project features not addressed in this EIS would require PCWA to file an application to amend its license at which time a BE or BA would be prepared, as appropriate.

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
3	Pesticides may not be used on NFS lands without the prior written approval of the Forest Service and is excluded from NFS lands within 500 feet of known locations of Forest Service special-status or culturally significant plant populations	California Fish and Game (condition 15)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources	Included in VIPMP costs, 37	Yes
4	Pesticide use is excluded from NFS lands within 500 feet of known locations of foothill yellow-legged frog or western pond turtles	California Fish and Game (condition 15)	Yes	Included in VIPMP costs, 37	Yes
5	Release specified minimum flows to designated stream reaches	California Fish and Game (condition 22)	Yes	$2,278,150	Yes
6	Release specified pulsed flows to designated stream reaches	California Fish and Game (condition 23)	Yes	Included in 5	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
7	Develop and implement a Hell Hole dam outlet feasibility study plan to identify maximum pulsed flows between 200 and 600 cfs that can safely and reliably be released from the existing low level outlet	California Fish and Game (condition 23)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. Study could have been conducted prior to license issuance.	Included in 5	Yes
8	Implement specified ramping rates to designated stream reaches	California Fish and Game (condition 24)	Yes	Included in 5	Yes
9	Contingency minimum flows in the event of unplanned outages at Middle Fork and/or Ralston powerhouses	California Fish and Game (condition 25)	Yes	Included in 5	Yes
10	Develop and implement a spawning habitat improvement plan for the Middle Fork American River below Ralston afterbay dam	California Fish and Game (condition 26)	Yes	$800 for plan; cost to implement included in 36	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
11	Annually review the current list of special-status species with resource agencies and determine if newly added species are likely to occur in areas directly affected by project operations	California Fish and Game (condition 27); NMFS (recommendation 2[A])	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in VIPMP costs, 37	Yes
12	Develop a study plan to assess project effects on newly listed special-status species if they are likely to occur on project-affected areas; NMFS adds to the measure that a BE or BA should also be prepared	California Fish and Game (condition 27); NMFS (recommendation 2[B, C])	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	No basis to estimate cost	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
13	Annually file a report with the Commission that documents the status of reintroduction of federally listed anadromous fish to the American River watershed	NMFS (recommendation 3)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$5,000	No, but we recommend PCWA monitor restoration efforts and notify the Commission when reintroduction upstream of Nimbus and Folsom dams is imminent.
14	If new occurrences of Forest Service special-status species are detected prior to or during ongoing construction, operation, or maintenance of the project, immediately notify the Forest Service and develop and implement protective measures, as appropriate	California Fish and Game (condition 27)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	No basis to estimate costs	Yes
15	Implement the Bald Eagle Management Plan	California Fish and Game (condition 27)	Yes	$37,440	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
16	Consult with California Fish and Game, Water Board, and Forest Service to finalize monitoring plans submitted with the license application	California Fish and Game (condition 28)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in the cost of each plan	Yes
17	Finalize and implement the Fish Population Monitoring Plan; general purpose, peaking reach young and juvenile, and Ralston afterbay hardhead movement monitoring	California Fish and Game (condition 28)	Yes	$77,830	Yes
18	Finalize and implement the Fish Population Monitoring Plan; entrainment monitoring at the existing Ralston and Oxbow powerhouses	California Fish and Game (condition 28)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources. Study could have been conducted prior to license issuance.	Included in 17	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
19	Finalize and implement the foothill yellow-legged frog Monitoring Plan	California Fish and Game (condition 28)	Yes	$64,120	Yes
20	Finalize and implement the Western Pond Turtle Monitoring Plan	California Fish and Game (condition 28)	Yes	$21,790	Yes
21	Finalize and implement the Benthic Macroinvertebrate Monitoring Plan	California Fish and Game (condition 28)	Yes	$6,470	Yes
22	Finalize and implement the Mercury Bioaccumulation Monitoring Plan	California Fish and Game (condition 28)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$17,840	No; the presence of mercury in project waters is not related to project operations.
23	Finalize and implement the Geomorphology and Riparian Monitoring Plan	California Fish and Game (condition 28)	Yes	$51,290	Yes
24	Finalize and implement the Water Quality Monitoring Plan; *in situ* and general water quality sampling	California Fish and Game (condition 28)	Yes	$24,110	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
25	Finalize and implement the Water Quality Monitoring Plan; total and fecal coliform sampling	California Fish and Game (condition 28)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in 24	Yes
26	Develop and implement a bear management monitoring plan	California Fish and Game (condition 28)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$400	Yes
27	Develop and implement an LWD management plan	California Fish and Game (condition 29)	Yes	$2,200	Yes
28	Annually meet with the Forest Service, California Fish and Game, and Water Board to review results of implementing streamflow and reservoir-related conditions, monitoring results, and other issues related to preserving and protecting ecological values	California Fish and Game (condition 30)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in the cost of specific plans	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
29	Finalize and implement the Streamflow and Reservoir Elevation Gaging Plan	California Fish and Game (condition 31)	Yes; except streamflow gages solely intended for recreation information	$142,690 (agency); $130,100 (staff)	Yes; except for inclusion of 3 gages solely intended for recreation visitors
30	Develop and implement a plan to evaluate release points when flow conduits need to be drained	California Fish and Game (condition 32)	Yes	$800	Yes
31	Implement the Recreation Plan following Commission approval	California Fish and Game (condition 33)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$850,000 (agency); $800,000 (staff)	Yes, with staff adjustments
32	Manage French Meadows and Hell Hole reservoirs to meet specified minimum water surface elevations and water surface elevation objectives to support reservoir-based recreation	California Fish and Game (condition 37)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in 5	Yes

No.	Recommendation	Agency	Within the Scope of Section 10(j)	Annualized Cost	Adopted?
33	Implement the reservoir fish stocking program as described in the Recreation Plan	California Fish and Game (condition 38)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	$61,900 (included in 31)	Yes
34	Release specified recreation streamflows to the peaking reach	California Fish and Game (condition 39)	No. Not a specific measure to protect, mitigate, or enhance fish and wildlife resources.	Included in 5	Yes
35	Develop and implement an erosion and sediment control management plan	California Fish and Game (condition 45)	Yes	$10,800	Yes
36	Implement the Sediment Management Plan	California Fish and Game (condition 45)	Yes	-$40,380	Yes
37	Finalize and implement the VIPMP	California Fish and Game (condition 46)	Yes	$196,290	Yes

5.4.2 Land Management Agencies' Section 4(e) Conditions

In section 2.2.5, *Modifications to Applicant's Proposal—Mandatory Conditions*, we list the 4(e) conditions submitted by the Forest Service, and note that 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." Thus, any 4(e) condition that meets the requirements of the law must be included in any license issued by the Commission, regardless of whether we include the condition in our staff alternative.

Of the Forest Service's 48 conditions, we consider 18 of the conditions (2 through 10, 12 through 14, and 16 through 21) to be administrative or legal in nature and not specific environmental measures. We, therefore, do not analyze these conditions in this EIS. Table 52 summarizes our conclusions with respect to the 30 final 4(e) conditions that we consider to be environmental measures. We include in the staff alternative 20 conditions as specified by the agency, modify 6 conditions to adjust the scope of the measure, and did not recommend three conditions and one monitoring plan included in a second condition, no. 28; the measures not adopted in total are discussed in more detail in section 5.2, *Comprehensive Development and Recommended Alternative*.

Table 52. Forest Service preliminary section 4(e) conditions for the Middle Fork American River Hydroelectric Project (Source: staff).

Condition	Annualized Cost	Adopted?
No. 1: Consultation	Included in the costs of several plans	Yes
No. 11: Protection of Forest Service Special-status Species	No basis to estimate cost	No
No. 15: Pesticide-Use Restrictions on NFS Lands	Included in VIPMP costs, 47	Yes
No. 22: Minimum Streamflows	$2,278,150	Yes
No. 23: Pulse Flows	Included in 22	Yes
No. 24: Ramping Rates	Included in 22	Yes
No. 25: Outages	Included in 22	Yes
No. 26: Spawning Habitat Improvement Plan for the Middle Fork American River Below Ralston Afterbay Dam	$800 for plan; cost to implement included in 46	Yes

Condition	Annualized Cost	Adopted?
No. 27: Wildlife and Plant Protection Measures	Bald Eagle Management Plan: $37,440; no basis to estimate remaining costs	Yes
No. 28: Monitoring Program	$307,740; $289,880 (staff)	Yes, except Mercury Bioaccumulation Monitoring Plan
No. 29: Develop an Entrainment Study Plan for the Ralston and Oxbow powerhouse intakes	$7,350	Yes
No. 30: Large Woody Debris	$2,200	Yes
No. 31: Annual Review of Ecological Conditions	Included in the cost of specific plans	Yes
No. 32: Implement the Streamflow and Reservoir Elevation Gaging Plan	$142,690; $130,100 (staff)	Yes; except for inclusion of 3 gages solely intended for recreation visitors
No. 33: Penstock and Other Drainage Structure Emergency and Maintenance	$800	Yes
No. 34: Recreation Plan	$850,000; $800,000 (staff)	Yes, with staff adjustments
No. 35: Recreation Operation, Maintenance, and Administration	Included in 34	Yes, although how PCWA funds project-related recreation facility operation, maintenance, and administration is up to PCWA
No. 36: Specific Improvements at Dispersed Recreation Sites	Included in 34	No
No. 37: Recreation Work Station and Storage Facility	No basis to estimate cost	No

Condition	Annualized Cost	Adopted?
No. 38: Reservoir Minimum Pool Elevations and Reservoir Levels Recreation Objectives	Included in 22	Yes, except for reservoir level recreation objectives
No. 39: Reservoir Fish Stocking Program	$61,900 (included in 34)	Yes
No. 40: Recreation Streamflows in the Middle Fork American River Below Oxbow Powerhouse	Included in 22	Yes
No. 41: Visual Resource Management Plan	$9,970; $9,550 (staff)	Yes, but we modified the frequency of visual condition assessments and plan revisions to align with alternating Form 80 reporting intervals (i.e., every12 years)
No. 42: Implement the HPMP	$43,940	Yes
No. 43: Cultural Resource Discovery	Included in 42	Yes
No. 44: Implement the Transportation System Management Plan	$257,220; $256,700 (staff)	Yes, but we modified the frequency of visual condition assessments to match Form 80 reporting intervals
No. 45: Implement the Fire Prevention and Suppression Plan	$9,440	Yes
No. 46: Erosion and Sediment Control Management Plan	$10,800	Yes
No. 47: Implement the Alternative 1 VIPMP	$196,290	Yes
No. 48: Aquatic Invasive Species Management Plan	$400	Yes

5.5 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) 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 the federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed the following 26 comprehensive plans that are applicable to the Middle Fork American River Project, located in California. No inconsistencies were found.

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APPENDIX A

Staff Responses to Comments on the Draft Environmental Impact Statement

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APPENDIX A

STAFF RESPONSES TO COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The U.S. Environmental Protection Agency (EPA) issued its notice of availability of the draft environmental impact statement (EIS) for the Middle Fork American River Hydroelectric Project (project) on August 3, 2012, and comments on the draft EIS were due on October 2, 2012. In addition, Federal Energy Regulatory Commission (Commission) staff conducted two public meetings to receive oral comments on the draft EIS in Auburn, California, on August 28, 2012. Four of the five members of the public that attended the meetings spoke. Two Placer County Water Agency (PCWA) speakers primarily responded to staff questions about project facilities and operations. Other speakers asked questions about the Commission's process and commented on recreational use associated with the peaking reach downstream of Oxbow powerhouse. These recreational use comments were included in written comments filed by the commenter.

In this appendix, we summarize the written comments received; provide responses to those comments; and indicate, where appropriate, how we modified the text in the final EIS. We group the comment summaries and responses by topic for convenience. We do not summarize comments that point out minor edits to the draft EIS; however, we have made these edits in the final EIS. The following entities filed comments on the draft EIS.

Commenting Entity	Filing Date
Department of Interior, Office of Environmental Policy and Compliance[a]	September 26, 2012
Foothills Water Network	October 1, 2012
Placer County Water Agency	October 1, 2012
Western States Trail Foundation	October 1, 2012
California State Water Resources Control Board	October 2, 2012
Department of Interior, Office of Environmental Policy and Compliance	October 2, 2012
Forest Service	October 2, 2012
California Department of Fish and Game	October 2, 2012

Commenting Entity	Filing Date
California Department of Parks and Recreation	October 2, 2012
U.S. Environmental Protection Agency	October 3, 2012
Individual Commenter	**Filing Date**
Jamin Horn	August 7, 2012
Patricia Gibbs	September 17, 2012
Hilde Schweitzer	September 28, 2012

[a] This agency comment letter did not contain any comments, and Interior states that its comment letter dated October 2, 2012, supersedes this letter.

PROCEDURAL

Comment: PCWA and EPA request that we update the status of the application for water quality certification in section 1.3, *Statutory and Regulatory Requirements*.

Response: We updated table 1 and section 1.3.2 to reflect the current status of water quality certification.

Comment: The U.S. Department of the Interior (Interior) states that its 10(a) recommendation to reopen the license if PCWA failed to perform its obligations under a memorandum of agreement reached between the U.S. Department of the Interior-Bureau of Reclamation (Reclamation), U.S. Department of the Interior-Bureau of Land Management (BLM), and PCWA is not addressed in the draft EIS. In addition, Interior mentions that PCWA, in its August 5, 2011, filing, supports including Interior's 10(a) recommendations to reopen the license in any new license issued for the project.

Response: The referenced memorandum of agreement establishes PCWA's obligation to help fund actions including but not limited to annual operation, maintenance, and administration of project-affected federal lands and facilities along the peaking reach, and providing for the health and safety of the public using those federal lands and facilities thereon. Interior clearly states that this agreement is not intended for inclusion in any license that may be issued for this project, except for the reopener 10(a) recommendation. Therefore, we do not discuss or analyze this agreement in the EIS. Section 9 of the agreement notes that, if PCWA fails to make annual payments to BLM or Reclamation as provided for in the agreement, these agencies may petition the Commission to amend the project boundary to encompass all applicable project-affected federal lands, and to include within the license any new condition(s) requiring the

payment of such cost of annual operation, maintenance, and administration of project-affected federal lands and facilities. Section 10 of the agreement explains that the purpose of the reopener recommendation is to provide BLM and Reclamation the ability to petition the Commission to reopen a new license for the project and seek new license conditions to fund the cost of facilities along the peaking reach. Both agencies already have the ability to petition the Commission to reopen any license that may be issued for the project. The requesting entity would be expected to provide support for its request that establishes the need to reopen the license and the nexus of the actions requested to the project. Interior provides no details in the agreement about what facilities the funding would support or the cost of supporting the facilities. Consequently, Commission staff has no basis to evaluate the benefits and costs of the recommendation in this EIS.

Comment: EPA comments that the draft EIS does not include a discussion of existing air quality and conformity with state and federal air regulations. The final EIS should describe and estimate air emissions from potential construction and other activities, as well as proposed mitigation measures to minimize those emissions and provide a comparison to existing conditions.

Response: We listed the issues we intended to address in our National Environmental Policy Act (NEPA) document in Scoping Document 1 issued on February 11, 2008. Estimations of air emissions from potential construction and other activities was not included as an issue we intended to address, and no party suggested that air quality should be added to the list of analyzed issues. While we did not include a section in the final EIS pertaining to air quality, we note that PCWA included an analysis of air quality effects related to Alternative 1 construction in its November 30, 2011, filing with the Commission (section 3.15). Construction projects related to Alternative 1 are essentially the same as those associated with the proposed project and the staff alternative. Based on what we are recommending, should a new license be issued, and using conservative modeling assumptions, PCWA determined that annual construction air emissions under Alternative 1 would be well below all established state and federal thresholds for criteria pollutants.

Comment: EPA comments that the draft EIS does not discuss the applicability of the section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act relative to project operation and maintenance that may involve dredging or discharges to water of the United States. The final EIS should include this information, identify the project effects of dredging and discuss permitting requirements and the role of the U.S. Army Corps of Engineers (Corps).

Response: We identify the effects of proposed project-related sediment management activities on pages 50, 51, 53, 116-119, 172-174, 176, 177, 180, and 184-186 of the draft EIS. PCWA's proposed Sediment Management Plan, included in the staff alternative, includes provisions for consultation with applicable resource agencies to

identify permits needed for sediment management activities, including the Corps, and that it would obtain all applicable permits prior to implementing sediment management activities. PCWA is responsible for obtaining necessary permits from the appropriate agencies for all project activities.

Comment: EPA states that it is not clear if the various resource management plans referred to in the draft EIS (including the Sediment Management Plan) have been prepared pursuant to directives from the U.S. Department of Agriculture-Forest Service (Forest Service), the Commission, PCWA, or a combination thereof. EPA states that these plans should be thoroughly described in the final EIS including timing, responsibility, and specific actions that would be taken under each of the plans.

Response: Following consultation with stakeholders, PCWA developed monitoring and management plans, and included these plans in its license application. In the draft EIS, we summarized the salient elements of each of PCWA's resource plans, some of which are hundreds of pages long, in the resource sections, including specific actions that would be taken by PCWA, the only entity over which the Commission has authority. Some plans, such as the erosion and sediment control plan, have yet to be developed. In such cases, we summarize the elements that should be included in the plan, which are based on stakeholder input and Commission staff analysis. After filing its license application, PCWA continued to collaborate with stakeholders to revise some of the monitoring and management plans, which led to filing revised plans with the Commission. We analyzed those plans in the draft EIS. Therefore, the resource monitoring and management plans analyzed in the EIS represent the collective efforts of stakeholders, including agencies, and the Commission. We do not see the need to add additional details regarding each plan in the final EIS.

Comment: The Forest Service, California Department of Fish and Game (California Fish and Game), and California State Parks comment that the list of comprehensive plans that begins on page 358 of the draft EIS should include the Forest Service Sierra Nevada Forest Plan Amendment and reference the goals and strategies for aquatic, riparian, and meadow ecosystems and associated species and riparian conservation objectives.

Response: We added this plan to the list of comprehensive plans in section 5.5. The goals and strategies of this plan were presented on page 210 of the draft EIS.

Comment: EPA states that the final EIS should describe measures that would be taken to avoid and minimize short- and long-term adverse impacts on water quality, aquatic resources, and other resources from construction activities. This description should include a list of proposed best management practices (BMPs), and the staff alternative should include mitigation to compensate for unavoidable impacts.

Response: We discuss the effects of construction activities and associated BMPs to minimize those effects related to erosion and sedimentation on pages 48 and 49 of the draft EIS; the effects of modifying the three small diversion dams on water quality and associated BMPs on pages 97 and 98 of the draft EIS; and construction effects and avoidance and protection measures pertaining to terrestrial resources on pages 168, 179, 180, 182, 182, 187, 188, 192, and 193 of the draft EIS. To clarify further construction effects and BMPs to avoid and protect resources from adverse effects, we added subsections that specifically address construction effects to sections 3.3.1.2, *Geologic and Soil Resources*, and 3.3.2.2, *Aquatic Resources*, and added additional clarifying text to sections 3.3.3.2, *Terrestrial Resources*, and 3.3.5.2, *Recreation and Land Use*.

Comment: EPA recommends the final EIS include a discussion of the cumulative effects of climate change as it relates to potential effects of the proposed action and action alternatives. It recommends including a short summary of applicable climate change studies with findings of potential environmental and water supply effects and recommendations for adapting to these conditions.

Response: Few resources are available for the evaluation of future climate change effects as they specifically relate to the project. The Commission's standard re-opener article would be included in any license issued for the project and would be the vehicle for making changes to the license should a material change in conditions occur that results in unanticipated environmental effects.

Comment: EPA comments that the draft EIS does not provide an analysis of potential environmental justice effects of the project. If environmental justice populations exist within the geographic scope of the project, EPA recommends the final EIS document the Commission's public involvement methods, describe likely impacts on these populations, and discuss measures that would mitigate these impacts.

Response: We listed the issues we intended to address in our NEPA document in Scoping Document 1 issued on February 11, 2008. Addressing environmental justice from potential construction and other activities was not included as an issue we intended to address, and no party suggested that environmental justice should be added to the list of analyzed issues. Environmental justice effects occur if low-income or minority populations, such as Native Americans, incur a disproportionately high share of adverse socioeconomic effects caused by implementation of an action. In this instance, the actions under consideration are to license the project as proposed by PCWA, as specified in Alternative 1, or as recommended in the staff alternative. There would be no adverse socioeconomic effects associated with any of these action alternatives. Consequently, we conclude there would be no effects related to environmental justice and have not included a section in the final EIS that addresses this issue.

Comment: The Foothills Water Network, Forest Service, California Fish and Game, and California State Parks request that Alternative 1 represent the proposed action,

because they believe it represents agreement among PCWA, resource agencies, and other relicensing participants that was reached after the license application was filed. They state that Alternative 1 reflects the negotiated outcome that is contained in the preliminary 4(e) conditions and PCWA's supplemental filing in November 2011.

Response: Only an applicant can define its proposed action. When PCWA filed Alternative 1, it stated that "PCWA's Proposed Action described and analyzed in the FLA remain unchanged." To confirm whether or not Alternative 1 replaced the proposed action defined in the license application, the Commission staff asked for clarification in a December 14, 2011, letter to PCWA. PCWA's January 11, 2012, response clearly states that Alternative 1 does not replace the proposed action.

PROJECT LANDS, FACILITIES, AND OPERATION

Comment: PCWA requests changing the label on figure 1 (page 2 of the draft EIS) from "Duncan Creek-French Meadows Tunnel" to "Duncan Creek-Middle Fork Tunnel."

Response: We made the indicated correction to this figure.

Comment: PCWA requests revising text to indicate that PCWA provides electrical power to the California electrical grid rather than to its customers. This comment pertains to sections 1.2.2, *Need for Power*; and 5.2, *Comparison of Alternatives*.

Response: We revised sections 1.2.2 and 5.2 to reflect PCWA's clarification.

Comment: PCWA explains that project lands that are not administered by the Forest Service are owned by PCWA or other private parties. PCWA requests that we revise the text in section 2.1.3, *Existing Project Boundary*, to include this information.

Response: We revised the text in section 2.1.3 to reflect this information.

Comment: PCWA states that it proposes to reduce the project lands included in the shoreline buffer at Middle Fork interbay and this reduction should be added to the list presented in section 2.2.2, *Proposed Project Boundary*.

Response: We added Middle Fork interbay to the list of areas in section 2.2.2 where PCWA proposes to remove lands within the existing project boundary.

CUMULATIVE EFFECTS

Comment: EPA states that the cumulative effects analysis does not consider information about projected growth, development, and other activities within the geographic scope other than hydropower development. It also does not take into account historic loss of environmental and cultural resources due to inundation from original project construction. The final EIS should discuss and quantify, where

possible, other past, present, or reasonably foreseeable actions, regardless of what agency or person undertakes such actions. Specifically, the final EIS should discuss the cumulative effects of sediment accumulation in reservoirs. The staff alternative should include mitigation for cumulative impacts and clearly identify the lead agency's mitigation responsibilities and the mitigation responsibilities of other entities.

Response: In the draft EIS, we identified water quality, water temperature, and Central Valley steelhead as potentially cumulatively affected resources. We analyze cumulative effects on these resources in section 3.3.2.3 of the draft EIS. This analysis considers other factors such as Reclamation's Folsom and Nimbus reservoirs and PCWA's American River Pump Station and Pulp Mill Canal Diversion Dam Project (non-hydroelectric facilities). Future water demand from PCWA's customers is factored into our site-specific analysis of reservoir water levels. EPA does not elaborate on how projected population growth, development, and other activities relate to the cumulatively affected resources we identified. We discuss historical conditions in this EIS to the extent available information allows us to do so. We consider sediment accumulation in project reservoirs to be a project-specific effect, and we analyze this effect in section 3.3.1.2, *Geologic and Soil Resources*.

GEOLOGIC AND SOIL RESOURCES

Comment: PCWA suggests that we revise the soils description in section 3.3.1, *Geomorphology* (page 38 of the draft EIS), to indicate the soils are highly erodible and slopes are unstable. PCWA also suggests the addition of text explaining that debris constrictions in the Ruck-a-Chucky area are the result of natural hill slope and channel processes (i.e., not related to the project) (page 39 of the draft EIS).

Response: We changed the text to section 3.3.1 in response to PCWA's clarifications.

Comment: PCWA requests that we revise the text on page 39 of the draft EIS to identify the most prevalent locations of LWD in project bypassed reaches.

Response: Although LWD debris was not present at many study sites and the LWD that was observed had little associated geomorphic function, we recognize that LWD can affect aquatic habitat. We added additional information to section 3.3.1.1 of the EIS about the general locations and functions of LWD within project bypassed reaches.

Comment: PCWA asks us to revise the estimated number of pieces of LWD observed at French Meadows reservoir from 100 to 150 pieces to 150 to 250 pieces (page 47 of the draft EIS) based on information provided in table 7.7.14 of the license application.

Response: We revised section 3.3.1.1 of the EIS to reflect this clarification.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that, although no LWD was observed in Ralston afterbay during 2007 surveys

(which was the basis for the affected environment description on page 47 of the draft EIS), under existing conditions, LWD accumulates in Ralston afterbay; however this condition is not described in the affected environment section (page 47) of the draft EIS.

Response: We recognize that woody debris accumulates in Ralston afterbay and account for this accumulation by stating that woody debris in this reservoir is flushed through spillway gates. However, to clarify this point we added text to section 3.3.1.1 of the EIS that states that LWD accumulates in Ralston afterbay.

Comment: The Water Board comments that an LWD plan is needed for the project that evaluates the adequacy of LWD entering the project and identifies reaches downstream of the project where LWD is insufficient. If such areas are identified, recruitment should be accomplished by LWD placement or allowing LWD to pass project dams. The plan should also include periodic monitoring at prescribed intervals and provisions to enhance LWD, if the need for this is indicated by monitoring. The Water Board states that it will evaluate burning LWD; however, its preferable alternative to burning LWD would be to pass this material downstream of Hell Hole dam to the Rubicon River.

The Forest Service, California Fish and Game, and California State Parks disagree with analysis in section 3.3.1.2, *Channel Morphology and Large Woody Debris* (page 60 of the draft EIS), that Hell Hole dam is the only project facility where LWD management is warranted. The agencies state that no study data support the statement in section 3.3.1.2, *Channel Morphology and Large Woody Debris* (page 59 of the draft EIS), that there is no evidence that the lack of LWD is diminishing the quality of aquatic habitat in the bypassed reaches. The agencies state that our analysis is misleading because the project-affected streams have insufficient LWD as compared to other similar streams in the Sierra Nevada Range. The agencies provide alternative analysis of LWD in project-affected streams based on a study by Ruediger and Ward (1996). The agencies believe all dams should be included in any LWD management program until it can be demonstrated that effective native LWD passage can be achieved in quantities necessary to provide suitable aquatic habitat downstream of all project diversion dams. The agencies state that aquatic habitat downstream of Ralston afterbay, Duncan Creek, North Fork Long Canyon diversion pools, and Middle Fork interbay could be improved by passing LWD downstream of the dams.

Response: We do not dispute the value of LWD to aquatic habitat in all the project bypassed reaches. Based on the agencies' comments and alternative analysis, we re-examined PCWA's geomorphic study reports and added additional descriptive language to section 3.3.1.1 that indicates, under existing conditions, at many bypassed reach study sites downstream of project dams, there was no LWD. LWD at those few sites that had moderate amounts of LWD (the reach 2 to 5 miles downstream of Hell Hole dam and the reach downstream of South Branch Long Canyon Creek) were supplied by recruitment of large trees from along the channels. Due to its lack of abundance, we

concluded in the draft EIS that LWD in project bypassed reaches had little geomorphic function and contributed little to the quality of aquatic habitat except at localized sites. However, if there are reasonable and feasible options for delivering LWD from all project impoundments to downstream bypassed reaches, aquatic habitat would likely be enhanced. Therefore, we agree with the agencies that an LWD plan is needed that addresses such options at all project dams, and we clarified this in the final EIS. Information used in this assessment of options could include, but not be limited to, PCWA's LWD study results, exhibit F drawings, available aerial photography, and PCWA's operational and structural limitations.

The potential benefits to manage LWD at these facilities should be evaluated based on LWD loading in the associated impoundments, the degree to which LWD is passed under current operations, and the logistical feasibility of increasing LWD passage through additional management actions. Additional LWD management may be unnecessary if, during development of the plan, it is demonstrated that effective native LWD passage is already achieved or the existing LWD loading in the impoundment is low enough that it does not warrant additional measures for LWD passage. We modified the text of sections 3.3.1.2 and 5.2.2 of the EIS to clarify that, although developing LWD management options at Hell Hole dam is clearly warranted, developing such options at other project dams is also appropriate given the paucity of LWD in most studied bypassed reaches. The Forest Service's Geomorphology/Riparian Monitoring Plan, which we recommend in this EIS, includes provisions for periodic monitoring of channel conditions, which would include LWD, at accessible locations downstream from project dams.

Comment: The Water Board is concerned that dredging material for sediment management and gravel augmentation could increase mercury methylation. The Water Board believes it would be beneficial to include a Mercury Bioaccumulation Monitoring Plan in the staff alternative that not only monitors the methylmercury level in fish tissue but also the level of mercury methylation in project sediments, particularly in project reservoirs and diversion pools. If monitoring indicates project operation and maintenance are increasing mobilization or methylation of mercury, a mercury management plan should be developed to evaluate potential measures to reduce the amount of bioavailable mercury in affected waters and sediment. Any dredged material from the project that exceeds Basin Plan objectives for methylmercury should not be used for gravel augmentation.

Response: PCWA's proposed Sediment Management Plan, which we recommend in the staff alternative, has provisions for testing bulk sediment that would be used for gravel augmentation and water column testing for methylmercury and total mercury. Should water column samples collected before and after sediment management activities indicate an increase in water column methylmercury, there would be a basis to consider additional management measures in consultation with resource agencies under

existing water quality regulations. We agree that, if the proposed sampling of sediments indicates unacceptable levels of methylmercury are present, it should not be used for gravel augmentation. However, an overt statement to this effect is not included in the Sediment Management Plan. Therefore, we added text pointing this out in section 3.3.3.3, *Aquatic Resources*, and modified our recommendation in section 5.2 accordingly. The Sediment Management Plan includes provisions for annual consultation with resource agencies where methylmercury and total mercury sampling results would be discussed and the need for follow-up actions evaluated. The plan also includes provisions for developing a report after each sediment management activity that would be provided to the Water Board, California Fish and Game, and the Forest Service for review and comment. We expect any necessary recommendations based on the monitoring results to be finalized during this comment period and included in the report. A final report and any needed recommendations would be submitted to the Commission and the Commission would approve or modify any such recommendations, as appropriate. The proposed Water Quality Monitoring Plan and the final plan included in Forest Service final condition no. 28 both have provisions for general water quality sampling that includes methylmercury and total mercury. This monitoring would identify whether project operations may be increasing mobilization or methylation of mercury. We conclude that the staff alternative includes sufficient measures to detect and address project-related mercury methylation.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the analysis in section 3.3.1.2, *Erosion and Sediment Control* (pages 50 and 53 of the draft EIS), should consider recent Forest Service directives and the National Best Management Practices for Water Quality Management on NFS Lands program that will go into effect in 2013. The agencies state that the analysis should be based on both the regional and national BMPs. This comment also pertains to section 3.3.2.2, *Protecting Water Quality during Sediment Management* (page 97 of the draft EIS), and section 3.3.2.2, *Protecting Water Quality during Vegetation and Pest Management* (page 99 of the draft EIS).

Response: The Alternative 1 erosion and sedimentation management plan, to be developed in consultation with the Forest Service within 1 year of license issuance, would include provisions for incorporating current standards, complying with Forest Service regulations and guidance, customization to site-specific conditions, and approval by the Forest Service, as we state on page 49 of the draft EIS. Our analysis on page 50 of the draft EIS clearly supports the Alternative 1 approach to developing this plan. Consultation of the Forest Service with PCWA during the development of this plan would ensure that PCWA develops the plan to be consistent with the Forest Service directives that are in place at the time. We added text to our analysis in section 3.3.1.2 to provide further clarification and to section 5.2.1 to make it clear that we recommend the Alternative 1 approach to developing an erosion and sedimentation management plan.

The agency comments regarding pages 53, 97, and 99 of the draft EIS pertain to the Sediment Management Plan and the Alternative 1 Vegetation and Integrated Pest Management Plan (VIPMP). Both of these plans: (1) include current Forest Service BMPs for avoidance and protection from adverse effects; (2) include provisions for annual consultation with the agencies regarding the need to update avoidance and protection measures; (3) were approved by the Forest Service; and (4) were included in our recommended alternative in the draft EIS. Therefore, any recent or future changes in Forest Service directives would be accommodated by both of these plans, and we see no need to modify the text in the EIS in response to this portion of the agency comments.

Comment: PCWA requests that we supplement the descriptions of the pulse flow measurements in table 3.3.1-3 (page 56 of the draft EIS) to clarify the compliance points that would be used before and after infrastructure modifications.

Response: We modified table 3.3.1-3 (now table 4 in the final EIS) to provide the clarifications requested by PCWA.

Comment: The Water Board agrees that pulse flows to the bypassed reaches would provide benefits such as sediment transport to benefit aquatic habitat and increased recruitment of riparian vegetation and the flow rate in the Rubicon River should be determined after reviewing the results of the feasibility study for the Hell Hole low level outlet. If the pulse flow rate cannot be achieved using the low level outlet, the Water Board comments that PCWA should be required to supplement the flow by using the spillway.

Response: We see no need to specifically recommend PCWA supplement flows using the Hell Hole spillway. The feasibility study is intended to identify the maximum pulse flow between 200 and 600 cfs that can safely and reliably be released from the existing low-level outlet at Hell Hole dam. Once the study is completed, pulse flows to the Rubicon River would be reassessed in light of the study results. The clarification of the compliance points for pulse flow releases at Hell Hole dam provided by PCWA in the previous comment, make it clear that pulse flows could be released from the low-level outlet, the dam spillway, or the minimum flow outlet, all of which would be gaged. Therefore, pulse flow releases to the Rubicon River that may be specified in a new license or an amended license following the feasibility study, could originate from one or more of these potential sources.

Comment: PCWA explains that the timing of the Alternative 1 pulse flows would occur prior to foothill yellow-legged frog breeding initiation and are designed to initiate gravel movement (without deep scouring) which would leave trout redds intact. PCWA also states that rainbow trout would emerge after initiation of the pulse flows. PCWA requests the text on page 58 of the draft EIS be revised with this information.

Response: We concur that PCWA's suggested text change clarifies that the timing of the initiation of pulse flows should avoid effects on foothill yellow-legged frog and trout redds; we added it to section 3.3.1.2.

Comment: The Forest Service, California Fish and Game, and California State Parks state that section 3.3.1.2, *Channel Responses to Altered Flow Conditions* (page 58 of the draft EIS), does not include an analysis of the differences in sediment transport related to the timing of pulse and spill flows. Although the analysis considers the benefit of the timing difference between the flows in PCWA's proposal and Alternative 1 in terms of rainbow trout fry emergence, the final EIS needs to also describe the effects of these flows on sediment transport.

Response: Alternative 1 specifies that, during wet water years, pulse flows would begin on May 15 instead of May 1 in the proposed action. We consider the difference in the timing of pulse flows under Alternative 1 compared to the proposed action to be inconsequential to the magnitude and duration of sediment transport, and conclude that a detailed analysis of sediment transport differences under Alternative 1 is not warranted.

Comment: The Water Board supports including a plan to evaluate the effects of dewatering project conduits in the staff alternative. The plan should include reporting the cause of potential instability and erosion and identifying strategies to mitigate the effects of dewatering. If dewatering has the potential to strand fish and wildlife or negatively impact spawning, the plan should provide a schedule and ramping rates for dewatering that would avoid these effects.

Response: The Forest Service-specified plan to identify optimal water release points when project flow conduits need to be drained and protocols to minimize erosion and sedimentation (now final condition no. 33) is included in the staff alternative. It is not clear if conduit dewatering has the potential to strand fish or negatively impact spawning based on information available to us. During the public draft EIS meeting held on August 28, 2012, PCWA stated that it typically does not drain project tunnels except in emergency situations, and the last time the Middle Fork Project tunnel was drained was in 1974. PCWA stated that tunnels and penstocks are typically drained directly into project waters and not over land.[36] Depending on the protocols used during emergency or other conduit draining, there could be potential for erosion, fish, and wildlife effects, and our recommended plan would help to identify such risks and develop proactive procedures that minimize such risks. The Forest Service final condition specifies that the plan be developed in consultation with the Water Board, in addition to California Fish and Game and the Forest Service. If during plan

[36] "Transcript of public meeting on: Draft Environmental Impact Statement, Middle Fork American River Hydroelectric Project, No. 2079-069." Tuesday, August 28, 2012, 9:10 A.M. -10:10 A.M., pages 15-18, issued on September 5, 2012.

development with PCWA, it is evident that dewatering practices could strand fish or wildlife, or negatively impact spawning, provisions could be included to avoid negative effects to the extent they are controllable by PCWA. We modified the text of sections 3.3.1.2 and 5.2.2 to clarify the parties that would be consulted during the development of this plan.

Comment: The Water Board comments that it expects increasing the surface elevation at the small diversion dams, as discussed in section 3.3.1.2, *Reservoir Shoreline Erosion* (page 62 of the draft EIS), would initially erode the newly inundated shoreline but then reach equilibrium. Because this would cause the surrounding area to become shallower and more riverine, an evaluation should be conducted to determine potential biological effects that might be created by the shift toward a shallower aquatic habitat.

Response: Given the small size of the three small diversion dam impoundments, small increase in the surface elevation at small diversion dams, narrow associated band of hillslope exposed to potential shoreline erosion, and shallow depth of soils in the affected areas, it is highly unlikely that the increase in sediment delivery to the impoundment basin would result in measurable changes in aquatic habitat. A reason for the proposed small diversion dam modifications is to facilitate downstream passage of sediments. Under existing conditions, sediment from upstream sources accumulates in the small impoundments; over time, this accumulation results in shallow, riverine conditions that eventually require removal and disposal or placement downstream of the dams. Following diversion dam modifications, the existing cycle of sediment accumulation behind the dam would continue, but with expected more effective downstream transport of sediments, the frequency of manual sediment removal from the impoundment may be less than under existing conditions. We added text to section 3.3.1.2 to indicate that the expected aggradation of sediment in the impoundment would be a continuation of existing conditions and that any incremental biological effects would be inconsequential.

AQUATIC RESOURCES

Comment: PCWA notes that the bulleted text on page 80 of the draft EIS that summarizes PCWA's water rights should include a reference to table 3.3.2-4.

Response: We agree and added the suggested reference to table 3.3.2-4 (now table 11 in the final EIS) in section 3.3.2.1 of the final EIS.

Comment: PCWA states that the type of use for permit no. 13856 (irrigation and incidental domestic, recreational, municipal, and industrial) should be added to table 3.3.2-6 on page 81 of the draft EIS. In this same table (page 82), the permit license number shown as 13855/13858 should be changed to read 13855-13858 to indicate that this row of the table pertains to the range of permits numbered 13855 through 13858.

Response: We agree and have corrected table 3.3.2-6 (now table 3 in the final EIS) accordingly.

Comment: The Water Board comments that a plan should be included in the staff alternative that would determine the cause of high manganese that was detected in seepage from French Meadows dam. The plan should include measures to address the source of contamination and require monitoring below French Meadows dam.

Response: We state on page 116 of the draft EIS that the source of the manganese is the rock and gravel dam material from local sources, and the cause of manganese levels in excess of secondary water quality criteria for aesthetics is low dissolved oxygen in seepage pathways through French Meadows dam. There are no plausible control measures to address mineral sources of manganese, and the proposed Water Quality Monitoring Plan that we recommend would verify whether proposed flow increases accompanied by reoxygenation and mixing downstream of the dam are sufficient to meet the applicable water quality criterion.

Comment: The Water Board states that additional sampling and monitoring was not conducted to investigate the magnitude, source, or extent of fecal coliform contamination that was detected during relicensing studies, referenced on page 88 of the draft EIS. As a result, it is not known if the contamination was a one-time or continuing problem. Future sampling that indicates levels above basin plan objectives should trigger continued sampling to monitor fecal coliform levels.

Response: The reference to a one-time fecal coliform sample that exceeded the basin plan objective pertains to a sample collected in North Fork Long Canyon Creek on October 2, 2007. Continued sampling at this location after the primary recreation season was over would not have provided meaningful results. The Commission-approved Water Quality Technical Study Plan called for sampling 17 locations where substantial contact recreation occurs, 5 times within a 30-day period. This sampling was accomplished, and the reported fecal coliform geometric means from samples at all locations were lower than the basin plan objective of 200 colonies per 100 milliliter. The approved plan also called for spot coliform sampling at additional locations once in the spring and once during the fall. PCWA recognized that documentation of compliance with the basin plan objectives requires the collection of 5 samples within 30 days, but used a surrogate of 200 colonies per 100 milliliter to suggest that fecal coliform could be an issue if this value was exceeded in spot samples. One of 43 locations sampled in the spring and fall exceeded the surrogate value. However, this value alone cannot be used to measure compliance with the applicable basin plan objectives because it was not based on a geometric mean of five samples at the same location collected within a 30-day period. Consequently, we added a footnote to the statement on page 88 of the draft EIS (section 3.3.2.1) that suggests this sample exceeded the basin plan objective. We note that the Water Quality Monitoring Plan included in Alternative 1, the staff alternative, and the Forest Service final 4(e)

conditions calls for fecal coliform monitoring at 15 locations in proximity to recreation facilities in accordance with basin plan protocols.

Comment: EPA comments that the health and safety impacts of consuming fish stocked in impaired water bodies for mercury are not discussed in the draft EIS. It states that the final EIS should discuss the effects of consuming fish with elevated methylmercury concentrations. Further, the staff alternative should include annually monitoring of stocked fish for methylmercury and posting warning signs to notify the public if monitoring determines levels exceed California Office of Environmental Health Hazard Assessment standards.

Response: We recommend PCWA stock fish in project reservoirs consistent with the Alternative 1 Recreation Plan. As we state on page 234 of the draft EIS, we expect the hatchery source of all stocked fish to be included in the annual recreation report that would be filed with the Commission. This would document that the source of stocked fish is reputable and therefore not providing contaminated fish for stocking in project waters. Game fish that reside in project waters presently contain elevated levels of methylmercury, and this is likely to continue in the future. We have seen no evidence that this mercury is related to project operations. On page 85 of the draft EIS we state that, according to the current 303(b) list, the source of mercury in Hell Hole reservoir is unknown, and the likely source of mercury in Ralston afterbay and North Fork American River is resource extraction. Under the proposed and our recommended operating mode, there would be no substantive changes to water levels in project reservoirs compared to existing conditions. Therefore, describing the health and safety impacts of consuming fish with elevated levels of mercury does not have a nexus to the proposed action, relicensing the project, and we do not consider it appropriate to describe the health and safety impacts from consuming such fish in our EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that, although mercury is identified in the draft EIS as a pollutant, the analysis in section 3.3.2.2, *Monitoring Methylmercury Concentrations of Sportfish in Project Waters* (page 101), dismisses the need for a monitoring plan because the project is not the source of the mercury and project operational changes would not alter the level of mercury in fish. The agencies state that the analysis should consider that project impoundments and tailrace turbulence influence the rates of mercury methylation allowing it to become bioavailable for bioaccumulation in aquatic and terrestrial species. Based on this project effect, the staff alternative should be revised to recommend including a Mercury Bioaccumulation Monitoring Plan for Hell Hole and French Meadows reservoirs, Ralston afterbay, and Middle Fork American River at Otter Creek through the term of any new license that may be issued for the project.

Response: Based on our review of existing mercury bioaccumulation data, it is apparent that mercury methylation and bioaccumulation that has occurred under existing conditions would continue to occur in project reservoirs and impoundments under a new

license. Because we do not expect that any changes to project operations would alter bioaccumulation rates or fish tissue levels, the value of long-term monitoring has not been established, other than to confirm previous findings. As we note in a previous comment response, the proposed Sediment Management Plan includes provisions for monitoring methyl and total mercury in sediments and the water column during sediment management activities that would enable project-related mercury methylation to be identified and addressed. We include the Sediment Management Plan in the staff alternative.

Comment: PCWA requests revising the text on page 86 of the draft EIS to state that measured DO levels were only periodically lower than basin plan objective levels. PCWA states that this change is necessary to clarify that not all DO measurements were below these objectives.

Response: We added PCWA's suggested clarification to section 3.3.2.1 of the final EIS.

Comment: PCWA agrees that hardhead were and are present in Middle Fork American River, however, extensive sampling in 2007-2009 clearly determined that they are only present in Middle Fork American River downstream of a large natural fish barrier located approximately 0.5 mile above Ralston afterbay and in the Rubicon River below a low flow natural barrier 5.4 miles upstream of Ralston afterbay. PCWA disagrees with our characterization that hardhead may occur elsewhere in project affected waters including the Middle Fork American River from French Meadows dam to Middle Fork interbay and the Rubicon River upstream and downstream of Hell Hole reservoir. Our source for this information is PCWA's pre-application document (PAD), but PCWA states that these statements are incorrect. Its source document for the PAD only suggests where hardhead could potentially occur; it does not give documented occurrences. PCWA requests the text about hardhead in section 3.3.2.1, *Special-status Aquatic Species* (page 95 of the draft EIS) be clarified to include this information.

Response: Our text on pages 95 and 96 already indicates that based on PCWA's sampling from 2007 through 2009, the only hardhead collected were from the Middle Fork American and Rubicon rivers a short distance upstream of Ralston afterbay, Ralston afterbay itself, and the Middle Fork American River downstream of Ralston afterbay dam. We see no need to add the additional text suggested by PCWA regarding existing conditions. We modified the potential historical hardhead distribution based on information we obtained from primary sources rather than the PAD.

Comment: PCWA states that there are two proposed sediment augmentation areas. However, the next to last sentence on page 97 of the draft EIS mentions the area below Middle Fork interbay but not the area below Ralston afterbay. PCWA asks that we add the second site to the end of this sentence.

Response: We added PCWA's suggested clarification to section 3.3.2.2 of the final EIS.

Comment: Interior comments that the draft EIS does not mention its 10(a) recommendations pertaining to minimum streamflows, peaking reach ramping rates, Oxbow powerhouse operations during outages, and recreation streamflows at the peaking reach.

Response: As indicated in appendix B of the draft EIS, Alternative 1 includes the resource agencies' preliminary conditions and recommendations. This would include the preliminary Forest Service conditions, California Fish and Game's 10(j) recommendations, and Interior's 10(a) recommendations. These measures are, with the exception of minor corrections, the same. We therefore often use the shortened form of an instream flow measure by referring to Alternative 1 or the agencies. However, to make it clear that instream flow measures from Interior that pertain to the peaking reach are analyzed in the EIS, we added text to sections 3.3.3.2 and 3.3.5.2 to include this clarification.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the effects of minimum flows in section 3.3.2.2, *Minimum Instream Flows* (page 103 of the draft EIS), do not appear to be specifically described.

Response: Our analysis of minimum flows does describe effects of the proposed and Alternative 1 minimum flow regimes compared to the no-action alternative. Given there are more than 600 specific minimum flows included in both alternatives, it is necessary to summarize the overall effects rather than to specifically describe the effects in a specific stream reach, water year type, and time period. The agencies provide no details regarding what additional descriptions they consider warranted. Consequently, we made no additions to our minimum flow analysis based on this comment.

Comment: PCWA and Foothills Water Network comment that Forest Service condition no. 22 contains errors. They state that the agency intended to specify the same minimum flows in the Middle Fork American River downstream of Middle Fork interbay during above normal water year types as PCWA proposed for the period of May 1 through June 30. PCWA asks us to make these corrections to table 3.3.2-8 and table 5-2.

Response: The Forest Service final condition no. 22, filed on December 3, 2012, includes the changes requested by PCWA and the Foothills Water Network. Based on these comments, we assume that the revised minimum flows for April and May were intended to be included in Alternative 1. We made the requested changes to tables 3.3.2-8 (now table 15 in the final EIS) and 5-2 (now table 43 in the final EIS) in sections 3.3.2.2 and 5.2.2, respectively.

Comment: PCWA disagrees with text on page 107 of the draft EIS that states the quality and quantity of aquatic habitat in the peaking reach is primarily limited by flow fluctuations rather than minimum flows. PCWA states that the increased minimum flows under both the proposed and Alternative 1 flow schedules would reduce flow fluctuations and benefit aquatic biota as compared to the existing condition. PCWA asks that we revise the text to reflect this expected condition.

Response: We agree that increased minimum flows under the proposed and Alternative 1 flow schedules would provide some benefits to aquatic biota compared with existing conditions. However, we still maintain that effects of the new minimum flow regime in the peaking reach on fish and other aquatic biota are expected to be negligible because changes in wetted habitat area would be of very short duration and likely insufficient to affect behavior (e.g., foraging), food availability, or production of aquatic biota. Thus, as stated in the final EIS, flow fluctuations would continue to be the primary determinant factor in aquatic habitat suitability.

Comment: PCWA suggests that we revise the text in sections 3.3.2.2, *Minimum Instream Flows* (page 108 of the draft EIS), and 5.2.2, *Additional Measures Recommended by Staff* (page 323 of the draft EIS), to state that the proposed and Alternative 1 minimum instream flows would support all life stages of hardhead, not just spawning.

Response: We concur with PCWA's revision of our draft EIS text and made the suggested change in the final EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that section 3.3.2.2, *Effects of Ramping Rates on Aquatic Biota*, presents an analysis of pulse and downramp from spill flow schedules as if the measures include an actual ramping rate. The agencies state that the measures consist of a series of minimum flows rather than an actual ramping rate and this should be acknowledged in the final EIS.

Response: It should be clear from table 3.3.2-9 in the draft EIS that our discussion of downramping of releases from French Meadows and Hell Hole dams following spills pertains to a series of declining minimum flows over an approximately 2 week period. We consider this collectively to represent a ramping rate. Our characterization of these flows as ramping rates is consistent with the terminology in Forest Service condition no. 23. We conclude that a change in text to reflect the agencies' comment is not warranted.

Comment: PCWA identifies errors in the day when post-spill minimum flows would start under Alternative 1, shown in table 3.3.2-9 of the draft EIS. The schedule for Rubicon River below Hell Hole dam during the first spill event should show a change

on day 10 rather than day 9. The schedule for the Middle Fork American River below French Meadows dam should show changes on days 1, 2, 3, 4, 5 and 7.

Response: We corrected table 3.3.2-9 (now table 16 in the final EIS) as PCWA requests.

Comment: PCWA requests that we revise the text on pages 111 (last paragraph) and 243 (third paragraph) of the draft EIS to reflect that it proposes an upper limit of 900 cfs on Oxbow powerhouse releases during the summer of drier water year types and the Alternative 1 ramping measure does not include this limit. PCWA states that the higher minimum instream flows provided in Alternative 1 would reduce the effect of flow fluctuations thereby eliminating the need to limit the maximum release. Removing the 900 cfs limit would also allow 1,000 cfs flow releases to support whitewater boating in the reach.

Response: We modified the text in sections 3.3.2.2 and 3.3.5.2 to clarify that PCWA's proposed project would have a 900 cfs upper limit in the peaking reach but Alternative 1 would not.

Comment: The Foothills Water Network requests that we include a modified version of Forest Service condition no. 24 in the staff alternative and states that the revised wording has been developed in consultation with PCWA and the Forest Service. The revised wording clarifies the definition of moderating peaking flows for the purpose of improving aquatic health and facilitating mid-range flows for angling and fall and winter whitewater boating downstream of the Oxbow powerhouse following the annual scheduled maintenance event or, if this event does not occur, beginning in November and continuing through February. The revision also clarifies that, in the event of a spill at Ralston afterbay dam, the ramping condition would only be suspended for the duration of the spill after which PCWA would resume moderating peaking flows.

Response: The Forest Service final condition no. 24, filed on December 3, 2012, includes the salient text changes referenced in the Foothills Water Network comment letter. We note that the proposed, Alternative 1, and final Forest Service condition all include language such as "good faith effort," "reasonable good faith effort," and "reasonable and feasible efforts" to moderate peaking flows from after the annual maintenance event at the Oxbow powerhouse through February. Such terms are not enforceable by the Commission. Even with the added definition of moderating peaking flow in the final condition (decreasing the difference between the minimum and maximum flows over any 24 hours), there is no definition of what constitutes an acceptable or unacceptable decrease in the change in daily flows. We do not dispute that moderating flows in the peaking reach during the fall and winter would provide benefits to aquatic biota, as well as recreational visitors, but without clear compliance terms, the Commission would only be able to enforce compliance with the minimum

flows that may be specified in a new license during this period. We added text to this effect in our analysis in section 3.3.2.2.

Comment: PCWA requests that we revise text in section 3.3.2.2, *Effects of Ramping Rates on Aquatic Biota* (page 112 of the draft EIS). It believes the new ramping rates below Hell Hole dam and French Meadows dam would result in an additional 10 or 11 years, respectively, when spills (in the 33-year period of record) would have been downramped whereas they would not have been downramped under existing conditions. This analysis is based on a spill magnitude of at least equal to or greater than the magnitude of the flow that would initiate movement of 25 percent of the gravel substrate. PCWA refers to table 3.7-4a of its supplemental filing (November 2011) for this information.

Response: We made the suggested correction to the EIS.

Comment: PCWA requests that we revise the text of the EIS to further clarify that, under Alternative 1, PCWA would be testing its ability to provide the ramping rates specified in the Forest Service condition no. 24 during the first two spill events at French Meadows and Hell Hole dams. PCWA provides suggested alternative text that provides more details about its process for reporting test results, recommending ramping modifications, and assessing license compliance. This comment pertains to text in: (1) the *Executive Summary* (page xxiii of the draft EIS); (2) section 2.4, *Staff Alternative* (page 30 of the draft EIS); (3) section 3.3.2.2, *Effects of Ramping Rates on Aquatic Biota* (page 112 of the draft EIS); and (4) section 5.2.1, *Measures Proposed by PCWA* (page 313 of the draft EIS).

Response: We made minor modifications to the text to provide additional clarity to the content of Alternative 1. However, our analysis of this aspect of Alternative 1 remains as it was in the draft EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that, in addition to beneficial effects on fish and riparian vegetation identified in section 3.3.2.2, *Effects of Ramping Rates on Aquatic Biota* (page 112 of the draft EIS), the analysis should note that the slowly declining hydrograph also protects foothill yellow-legged frog egg masses.

Response: The discussion on page 112 of the draft EIS pertains to aquatic biota. As we state in a previous response, we address reptiles and amphibians in section 3.3.3, *Terrestrial Resources*. In response to the agencies' comments, we added text to section 3.3.3.2 to point out that slow downramping of spills at French Meadows and Hell Hole dams would be protective of foothill yellow-legged frog egg masses.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the effects in section 3.3.2.2, *Effects of Recreational Flow Releases on Aquatic Biota*, do not appear to be specifically described.

Response: In our analysis on page 113 of the draft EIS, we conclude that, compared to existing conditions, the recreational releases are not likely to substantially change the quantity or quality of aquatic habitat available for fish, macroinvertebrates, and other aquatic biota. The agencies provide no details of why they feel the effects are not specifically described.

Comment: The Water Board comments that it would like to participate in further development of the Streamflow Reservoir and Gaging Plan discussed in section 3.3.2, *Monitoring Instream Flows and Reservoir Water Surface Elevation* (page 119 of the draft EIS). The Water Board states that, because the data for multiple gages would already be recorded by PCWA at 15-minute intervals, the finalized Streamflow Reservoir and Gaging Plan should provide for including the entire 15-minute interval data set and not just the 24-hour average. This 15-minute interval data set should be made available to the public agencies and the Commission in a readily accessible electronic format. This complete data set would allow the agencies to detect any large variations in flow that might be lost when averaging the data over a span of 24 hours.

Response: The Forest Service filed the Alternative 1 Streamflow and Reservoir Elevation Gaging Plan on December 3, 2012, as part of its final 4(e) conditions for the project. The plan includes provisions for providing 15-minute interval data sets for each gage in a readily accessible format to the Water Board, the Forest Service, California Fish and Game, and the Commission, upon request. Therefore, the Water Board could request that PCWA annually provide the 15-minute interval data sets.

Comment: The Water Board comments that trout recruitment would be enhanced by incorporating redd monitoring along with gravel augmentation in the reach downstream of Ralston afterbay and this should be included in the staff alternative.

Response: As we state in section 5.2.2 of the draft EIS (page 335), the staff alternative includes provisions for including redd monitoring or implementing other quantitative approaches to document the effectiveness of our recommended spawning habitat improvement plan. The plan specified in Forest Service final 4(e) condition no. 26 would be developed in consultation with the Water Board, Forest Service, California Fish and Game, and other interested parties.

Comment: The Forest Service, California Fish and Game, and California State Parks agree with our recommendation to include a spawning habitat improvement plan in the staff alternative (page 335 of the draft EIS). The agencies recommend the plan be developed in consultation with them as well as interested parties within 1 year of license issuance and request that PCWA file the plan with the Commission for approval after these agencies have indicated their support of the plan.

Response: Our summary of this additional staff recommendation in section 5.2.2 of the draft EIS already specifies the 1-year time frame for plan development. We added text to clarify the consulted entities in plan development.

Comment: The Forest Service, California Fish and Game, and California State Parks state that a gage on the Rubicon River at Ellicott Bridge is necessary for agencies to assess the effects of new flow schedules on the resulting flow patterns and fluctuations extending downstream of Hell Hole dam. A new gage would provide information to: (1) determine how the new flow schedule affects flows downstream; (2) assess the effects on aquatic species along the entire reach of the Rubicon River; and (3) validate water temperature modeling that was developed during relicensing.

Response: Flows at Ellicott Bridge under existing conditions and all action alternatives are or would be primarily determined by releases from both the Middle Fork American River Project (Hell Hole dam) and the Upper American River Project (FERC No. 2102). Flows immediately downstream of Hell Hole dam would be measured by three new gages included in the Streamflow and Reservoir Elevation Gaging Plan. Flows from the Upper American River Project entering the Rubicon River from the South Fork Rubicon River are measured at USGS gage no. 11430000 (see figure 2 in the EIS). Using real-time data from these gages and predictable approximations of accretion flows from other sources, reasonable predictions of flow at Ellicott Bridge can be formulated. This flow information should be sufficient to enable interpretation of aquatic species and water temperature monitoring in plans that we recommend as part of the staff alternative. We continue to conclude that the benefits of a new gage at Ellicott Bridge would not warrant its cost.

Comment: The Forest Service, California Fish and Game, and California State Parks state that the gage upstream of the North Fork American River pumping station is necessary to determine project compliance with the 75 cfs minimum instream flow requirement downstream of the pumping station. In addition, this gage would provide information to determine compliance with providing the class II boating flows included in Alternative 1.

Response: Compliance with the 75 cfs minimum instream flows requirement downstream of the North Fork American River pumping station, a non-project facility, has no nexus to the relicensing of the Middle Fork American River Hydroelectric Project. The compliance point for providing class II boating flows specified in Alternative 1 and Forest Service final condition no. 40 would be the Middle Fork American River near Foresthill USGS Gage no. 11433300, which we recommend in the staff alternative.

Comment: PCWA states that the 1- millimeter (mm) clear spacing of the fish screens at the small diversion dams represented a preliminary design that would likely be modified during final design and consultation with the resource agencies. The final fish

screens would be designed to comply with California Fish and Game and other agency requirements, and PCWA requests that we include this updated information in section 3.3.2.2, *Fish Entrainment* (page 122 of the draft EIS).

Response: We modified the text in section 3.3.2.2 to reflect the potential for the final design of the wedge-wire screen to include designs with clear spacing wider than the 1 mm specified in appendix A of exhibit E of the license application.

Comment: The Water Board comments that any fish monitoring plan that is approved for the project include recommendations for adaptive changes to project operations or features if monitoring indicates a negative fish population trend (page 123 of the draft EIS).

Response: Both the Fish Population Monitoring Plan specified in Alternative 1 and the Forest Service final condition no. 28 include provisions for developing a report of monitoring results within 120 days of completion of a monitoring year for review and comment by the agencies. Provisions are also included for consultation meetings with the agencies to discuss the results or modifications of the ongoing monitoring programs. The purpose of this monitoring is to document changes in fish population trends. The potential for action based on monitoring results is inherent in any such plan. We expect that if declining population trends are evident, PCWA would discuss with the agencies potential solutions that would address the issue and provide its recommendations regarding corrective actions in the final monitoring reports filed with the Commission. The Commission would determine the merits of the recommendations based on the available record.

Comment: The Forest Service, California Fish and Game, and California State Parks disagree with the analysis in section 3.3.2.2, *Monitoring Fish Population in Project Waters* (page 124 of the draft EIS), that it would not be necessary to monitor hardhead populations. The agencies explain the that information provided by monitoring hardhead would provide a basis for assessing project effects of entrainment, recreational fishing, water temperature changes, and water surface elevation fluctuations. In particular, the agencies state that they suspect that substantial hardhead entrainment is occurring at Ralston afterbay, and monitoring the hardhead population would provide data to substantiate or refute this notion. The agencies believe the benefits of acquiring information about hardhead populations outweigh the possible harm to a few individual fish and explain that the tagging procedure includes methods to minimize this risk.

Response: In the draft EIS we did not recommend implementation of the hardhead component of the Fish Population Monitoring Plan because no goals or objectives were provided other than to monitor hardhead movement in Ralston afterbay in relation to project operations. The agencies and PCWA previously provided no details that the goals of hardhead monitoring were to assess project effects related to entrainment, recreational fishing, water temperature changes, and water surface elevations on

hardhead populations. In particular, no previous indication was provided that there was a suspicion that substantial hardhead entrainment is occurring at the Oxbow powerhouse. Although the final Fish Population Monitoring Plan provided with the Forest Service final 4(e) conditions still does not specify the goals of hardhead monitoring, we assume they include those goals reflected in the agencies' comments. Based upon the new information provided by the agencies, we now concur that the proposed hardhead monitoring would provide information to support the expected enhancement in the water temperature regime in and upstream of Ralston afterbay by the flow regime specified in the final Forest Service condition. Hardhead monitoring would also provide an indication of whether a hardhead response to reservoir drawdowns associated with sediment management activities or routine maintenance drawdowns would be to enter the Oxbow powerhouse penstock and therefore be subject to turbine mortality. Monitoring the number of tagged fish that are detected downstream of the Oxbow powerhouse, as specified in the plan, would provide data to support or refute this potential project effect on hardhead populations and supplement the results of the proposed entrainment studies at Ralston afterbay. The annual consultation with resource agencies provided for in the plan would enable the need for specific actions to be formulated based on the monitoring results. Given both the Forest Service and California Fish and Game acceptance of the possible risk to hardhead that are tagged, we now include this element of the Fish Population Monitoring Plan in the staff alternative.

Comment: The Forest Service, California Fish and Game, and California State Parks do not understand how we concluded that entrainment is an unavoidable adverse project effect (page 344 of the draft EIS) without data that hardhead and entrainment monitoring would provide to quantify losses or document hardhead behavior.

Response: Regardless of whether entrainment studies or hardhead monitoring are conducted at Middle Fork and/or Oxbow powerhouses, some entrainment of at least some lifestages of fish will occur even with the implementation of state-of-the-art entrainment protective measures. We feel confident in making this statement without benefit of the referenced studies.

Comment: The Water Board comments that any water temperature monitoring that is approved for the project consider the basin plan water quality objectives for temperature. The plan should include actions that would be implemented to bring affected project waters into compliance if monitoring indicates the project increases the natural receiving water temperature by more than 5°F (page 125 of the draft EIS).

Response: Both the Water Temperature Monitoring Plan specified in Alternative 1 and the Forest Service final condition no. 28 include provisions for developing a report of monitoring results within 120 days of completion of a monitoring year for review and comment by the agencies. Provisions are also included for consultation meetings with the agencies to discuss the results or modifications of the ongoing monitoring programs.

The primary purpose of this monitoring is to enable interpretation of biological monitoring results, and it could also be used to document compliance with basin plan water quality objectives for temperature. The potential for action based on monitoring results is inherent in any such plan. We expect that, if negative temperature trends are evident, PCWA would discuss with the agencies potential solutions that would address the issue and provide its recommendations regarding corrective actions in the final monitoring reports filed with the Commission. The Commission would determine the merits of the recommendations.

Comment: The Forest Service, California Fish and Game, and California State Parks believe the characterization in section 3.3.2.2, *Monitoring Water Temperature in Project Waters* (page 125 of the draft EIS), that little overall change in water temperature is expected compared to existing conditions, oversimplifies the effects of the Alternative 1 minimum instream flow measure. The agencies state that, although this description is true for some reaches, the flows were selected for purposefully maintaining or changing habitat (i.e., suitable water temperature) for certain species. This characterization of water temperature does not reflect the specific resource objectives and balancing that are the basis of the minimum flows in Alternative 1.

Response: We modified our characterization of the temperature regimes in the bypassed reaches in section 3.2.2.2 to acknowledge that the minimum flows and pulse flows included in the proposed action and Alternative 1 represent a balancing of temperatures that are supportive of coldwater species (rainbow trout) and transition zone species such as hardhead.

Comment: The Water Board suggests that it would be appropriate to include a public information program in the VIPMP that includes posting signs at affected areas that would inform the public about the potential to spread aquatic invasive species to unaffected areas by using contaminated equipment (page 127 of the draft EIS).

Response: As we discuss on page 128 of the draft EIS, the Alternative 1 VIPMP references PCWA's existing Invasive Mussel Protection Plan that is already in effect pursuant to California law. The plan includes a public education program regarding how to minimize the transfer of invasive mussels into project waters, including signage and distribution of information cards to the public. This information would also pertain to preventing the spread of other aquatic invasive species. We added some additional text to our discussion in section 3.3.2.1 providing more details of this plan. Forest Service final condition no. 48 pertains to aquatic invasive species management, and requires development of a plan that would contain nearly all the elements of the existing Invasive Mussel Protection Plan.

Comment: PCWA states that the text in section 3.3.2.3, *Central Valley Steelhead* (page 129 of the draft EIS), should explain that the two fish passage barriers at Tunnel Chute and Ruck-a-Chucky rapids pre-date construction of Nimbus and Folsom dams.

Response: We added PCWA's suggested clarification to the final EIS.

TERRESTRIAL RESOURCES

Comment: PCWA provides updated information about Stebbins' phacelia and the amount of riparian vegetation around project reservoirs and diversion pools that it states should be included in section 3.3.3.1, *Special-Status Plants* (page 136 of the draft EIS) and *Riparian Vegetation* (page 140 of the draft EIS).

Response: We added the updated information to table 3.3.3-2 (now table 19 in the final EIS) in section 3.3.3.1 of the EIS.

Comment: PCWA provides updated information about the amount of riparian vegetation and total miles of shoreline around French Meadows and Hell Hole reservoirs that it states should be included in section 3.3.3.1, *Riparian Vegetation* (page 140 of the draft EIS). PCWA cites the source of this information as table 7.8-1 and Supporting Document B, AQ-10 Riparian Resources Technical Study Report, both included in the final license application.

Response: The values we present in table 3.3.3-4 of the draft EIS for total miles of shoreline at French Meadows and Hell Hole reservoirs are consistent with the values presented in PCWA's table 7.8-1 in the final license application. We reviewed the Riparian Resources Technical Study Report cited by PCWA as the source for revised shoreline values and were not able to find them. Therefore, we have not changed those values in the final EIS. However, we did update the total miles of vegetated shoreline as requested by PCWA.

Comment: PCWA provides updated information about the number of osprey nests that it states should be included in section 3.3.3.1, *Wildlife* (page 143 of the draft EIS), based on a supplement to the Biological Technical Study Report prepared in 2011.

Response: We included PCWA's updated information in section 3.3.3.1 of the final EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the affected environment and environmental effects related to foothill yellow-legged frogs and western pond turtles (which the agencies consider to be primarily aquatic species), discussed in section 3.3, *Terrestrial Resources* (page 145 of the draft EIS), should be presented in the aquatic resources section in order to provide a more comprehensive analysis of the aquatic community.

Response: We recognize that foothill yellow-legged frogs and western pond turtles have inextricable ties to aquatic habitat. However, traditionally, the Commission's National Environmental Policy Act documents address wildlife species that use riparian

and wetland habitat, such as foothill yellow-legged frogs and western pond turtles under terrestrial resources.

Comment: PCWA explains that the Alternative 1 VIPMP would require consultation with the Forest Service to develop specific treatment of noxious weed populations within project boundaries and requests this information be included in section 3.3.3.2, *Noxious Weed Management* (page 163 of the draft EIS).

Response: We included PCWA's suggested clarification in section 3.3.3.2 of the final EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks state that the analysis in section 3.3.3.2, *Vegetation Management* (page 162 of the draft EIS), should state that the proposed VIPMP would not meet Forest Service directives and LRMP direction about reducing the spread of invasive plants on NFS lands. The agencies explain that the proposed action would only treat a small fraction of the invasive plants within the project boundary and that this practice would not meet the objective of decreasing the impacts of invasive plants through preventative practices, rapid response, control and restoration. Further, treating existing invasive plants for only 3 years, as PCWA proposes, would be ineffective because it is the Forest Service's experience that it takes longer than this to eradicate or control infestations. For these reasons the proposed VIPMP would not address the effects of invasive plants within the project area.

Response: We agree with the agencies that it would be beneficial to point out that the proposed two-phased approach would only treat a small fraction of the noxious weeds within the total area within the project boundary and would be ineffective in controlling invasive plant species. We added text to section 3.3.3.2 of the final EIS to make this point clear.

Comment: The Water Board comments that the noxious weed treatment component of the VIPMP should require compliance with Basin Plan objectives that protect the beneficial uses of waters from the effects of toxic substances (page 163 of the draft EIS).

Response: Both the proposed and Alternative 1 VIPMPs include Water Quality Monitoring Plans that would document the presence or absence of herbicides in project waters before and after treatment at project-related vegetation management sites. Both plans have provisions for providing annual water quality monitoring reports to the Water Board, Forest Service, and California Fish and Game for review and comment. The reports would include comparisons of monitoring results to applicable water quality standards and objectives. This information would enable the Water Board to confirm compliance with Basin Plan objectives. We added text to section 3.3.3.2 to clarify this common element of both plans. We recommend the Alternative 1 VIPMP and conclude

that this plan would be most effective in protecting project waters from toxic substances.

Comment: EPA requests the final EIS provide additional information about noxious weed treatment including methods, the need for treatment, details about pesticide application, and the likely effectiveness for reducing the spread of noxious weeds. The effects of the proposed treatments should be compared to the existing conditions.

The Forest Service, California Fish and Game, and California State Parks comments that details in the Alternative 1 VIPMP about the type of herbicide, method of treatment, and associated buffer distances should be described in section 3.3.3.2, *Protection of the Bald Eagle and Other Raptors* (page181 of the draft EIS), in order to evaluate the effects of this alternative compared to the proposed action.

Response: As we state on page 162 of the draft EIS, the need for treatment would be established by conducting noxious weed inventory surveys at 5-year intervals. Details of pesticide methods and potential application locations are site specific at project facilities where active vegetation management occurs. They can be found in table 1 through 9 of the proposed VIPMP (33 pages) and tables 1 through 7 of the Alternative 1 VIPMP (25 pages). Both plans are available on the Commission's eLibrary system. We summarizes the types of vegetation management, noxious weed control, project facilities where vegetation management (including noxious weed control) would occur, and buffer zones associated with different pesticides near sensitive habitats on pages 162 and 163 of the draft EIS. However, in response to agencies request to include this information in the subsection titled *Protection of Bald Eagle and Other Raptors*, we added a cross reference to the subsection *Noxious Weed Management*, where this information is summarized. We conclude that the Alternative 1 VIPMP would be most effective in controlling noxious weeds within the project boundary and it is included in the staff alternative.

We added text to section 3.3.3.1 to summarize PCWA's current vegetation management practices, which would include noxious weed control. Under these practices, noxious weed populations have become established within the project boundary as summarized in table 3.3.3-3 of the draft EIS(table 20 in the final EIS). We expect implementation of the Alternative 1 VIPMP to result in much more effective control of these populations.

Comment: PCWA requests that we revise text in section 3.3.3.2, *Protection of Riparian Vegetation along Bypassed and Peaking Reaches* (page 167 of the draft EIS), to indicate the Geomorphology and Riparian Monitoring Plan would need to be approved by California Fish and Game and the Water Board, not just the Forest Service.

Response: Our text in the draft EIS accurately describes the wording on page 38 of the Forest Service preliminary 4(e) condition no. 28 as well as the analogous California Fish and Game 10(j) recommendation, and no change is warranted in response to this

comment. We note that, subsequent to the issuance of the draft EIS, the Forest Service filed its final 4(e) conditions, which include a final Geomorphology and Riparian Monitoring Plan. In its transmittal letter, the Forest Service states that the final conditions "…are based on the Forest Service review of the application, extensive coordination with Federal and State agencies and others, public comment, and consultation with the Licensee." However, we therefore assume that the final Geomorphology and Riparian Monitoring Plan filed by the Forest Service was developed in consultation with California Fish and Game and the Water Board, and no objections to this final plan have been filed with the Commission. Provisions are made for Commission approval of the plan.

Comment: PCWA provides updated information about Stebbins' phacelia and inundation frequency that it states should be included in section 3.3.3.2, *Effects of Proposed Changes in Hell Hole Reservoir Operations on Vegetation* (pages 169, 170, and 171 of the draft EIS).

Response: PCWA provides updated information regarding Stebbins' phacelia inundation frequencies for operation of Hell Hole reservoir under Alternative 1, and we have included this information in section 3.3.3.2 of the final EIS. We assume the modeling results for Hell Hole operation under the proposed project included in the license application are still valid.

Comment: PCWA clarifies that its proposed recreation plan would remove two campsites at Hell Hole campground; however, the Alternative 1 recreation plan specifies either removing three sites or converting Hell Hole Campground to a group campground. PCWA requests this Alternative 1 information be included in section 3.3.3.2, *Effects of Proposed Changes in Project Facilities on Vegetation* (page 171 of the draft EIS).

Response: We included PCWA's suggested clarification in section 3.3.3.2 of the final EIS. Our findings remain the same: there would be a net reduction in recreational sites at Hell Hole reservoir, which would reduce the effect of recreational activities on Stebbins phacelia and other plants and wildlife near those sites where recreational facilities currently exist.

Comment: PCWA reports that special-status plant surveys along the French Meadows campground water supply access road were completed in 2011 and results were included in its supplemental filing (November 2011). It states that we should change the text in section 3.3.3.2, *Effects of Proposed Changes in Project Facilities on Vegetation* (page 172 of the draft EIS), to reflect this information.

Response: The point of our text was not whether PCWA conducted special-status plant surveys along the French Meadows campground water supply access road completed in 2011. Rather we wanted to note that the Alternative 1 VIPMP specified that special-

status plant surveys would be conducted every 5 years in accordance with the methods specified in its prefiling document TERR 2 – Special-Status Plants Technical Study Report SD B. This report includes field survey methods and the geographic scope of surveys conducted in 2006 through 2008. We interpreted the methods that would be used to include the geographic scope and the survey methods. The French Meadows campground water supply access road was not included in the areas surveyed and reported in that report. Our interpretation caused us to conclude that this access road would not be included in future sensitive plant surveys. However, in its comments on the draft EIS, PCWA states that it "has committed to conduct special-status plant surveys every five years at all MFP [Middle Fork American River Project] facilities identified in Table 5.1 of the Alternative 1 Vegetation and Integrated Pest Management Plan, including the French Meadows Campground Water Supply Facility Access Road." Given this clarification and commitment, we deleted our recommendation to include this road in future sensitive plant surveys that would be conducted in accordance with the Alternative 1 VIPMP because it would be included in surveys without our additional recommendation.

Comment: The Forest Service, California Fish and Game, and California State Parks question our analysis in section 3.3.3.2, *Protection of the Bald Eagle and Other Raptor* (page 180 of the draft EIS), that nearby rivers and reservoirs could provide sufficient prey to compensate for decreased fish stocking. The agencies state that it is unclear how this determination was made, and they believe that decreased fish stocking would probably result in decreased populations of bald eagles and osprey at Hell Hole and French Meadows reservoirs.

Response: We deleted the statement regarding fish from nearby rivers and reservoirs providing sufficient prey to compensate for decreased fish stocking from section 3.3.3.2 of the final EIS. Decreased stocking would reduce availability of one type of prey for eagles and ospreys. These species also feed on waterfowl, small mammals, and carrion, and the availability of these sources would remain the same. We now draw no conclusion regarding whether decreased stocking could lead to a population decline of piscivorous birds.

Comment: The Forest Service, California Fish and Game, and California State Parks disagree with the determination in section 5.4.1, *Summary of Section 10(j) Recommendations and 4(e) Conditions* (page 354 of the draft EIS), that fish stocking is not within the scope of section 10(j). They state that, because fish stocking provides prey for aquatic and terrestrial piscivorous species, in addition to angling opportunities for recreationists, it should be considered a measure to enhance fish and wildlife in addition to providing angling opportunities. The agencies provide references to California Fish and Game Code to support their position.

Response: In order to be within the scope of section 10(j), a measure must specifically provide for the protection, mitigation, or enhancement of fish and wildlife resources

affected by the project. The rationale document for California Fish and Game's 10(j) recommendation pertaining to the fish stocking program (page 92) states that the objective addressed by this measure pertains to French Meadows and Hell Hole reservoir angling. Fish and wildlife benefits of stocking are not mentioned. We recognize that fish stocking for recreational purposes has ancillary benefits, such as providing prey for aquatic and piscivorous species, but as presented in the measure itself and the rationale document for the measure, stocking is not a specific measure for the protection, mitigation, or enhancement of fish and wildlife resources. We continue to conclude that this measure is outside the scope of section 10(j).

Comment: PCWA explains that the Alternative 1 VIPMP only calls for raptor surveys prior to initiating ground disturbing activities and nests of newly-designated raptors would be identified during this process. Consequently, it states that text in section 3.3.3.2, *Protection of Newly Designated Special-Status Plants and Wildlife* (page 182 of the draft EIS), should be revised to remove the reference to conducting raptor surveys every 5 years.

Response: We made the corrections to section 3.3.3.2 suggested by PCWA to clarify that the 5-year survey interval pertains only to special-status plant surveys and not to raptor surveys.

THREATENED AND ENDANGERED SPECIES

Comment: PCWA states that consultation with FWS should only be required if the project could potentially result in adverse effects on valley elderberry longhorn beetle or its habitat (defined by FWS as elderberry shrubs that are located below an elevation of 3,000 feet). PCWA believes the text in section 3.3.4.2, *Valley Elderberry Longhorn Beetle* (page 191 of the draft EIS), should be supplemented to clarify the circumstances that would require consultation.

Response: We agree that PCWA's suggested text adds clarity regarding the documented range of elevations where valley elderberry longhorn beetle are known to occur, and we modified section 3.3.4.2 accordingly.

Comment: EPA comments that the results of consultation with FWS regarding compliance with section 7 of the ESA regarding listed species should be included in the final EIS.

Response: We provided the status of section 7 consultation in table 1 and section 1.3.3 of the draft EIS. We issued a letter to FWS on July 24, 2012, requesting that it concur with our finding that formal consultation under section 7 of the ESA is not required. FWS has not yet responded to our request. We updated the final EIS to include the date our concurrence letter was issued.

Comment: EPA comments that the final EIS should discuss any existing or planned measures that support steelhead recovery in Middle Fork American River and the extent to which the project could support such efforts.

Response: We discussed existing and planned measures that would support steelhead recovery in the American River watershed in sections 3.3.2.1 (pages 96 and 97 of the draft EIS) and 3.3.2.3 (pages 129 through 131). As noted in those sections, efforts to restore anadromous fish populations upstream of Reclamation's Nimbus dam are the responsibilities of others and subject to a high degree of uncertainty. We recognize that, should steelhead eventually be provided access to waters in the peaking reach, downstream of Oxbow powerhouse, NMFS has stated that it would request that the Commission reopen any license that may be issued for this project to address upstream and downstream anadromous fish passage issues. In section 5.5.2 (pages 335 and 336 of the draft EIS), we include a recommendation in the staff alternative that PCWA file annual reports with the Commission regarding the status of anadromous fish restoration efforts in the American River watershed. These reports would enable the Commission to keep abreast of ongoing progress and meet its responsibilities under the ESA. We conclude that no text changes regarding this are necessary in the final EIS.

RECREATION AND LAND USE

Comment: EPA comments that our final EIS should discuss the proposed project's compliance with the Americans with Disabilities Act.

Response: As discussed in section 3.3.5.1, *Project Area Recreation Resources*, some project recreation facilities do not meet accessibility guidelines. The staff alternative includes implementing, with adjustments, the Alternative 1 Recreation Plan which would require PCWA to construct or reconstruct recreation facilities to meet current (at the time of construction) accessibility standards.

Comment: PCWA requests that we revise information in section 3.3.5.1, *Project Area Recreation Resources* (page 200 of the draft EIS), to read: "Except for group campgrounds, visitor use and capacity data indicates all of the Project recreation facilities are underutilized on weekdays, weekends, and holidays. The group campgrounds experience occupancy rates ranging from 10% on weekdays to 75% on weekends. By comparison, the remaining recreation facilities are underutilized and experience occupancy rates ranging from as low as 2 percent on weekdays to 43 percent on weekends." PCWA states that suggested revisions presented in its draft EIS comments more accurately reflect utilization rates of project recreation facilities.

Response: In the draft EIS, we presented this recreation use information at a more general level than PCWA suggests. Although we revised the text in section 3.3.5.1, as PCWA suggests, this information does not change our analysis.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the developed campground at Long Canyon (Middle Meadows Group Campground) is a project recreation facility, and text that indicates it is a non-project facility should be deleted in section 3.3.5.1, *Recreational Use* (page 201 of the draft EIS).

Response: The agencies refer to affected environment text that describes the project as it currently exists, and the Middle Meadows campground is not currently a project facility. Because other information in the EIS describes PCWA's proposed changes to the project boundary, this distinction is not necessary and was deleted.

Comment: Interior, Forest Service, California Fish and Game, and California State Parks state that the footnote in table 3.3.5.1 indicates the American Whitewater website as the source for the difficulty ratings presented in the table. However, this source does not provide a difficulty rating for the Murderer's Bar run.

Response: The source of the information contained in the table is listed in the table caption as PCWA, 2011a, which is the license application. The footnote pertains to the definitions of the difficulty class descriptions (e.g., V), and these are provided on American Whitewater's website.

Comment: Interior, Forest Service, California Fish and Game, and California State Parks requests that we use the 2000 to 2009 average annual commercial use estimate of 20,001 boaters in the analysis of whitewater boating use on the Middle Fork American River below Oxbow powerhouse.

Response: The text is intended to describe the relative amount of private and commercial boating in the peaking reach. Although the 10-year annual commercial boating use estimate provided by the agencies would be useful in the analysis, they do not provide the corresponding amount of total (private and commercial) annual boating use that is necessary to present a comparable analysis to what was presented in the draft EIS which used only the 2007 data. Although the average annual commercial boating use provided by the agencies is similar to, but higher than, the 2007 use estimate it would not change the characterization that commercial use accounts for most of the boating use in the peaking reach.

Comment: Interior provides modified text for section 3.3.5.1, *Auburn State Recreation Area* (page 207 of the draft EIS). The modified text indicates the visitor use estimate is 900,000 visitor-use-days per year rather than 900,000 visitors per year. It also suggests that we delete the text that states there are no project recreation facilities located in the Auburn State Recreation Area.

Response: The affected environment text in the draft EIS is based on information provided in the license application, which provides the estimated use in terms of the

annual number of visitors rather than visitor-use-days. We researched this information on the internet and find that BLM and Reclamation also estimate 900,000 visitors to the state recreation area, annually, in their recreation publications (http://www.parks.ca.gov/pages/502/files/ASRANews111503.pdf and http://www.usbr.gov/mp/PA/docs/fact_sheets/Auburn_Dam.pdf). Additionally, the text in section 3.3.5.1 that states there are no project recreation facilities located in the Auburn State Recreation Area is correct.

Comment: Interior provides modified text for section 3.3.5.1, *Land Use and Project Boundary* (page 208 of the draft EIS). The modified text would also change our reference to Auburn Project Lands to read Auburn Dam and Reservoir Project Lands.

Response: Although we adopted PCWA's convention for referring to these lands in the draft EIS, for clarity, we revised all references to these lands to read "Auburn Dam and Reservoir Project lands."

Comment: Interior provides additional modified text for section 3.3.5.1, *Land Use and Project Boundary* (page 208 of the draft EIS). The modified text states: "The Auburn Project Lands include Reclamation fee title lands (approximately 20,000 acres), and other federal lands (6,000 acres) managed by BLM with lesser acreage by the Forest Service and the Corps, with the remainder being private land."

Response: Based on the license application and September 2012 Reclamation fact sheet (http://www.usbr.gov/mp/PA/docs/fact_sheets/Auburn_Dam.pdf), lands reserved for the Auburn Dam and Reservoir Project include 26,000 acres of public land managed by Reclamation. Because the total acreage reserved for the project is about 41,000 acres, our text correctly states that the remaining 15,000 acres consist of public lands managed by various agencies and privately owned lands. We revised the text to further clarify the acreage of public and private land.

Comment: Interior provides additional modified text for section 3.3.5.1, *Land Use and Project Boundary* (page 208 of the draft EIS). The modified text states: "Land use planning and resource management on all federal lands within Auburn Project Boundary remain with each agency as appropriate. In 1979, by agreement with Reclamation, the state of California identified 26,000 acres of Auburn Project Lands as the Auburn State Recreation Area. The California State Department of Parks and Recreation manages recreation[al] use on these lands through a Managing Partner Agreement with Reclamation, which includes those lands managed by BLM."

Response: We revised the text to be consistent with BLM's preferred characterization of recreation management responsibilities.

Comment: The Forest Service, California Fish and Game, and California State Parks do not agree that the Recreation Plan should be revised to be consistent with the staff

alternative, which excludes funding for law enforcement (see page 220 of the draft EIS). Specifically, the agencies refer to 37 law enforcement responses to the licensed area for the period 2006 and 2007, protection for PCWA's assets, public safety, and resource protection as the nexus to the project and the basis for PCWA to provide law enforcement funding to the Forest Service, as specified in the Alternative 1 Recreation Plan.

Response: As discussed in section 3.3.5.2, *Recreation Facility Operation and Maintenance*, PCWA already supports the needs associated with law enforcement through the public land use fees and county taxes that it pays for the project so it would not be appropriate for PCWA to provide additional funding for these services.

Comment: The Forest Service, California Fish and Game, and California State Parks explain that the Hell Hole Administration Station, specified in preliminary 4(e) condition no. 36 (now final 4(e) condition no. 37), provides necessary work space and storage to operate and maintain the project recreation facilities located at Hell Hole reservoir and Long Canyon and should not be excluded from the staff alternative. The agencies state that the Forest Service has removed the reference regarding public rental of the facility and limited the scope of the facility to include storage and workspace related to maintaining the project recreation facilities.

Response: The Forest Service final 4(e) filing did not remove the reference to providing a facility for public recreational rental use, which was included in the rationale document that accompanied the preliminary 4(e) conditions. The Forest Service did not revise its rationale document when it submitted its final 4(e) conditions. Consequently, we have no basis to conclude the intended scope of this facility has changed. Further, as indicated in the final 4(e) condition, the facility "may also serve a shared purpose with the Forest Service," so it would not be appropriate for the project to bear the cost of non-project use. Therefore we continue to exclude this measure from the staff alternative for the reasons given in the draft EIS.

Comment: The Forest Service, California Fish and Game, and California State Parks ask us to include the bear management monitoring plan specified in preliminary 4(e) condition no. 28 (and also included in final 4(e) condition no. 28) in the staff alternative. The comment letter states that the purpose of this measure would be to establish and formalize a monitoring and reporting process for bear-related incidents and to evaluate existing measures for reducing interactions between humans and bears at project campgrounds and facilities. Information provided through implementing this plan would provide the basis for adjusting actions and strategies related to bears.

Response: The Forest Service initially provided no information on why a bear management monitoring plan may be needed, and we are not aware of any reported problem interactions in the project area between bears and humans. In addition, no details were initially provided regarding what specifically would be included in the

plan. No information was provided as to what would be monitored (bear populations, effectiveness of bear-proof containers, or both) and what types of bear management actions would occur beyond those already in use. We now appreciate the clarification by the agencies that the intent of this plan is aligned with monitoring and reporting interactions between humans and bears and, if necessary, modifying management actions related to project recreation facilities. Because the purpose of the plan would focus on recreation use and management rather than bear habitat management, we find this need would be best addressed as an element of the recreation plan. We revised our staff alternative in this final EIS to include revising the Recreation Plan to include monitoring, reporting, and addressing documented problems with interactions between humans and bears at project recreation facilities.

Comment: The Forest Service, California Fish and Game, and California State Parks explain that Cache Rock is used as a lunch stop by whitewater boaters and river recreationists and funding of recreational amenities at this facility, as specified in preliminary 4 (e) condition no. 35 (now final 4(e) condition no. 36), should be included in the staff alternative. The agencies attribute a significant level of the use at this site to the project because the flows, which are managed by the project, improve the area for recreational use and the proposed improvements are needed to address sanitation concerns and provide a quality recreation experience for visitors. Similarly, the Foothills Water Network recommends including the recreation development at Cache Rock in the staff alternative because it is the only public access point to the river between Oxbow powerhouse put-in and Ruck-a-Chucky takeout and the project's peaking operation allows for mixed recreational use at low and high flows, which attracts recreationists.

Response: As discussed in section 3.3.5.2, recreational use at Cache Rock is not primarily related to the project because several other factors unrelated to the project, such as road access and mineral presence, contribute to the recreational use at this site and the agencies do not provide any information that is different from our characterization of recreational use at this site. Further, they do not explain why the cost of recreation improvements, which would support the majority of use that is not related to the project, should be borne by PCWA. We do not believe that the agencies' rationale (i.e., flows from the project pass Cache Rock and it is the only point of public access along the reach) provide a sufficient project nexus for supporting the Cache Rock recreation improvements.

Comment: Foothills Water Network recommends including the recreation development at Ellicott Bridge in the staff alternative. It states that our rationale that the site is more than 8 miles downstream of Hell Hole dam is not a sufficient rationale for dismissing a project nexus. Project studies that show project effects related to water temperature in the Rubicon River extend to its confluence with Middle Fork American River. Further, measures such as pulse flows, downramping, and providing real-time

gage information at Ellicott Bridge would increase the number of boaters using this reach, and additional parking would need to be accommodated.

The Forest Service, California Fish and Game, and California State Parks explain that the need for development at Ellicott Bridge is based on improved conditions for angling and other water-based recreation use in the Rubicon River between Hell Hole reservoir and Ralston afterbay that are provided by the project flows. The agencies also attribute use at this site to the presence of project recreation facilities at Hell Hole and French Meadows reservoirs and improved access to the area. The agencies believe there is a need for improvements based on Forest Service observations of improper sanitation and unmanaged parking that causes vegetation loss, soil compaction, and erosion. The agencies state that the final EIS should acknowledge there are multiple reasons that recreation visitors are attracted to locations and that the project should bear a portion of the responsibility for addressing issues related to this use.

Response: As discussed in section 3.3.5.2, we state that recreational use at Ellicott Bridge is not primarily related to the project. Our text regarding the distance from Hell Hole reservoir is intended to convey the spatial orientation so the reader would understand that Ellicott Bridge is located at a notable distance from any project facility or reservoir. Further, it was intended to characterize the negligible ability of the project to influence recreational use at this site.

Our determination that PCWA should not be responsible for providing recreation improvements at this site takes into account other factors that are mainly responsible for attracting visitors to recreate at this site. Rivers and stream courses, by their nature, attract visitors regardless of how or why flows may fluctuate. Public road access, such as that provided by Primary Forest Route 2, makes it easier for visitors to access rivers and streams, which also contributes to the level of recreational use at Ellicott Bridge. In addition, flows at this location are primarily influenced by hydropower development on the South Fork Rubicon River (Upper American River Project, FERC No. 2101) from November through May based on measured and modeled flows (see table 3.3.2-3 in the draft EIS, now table 10 in the final EIS) rather than by releases from the Middle Fork Project. Flows at Ellicott Bridge from June through October are generally not sufficient to support whitewater boating, a recreational activity identified with this location.

For clarity, we revised text in section 3.3.5.2 to further explain our basis for concluding that the recreation improvements specified at Ellicott Bridge should not be project recreation facilities.

Comment: The Foothills Water Network, the Forest Service, California Fish and Game, California State Parks, and H. Schweitzer explain that there would not be any scheduled releases for whitewater boating from Hell Hole dam because the valve at the dam cannot release sufficient flow for whitewater boating. However, they note that PCWA can still foster publicizing boatable conditions that may exist downstream of the

project by providing a gage and real-time flow information. Currently it is difficult to estimate flows based on variable conditions created by spill events, accretion, and inflow from the South Fork Rubicon River. Therefore, boaters cannot take advantage of suitable boating conditions that may exist. The lack of flow information limits boating use in the reach, and providing a gage and flow information would allow more boaters to use the reach. Consequently it is necessary for boaters to have real-time gage information and the appropriate measurement location would be at the beginning of the run at Ellicott Bridge. The commenters conclude that this gage would have a nexus to the project.

Response: We agree that there are many factors that make it difficult to determine when there may be suitable flows for whitewater boating downstream of Ellicott Bridge including, as the commenters note, conditions that are unrelated to the project. Flows at this location are primarily influenced by hydropower development on the South Fork Rubicon River (Upper American River Project, FERC No. 2101) from November through May based on measured and modeled flows (see table 3.3.2-3 in the draft EIS, now table 10 in the final EIS) rather than by releases from Middle Fork American River Project. Flows at Ellicott Bridge from June through October are generally not sufficient to support whitewater boating, a recreational activity identified with this location. We agree that having real-time flow information would increase boater ability to take advantage of flows that may reach suitable levels. However, because project operations cannot sufficiently influence flows during the boating season, it would not be appropriate for the project to bear the cost of this measure.

Comment: PCWA requests that we clarify in section 3.3.5.2, *Boat Ramp Extensions* (page 226 of the draft EIS), that its supplemental filing (November 2011) did not indicate that the French Meadows boat ramp extension may not be feasible. PCWA states that its information in the supplemental filing about the feasibility of extending the boat ramp only pertains to extending the Hell Hole boat ramp.

Response: Text on page 226 of the draft EIS presents PCWA's proposed and the Alternative 1 Recreation Plans as they pertain to boat ramp extensions (explained in section 4.6.3 on page 16 of the proposed Recreation Plan and section 4.3.14 on page 26 of the Alternative 1 Recreation Plan). Regarding the proposed French Meadows boat ramp extension, both Recreation Plans state: "Specifically, PCWA will extend the boat ramp up to 365 linear feet, to an elevation of about 5,175 feet, which is 25 vertical feet lower than the bottom of the existing boat ramp…It may not be possible to extend the boat ramp to an elevation of 5,175 feet due to currently unknown factors such as slope and reservoir bed condition." Consequently, we consider it unnecessary to revise the text in response to this comment.

Comment: PCWA requests that we change the text in section 3.3.5.2, *Boat Ramp Extensions* (page 227 of the draft EIS), to state that preliminary Forest Service condition

no. 37 specifies and PCWA proposes that the minimum water surface elevation during the peak recreation season at French Meadows reservoir would be 5,157 feet.

Response: PCWA incorrectly states that preliminary Forest Service condition no. 37 (which correlates to final Forest Service condition no. 38) specifies that the minimum water surface elevation during the peak recreation season in critical and extreme water year types would be 5,157 feet. The correct water surface elevation listed in the condition under these circumstances is 5,175 feet. PCWA's proposed minimum water surface elevation under these same conditions would be 5,157 feet. The text in section 3.3.5.2 has been adjusted to reflect these details.

Comment: PCWA requests that we change the text in section 3.3.5.2, *Boat Ramp Extensions* (page 228 of the draft EIS), to state that, under existing conditions in dry and critically dry water year types, the Hell Hole boat ramps are only available for a portion of the peak and extended recreation season, and they are generally unavailable in extremely critical water year types.

Response: PCWA is requesting that we present our analysis based on combining the peak and extended recreation seasons. Our analysis purposefully distinguishes between the peak and extended recreation seasons (which have very different levels of recreational use) and is consistent with figures C2c of the final license application which PCWA refers to in its comment. Although the data plotted for some of the years included in the individual dry and critical water year types extend below the operational range of the Hell Hole boat ramp around Labor Day, the graphed reservoir elevations from June 1 to Labor Day (the peak recreation season) fall within that operational range of the boat ramp. This depiction is consistent with our text on page 228 of the draft EIS. Further, the figure C2c graph of the extremely critical water year type shows the reservoir elevation within the operational range of the boat ramp from about June 1 to about the end of July. This is also consistent with our characterization of the boat ramp availability in the draft EIS. Consequently, we conclude that no text modification is warranted in response to PCWA's comment.

Comment: The Forest Service, California Fish and Game, and California State Parks comment that the Commission's analysis focuses on mid-summer visitation rather than the entire period of recreational use at the reservoirs. Further, the agencies state that the analysis concludes that there is insufficient information on the record to justify the need for implementing late-season reservoir objectives (pages 229-230 of the draft EIS). The agencies comment that the objectives discussed in section 3.3.5.2, *Reservoir Level Objectives*, are based on a July 15 date in order to balance the needs of hydropower generation and visitors through the high use season. However, the focus of the measure is not just for mid-summer activities and visitation because the recreation season at Hell Hole and French Meadows reservoirs extends into the fall. The agencies explain that the objectives consider: (1) maintaining functionality of facilities through the recreation use period; (2) aesthetic qualities and public perceptions; (3) continuing to provide for

user enjoyment as in the past and into the future, (4) historic reservoir levels associated with uses, conflicts, and other management issues, and (5) personal observations of Forest Service staff. The agencies describe conditions associated with low reservoir levels including unmet visitor expectations, boating hazards, and vehicle use below the high water mark. The agencies state that public information about existing reservoir levels would allow visitors to adjust their plans, expectations, and behaviors. Additionally, patrols and shoreline protection measures, which could be required if reservoir objectives are not met, would reduce inappropriate use that could negatively affect resources and public safety.

Response: We agree that recreation use occurs outside of the peak season, and we also agree with the objectives stated by the agencies. However, we disagree with the agencies that specific reservoir level targets are necessary to provide for non-peak season visitor use and meet agency objectives. The assemblage of measures included in the staff alternative address the concerns associated with the agencies' stated objectives, and it is not necessary to include another measure that meets these same objectives yet would be unenforceable by the Commission, because it does not contain compliance targets (i.e., if a specified target reservoir elevation is not met by the designated date, PCWA would not be considered out of compliance with this measure), and could possibly trigger specific actions that may or may not effectively address a concern.

Comment: PCWA, Foothills Water Network, Interior, Forest Service, California Fish and Game, and California State Parks request that we revise table 3.3.5-11, flow schedule provided in preliminary Forest Service condition no. 39 to support class IV boating opportunities on the peaking reach downstream of Oxbow powerhouse (page 238 of the draft EIS), for below normal water year types to read: "Saturdays (except for Western States 100 and Tevis Cup Race) and Sundays."

Response: In its final 4(e) condition filing, the Forest Service revised the weekday class IV boating flow table consistent with its comment on the draft EIS, and we revised table 3.3.5-11 (now table 34 in the final EIS) to reflect this correction. We made this same correction to table 5-5 (now table 46 in the final EIS).

Comment: The Western States Trail Foundation and P. Gibbs comment that the flow schedule in the staff alternative (tables 5-5 and 5-6) should state that flows to support whitewater boating would be superseded by flows that would allow stream crossings for the Western States 100 and Tevis Cup race events in all water year types. The Western States Trail Foundation and P. Gibbs request that we supplement the tables to state, "Saturdays except for Western States 100 and Tevis Cup dates," in the rows for every water year type. The Western States Trail Foundation states that, if tables 5-5 and 5-6 are not modified as it requests, we should include the provision in the Forest Service 4(e) condition that specifies annual coordination between PCWA and race representatives and that flows for the race would take priority over flows that support whitewater boating use.

Response: We recommend implementing the Alternative 1 instream flow measure, which is consistent with that specified in preliminary Forest Service condition no. 39. Consequently, the staff alternative includes the element of the condition that, in below normal, dry, critical, and extremely critical water year types, whitewater boating flows would be superseded by flows necessary for allowing the Western States 100 and Tevis Cup races to proceed. We do not agree with the P. Gibbs and Western States Trail Foundation requests that the flows suitable for the races take precedence over whitewater boating flows in wet and above normal water year types because the flows during these water year types would likely be too high to be controlled by the project. We added a note to the tables in section 3.3.5.2 and section 5.2.2 indicating that the flows necessary for allowing stream crossings during the Western States 100 and Tevis Cup races would take precedence over whitewater boating flows in below normal, dry, critical, and extreme critical water year types.

Because the Alternative 1 instream flow measure also specifies PCWA annually coordinate with race representatives, that action is also included in our staff alternative. For clarity, we supplemented the text in section 3.3.5.2 with this information.

Comment: The Foothills Water Network requests the staff alternative include a modified version of preliminary Forest Service condition no. 39 that would allow whitewater boating flows to be released on Tevis Cup and Western States 100 race days on a schedule that would not conflict (i.e., create unacceptable conditions for trail crossings) with these special events. The condition would still specify that flows to accommodate these special events would take precedence over flows that support whitewater boating use. Foothills Water Network states this modification is necessary because, as written, the Forest Service condition would never allow boating flows to be released on the regular schedule on special event dates. Consequently, Foothills Water Network asks us to modify preliminary condition no. 39 to allow for the possibility of a modified (i.e., perhaps earlier timing, shorter duration, and/or different magnitude of flows) by requiring PCWA coordinate with boating and race representatives to plan the flow releases for special events.

Response: The Forest Service did not modify this text of its preliminary condition when it submitted its final condition. The specified annual consultation with race representatives required in the condition would provide an opportunity to determine if there are potential options for scheduling flows that would not conflict with the races. We believe this aspect of the condition, which is included in the staff alternative, accommodates Foothills Water Network's concern.

Comment: The Forest Service, California Fish and Game, and California State Parks request that we include the text in section 3.3.5.2, *Whitewater Boating* (page 237 of the draft EIS), that is included in Alternative 1 measure that provides for special whitewater flow events and special event recreation coordination for Tevis Cup, Western States 100, and Wounded Warrior events. The agencies also request that we include a

statement that the recreation flow releases would be based on the Bulletin 120 May forecast of American River unimpaired flow (acre-feet) below Folsom Lake for the specified water year type classifications and provide the compliance conditions for providing recreation flow releases.

The Foothills Water Network requests that we include in the staff alternative the section of preliminary Forest Service condition no. 39 that provides flow conditions suitable for the Wounded Warrior event during the annual maintenance outage.

Response: Because the Alternative 1 instream flow measure, which we adopt, specifies actions related to special events, determining the water year type based on the Bulletin 120 May forecast of unimpaired flow of the American River below Folsom Lake, and compliance conditions, these elements are included in the staff alternative. For clarity, we added notes to the tables and text in in sections 3.3.5.2 and 5.2.2 explaining the relevant points related to special events, compliance, and the basis for determining water year type.

Comment: P. Gibbs states that the draft EIS does not accurately reflect impacts on other recreationists in the Auburn State Recreation Area, particularly related to special events (e.g., Tevis Cup ride).

Response: We revised the text in section 3.3.5.2 to explain the effects of the flow measure on non-whitewater boating recreational use in the peaking reach.

Comment: P. Gibbs states that the draft EIS analysis is flawed because it relies on PCWA's information which did not include stream crossing studies at the peaking reach and used a 35-year-old-chart developed in New Zealand that uses depth and velocity and does not consider channel width, water temperatures, or proximity of rapids and strainers. Therefore, the effects of flows associated with the proposed project on trail users and swimmers could not accurately be determined.

Response: PCWA originally planned to assess these effects by conducting river crossings under the range of flows used to complete the aquatic and whitewater boating studies. Because these study flows were greater than 350 cfs, conducting the study as planned would not have provided information about the determinant range of flows (i.e., lower than 350 cfs) for trail users and swimmers. Additionally, PCWA determined flows greater than 350 cfs would pose unacceptable risk to river crossing study participants. Instead of conducting river crossing evaluations as originally planned, PCWA revised the study methodology to use a focus group to identify key crossings and collected field data at these locations to determine stage-discharge relationships. PCWA discussed and received support for this revised approach from most relicensing participants and the Recreation Technical Working Group approved this revised approach at its July 21, 2008, meeting.

The reference cited in PCWA's study report (developed in New Zealand) uses a standard which specifies that the product of river velocity and depth (feet per second times feet) should be less than 10 for safe wading (commonly referred to as the rule of 10). Colorado State University conducted a study that showed the product of depth and velocity ranging from 7.4 to 23 produced instability for an adult to stand or maneuver in flowing water (Abt et al., 1989). The Forest Service also refers to this study and acknowledges that experimental procedures, which did not consider factors such as water temperature, tended to overestimate stability (Forest Service, 2012b). However the Forest Service states that it is wise to avoid exceeding the rule of 10 for safe wading. The U.S. Geological Survey also uses the rule of 10 as a safe wading standard in its field data collection manual (Lane et al., 1997). Because the rule of 10 is widely used and is a generally accepted safe wading threshold used in literature, irrespective of the location of the river, we consider it to be an appropriate standard for analyzing stream crossings on the Middle Fork American River.

Comment: P. Gibbs states that the higher stream crossing thresholds (moderate/difficult to difficult) developed by PCWA should not be used as the basis for determining whether it is possible to cross the river at the peaking reach.

Response: Considering the peaking reach receives a significant level of use by families for hiking, swimming, and wading, including individuals who may have varying levels of physical capabilities, we agree with P. Gibbs that the determinant flow should be the one at which the least capable person in a party could successfully cross the river rather than the moderate/difficult or difficult crossing thresholds used in PCWA's analysis. Consequently, it is appropriate to use river crossing thresholds that correspond to a low level of difficulty. We supplemented our analysis in section 3.3.5.2 accordingly to use the lower flows as the thresholds for determining the number of hours when the flows would be suitable for river crossing in the peaking reach.

Comment: P. Gibbs states that the term "preferred" that is used in the draft EIS to describe depths and velocities for peaking reach river crossings is not based on information provided to PCWA by focus group and the technical working group and is misleading.

Response: We conducted a global search of the draft EIS text and the term "preferred" is not used to describe depths and water velocities associated with river crossing sites. Therefore, no revision to the EIS text is warranted.

Comment: P. Gibbs states that the analysis of available peaking reach river crossings should present results specifically for the high recreation use seasons (summer and fall) and not be averaged across the whole year. In addition, the data for the fall outage period should be analyzed separately and should not be included in the seasonal average because it skews the average number of hours with flows suitable for stream crossing in the peaking reach.

Response: We agree that it is appropriate to analyze river crossings during the summer and fall periods which are when the highest recreational use for hiking and swimming occurs. We revised our analysis in section 3.3.5.2 to focus on these time periods.

During the 3- to 6-week outage period in the fall, flows in the peaking reach are held at a relatively steady flow close to, but greater than the 75 cfs minimum instream flow requirement under current project operation. We recognize that this extended period with crossable flows raises the existing average number of hours of available river crossings over the entire 3-month fall period. However, we do not agree that it is necessary to segregate this data for separate analysis because the fall outage is part of normal project operation and PCWA proposes to continue this practice. In other words, the average crossing time with flows suitable for an easy crossing that are calculated for the proposed and Alternative 1 flow schedules also include an outage period so these data are comparable to the average calculated for the existing condition. We conclude that no EIS text changes are warranted to respond to this portion of the comment.

Comment: P. Gibbs states that PCWA's river crossing analysis excluded 1 year of hydrology data, and this is not explained.

Response: Ms. Gibbs does not specify which year of hydrology data appears to have been omitted from the analysis. Without knowing details of the omitted year, we cannot respond to the comment.

Comment: P. Gibbs requests that we include in the staff alternative provisions to provide onsite river stage gages at peaking reach trail crossing sites for recreational visitors to reference when deciding whether to cross the river. She requests including a real-time river gage on the Middle Fork American River (upstream of its confluence with North Fork of the American River but well downstream of the existing USGS gage) so that recreational visitors can be better informed about the highly variable daily flows at the downstream end of the peaking reach.

The Foothills Water Network believes the gage upstream of the North Fork American River pumping station has a project nexus because the flows in the reach below the confluence of the North and Middle Forks of American River range from 200 cfs to 1,000 cfs on a daily basis in the summer. It notes that an unregulated river would have consistent and lower flows than what currently exists. The daily peaking flows that occur in the reach demonstrate the project influence and, consequently, the clear relationship of the flow conditions in this reach to the project. The Foothills Water Network states that although real-time flow information is provided below Oxbow powerhouse, visitors cannot factor in the many variables that influence flows downstream of the confluence of the Middle Fork and North Fork American River, which is 25 miles downstream of the powerhouse. It points out that such factors include travel time, flow attenuation and accretion, and ramping rates at various base and peaking flows, all of which have a bearing on the suitability of conditions for

recreational activities. Consequently, a gage is needed at this downstream location to let the public know when conditions are suitable for non-boating recreational uses in the reach. The Foothills Water Network also points out that the variety of flows provided in the reach by the project both facilitate and discourage recreation activities during different times of the day. Therefore if it were not for the project, the variety of opportunities that currently exist would not be provided. In addition, it notes that providing a real-time flow gage in this reach would improve public safety. The Forest Service, California Fish and Game, and California State Parks provide similar comments.

Response: We agree that providing permanent reference marks (such as numbered bolts anchored into rock) at locations where trails cross the peaking reach (similar to the staff gages recommended by P. Gibbs) would provide helpful information for recreational visitors to reference when deciding whether to cross the river. We have adjusted the staff alternative to include this measure. We continue to conclude that requiring PCWA to install a second real-time flow gage in the peaking reach just upstream of the confluence of the Middle Fork and North Fork American Rivers is not warranted because of other measures that we include in the staff alternative. However, providing adjustment factors that can be applied to real-time data reported from USGS gage no. 11433300 near Foresthill for estimated expected timing and magnitude of flows just upstream of the confluence of the North Fork American River would enhance trip planning by recreational visitors to the area without the need for incurring the costs for installing, operating, and maintaining a second new real-time gage on the peaking reach. Consequently, we modified the staff alternative to include adding such adjustment factors to information reported from gage no. 11433300.

Comment: P. Gibbs asks that the staff alternative require PCWA to contribute funding to build a bridge over the river in the peaking reach. If no bridge is constructed, PCWA should be required to fund increased staffing for California State Parks because project flows have led to much higher public use of this portion of the river with a corresponding increase in calls for law enforcement and emergency response.

Response: We do not agree with including a measure that would require PCWA contribute to funding a bridge across the peaking reach or funding law enforcement for California State Parks. Our analysis indicates that the staff alternative would provide flows that allow river crossings for special events (e.g., Western States 100) and the slower ramping rates would improve conditions for crossing the river (i.e., reduce the potential for visitors being stranded). Further, we revised our staff alternative to include measures that increase public information and awareness through brochures, signage and water level indicators at the Western States Trail crossing would reduce the effects on river crossings. Providing funding for California State Parks would not be appropriate because PCWA already supports the needs associated with law enforcement

and emergency response through the public land use fees and county taxes that it pays for the project.

Comment: The Foothills Water Network requests that we analyze the component of Alternative 1 that would require PCWA to post on the internet 24-hour predicted flows from Oxbow powerhouse based on predicted operation using the California Independent System Operator schedule. Including this measure would provide some predictability and capacity for planning safe recreational use of the peaking reach. P. Gibbs requests that we recommend PCWA be required to provide information on the PCWA website, brochures, and at boating put-in sites to inform the public that there are daily project-related flow fluctuations that can prevent them from crossing the river.

Response: We agree that being overt about providing recreational visitors with peaking reach flow information in various media would facilitate trip planning and foster awareness of project-related flow changes. We added text to sections 3.3.5.2 and 5.2.2 to clarify this point.

Comment: PCWA requests that we revise text in section 3.3.5.2, *Whitewater Boating* (page 240 of the draft EIS), regarding whitewater boating opportunities at Long Canyon Creek because opportunities under existing, proposed, and Alternative 1 only exist in the wet water year type.

Response: We revised the text in section 3.3.5.2 to reflect that whitewater boating opportunities only exist in wet water year types.

Comment: PCWA requests that we revise the text in section 3.3.5.2, *Whitewater Boating* (page 241 of the draft EIS), to clarify that its proposed minimum flows, when coupled with other proposed instream flows, would exceed the suitable whitewater boating flow range during May and June of above and below normal water year types between French Meadows dam and Middle Fork interbay. PCWA also explains additional circumstances that cause flows to exceed the boatable range of flows in May and June that it would like included in the final EIS.

Response: We revised the text of section 3.3.5.2 to clarify that under PCWA's proposed project there would be fewer opportunities in below normal and above normal water year types but opportunities would be maintained in the wet water year type. We agree that, additional circumstances noted by PCWA such as spill events, accretion, and increased minimum instream flows, in addition to pulse flows, would also cause flows to exceed the boatable range of flows in May and June. The text has been supplemented with this information.

Comment: EPA requests the final EIS discuss the current and anticipated maintenance needs for project roads and trails and provide details about the Transportation System Management Plan. EPA also asks that the final EIS include descriptions of: (1) any

BMPs that would be used to respond to maintenance needs and (2) the impacts of implementing the Transportation System Management Plan as compared to the no-action alternative.

Response: The Alternative 1 Transportation System Management Plan, which was developed in consultation with and supported by the Forest Service and California Fish and Game in its January 12, 2012, letter to the Commission, is summarized in the draft EIS. Tables 1 through 5 of the plan provide specific details of what needs to be done at each project related road and trail and when it is scheduled to be done. Table 6 of the Alternative 1 Transportation System Management Plan provides four pages of specific BMPs that would be used to respond to road and trail maintenance needs and protect environmental resources. These practices are consistent with current Forest Service road and trail maintenance guidelines.

In the past, as described in section 3.3.5.1 (pages 213 and 214 of the draft EIS), under the no-action alternative, PCWA cooperatively worked with the Forest Service under various agreements to ensure appropriate road and trail maintenance. This approach generally has resulted in most project road segments being in good to fair condition and all but one project trail being in good condition. The Alternative 1 Transportation System Management Plan consolidates maintenance procedures and associated environmental protection measures in a single document, identifies specific maintenance activities that need to be done based on site-specific assessments, and establishes a time line for maintenance activities. We expect implementation of this plan to result in few, if any, roads and trails persisting in poor or fair condition for any substantial duration. We conclude that no EIS text changes are necessary to respond to this comment.

CULTURAL RESOURCES

Comment: PCWA states that the California SHPO concurred with all of PCWA's recommendations and the text in section 3.3.6.1, *Archaeological and Historic-Era Resources* (page 252 of the draft EIS), should be revised to reflect this information.

Response: PCWA's May 13, 2010, letter sought the California SHPO's concurrence with the National Register evaluations of 14 resources. In its June 22, 2010, response, the California SHPO discusses 14 sites that were evaluated for listing on the National Register and two sites that were recommended as eligible. The letter states that "the remaining 12 sites are ineligible for the NRHP" but inadvertently only lists 11 sites. Site FS-05-17-54-480 was recommended as ineligible in PCWA's letter, but it was not included in the California SHPO's list of ineligible resources. However, we agree with PCWA's recommendation that this site is not eligible for listing on the National Register. We clarified this information in sections 3.3.6.1 and 3.3.6.2 of the final EIS.

Comment: PCWA provides the following updated information that it states we should incorporate into section 3.3.6.2, *Historic Properties Management Plan* (page 265 of the draft EIS). PCWA explains that sites FS-04-17-54-372 and FS-05-17-54-478 were evaluated in a National Register Historic Properties Report provided in its supplemental filing (November 2011), and study results indicate that neither of these sites is eligible for inclusion on the National Register. The report has not yet been sent to the California SHPO for concurrence, because the ownership of the federal land underlying FS-05-03-53-372 was previously thought to be located on land managed by BLM. Therefore, a copy of the report for FS-05-03-53-372 and FS-05-17-54-478 was provided to BLM for review on August 28, 2012. However, on September 20, 2012, BLM indicated that the land underlying FS-05-03-372 is managed by the Forest Service. Therefore, BLM does not have jurisdiction and declined to comment on the report. PCWA states that a copy of the report will be sent the California SHPO for review along with a letter requesting concurrence with the study recommendations, and copies of all correspondence with BLM and the California SHPO will be provided to the Commission.

Response: We added text to sections 3.3.6.1 and 3.3.6.2 of the final EIS that clarifies the National Register status of these two sites.

Comment: EPA states that the final EIS should describe the status of tribal consultation with affected tribes, discuss the mitigation measures included in the Programmatic Agreement (PA), and include the PA as an appendix to the final EIS. EPA also recommends including the tribes on the final EIS distribution list.

Response: We revised sections 3.3.6.1 and 3.3.6.2 to better describe the tribal consultation efforts undertaken for the project. Through written correspondence and meetings, a total of seven tribes have been consulted by PCWA (Auburn Rancheria [United Auburn Indian Community], Colfax-Todds Valley Consolidated Tribe, Washoe Tribe, Shingle Springs Rancheria, Miwok Tribe of the El Dorado Rancheria, T'si-Akim Maidu, and Todd Valley Miwok-Maidu Cultural Foundation). All seven tribes have been invited by the Commission to provide comments on the draft PA issued on August 23, 2012, and to sign it as concurring parties.

The draft PA does not contain any specific mitigation measures. These measures are instead contained within the confidential final HPMP which would be implemented through execution of the final PA. Because it is a confidential document, the final HPMP cannot be appended to the final EIS. However, the draft EIS contained a summary of the proposed cultural resource management measures provided in the final HPMP. This same summary is provided in the final EIS.

Comment: PCWA suggests that we revise the text in the description of the staff alternative in section 5.2.2, *Additional Measures Recommended by Staff*, to include additional sources of potential effects (e.g., gage maintenance).

Response: We agree that the clarification of potential effects cited by PCWA should be included in the final EIS. However, PCWA filed a final HPMP that adequately addresses our recommendations in the draft EIS. Thus the recommended staff alternative is to implement the final HPMP. PCWA's clarifications regarding potential project effects are addressed in table 3.3.6-1 (now table 38 in the final EIS), in the text of section 3.3.6.2 where appropriate, and in section 5.2.2 of the final EIS. We also modified section 3.3.6.2 to present and analyze the additional provisions included in the final HPMP.

AESTHETIC RESOURCES

Comment: The Forest Service, California Fish and Game, and California State Parks disagree with the staff recommendation to revise the Visual Resource Management Plan once every 10 years (page 270 of the draft EIS). The agencies state that revising the plan every 5 years, as specified in Alternative 1, would ensure that visual management needs associated with maintenance and new construction are addressed.

Response: As discussed in section 3.3.7.2, *Aesthetic Resources, Environmental Effects*, revising the plan every 5 years appears excessively frequent considering: (1) most of the existing project facilities are visually consistent with established EVCs; (2) planning for future development would include Forest Service review and approval; and (3) the plan already identifies several specific actions that would be implemented. Because these circumstances provide an adequate level of certainty relative to visual appearances, and visual conditions change very slowly over time, we conclude that a longer period of time can lapse between plan revisions without compromising visual quality at the project. In addition, the resource agencies do not provide any additional information to support a 5-year plan review period, there is no basis for changing the staff recommendation.

DEVELOPMENTAL ANALYSIS

Comment: At several locations in the draft EIS (e.g., pages 275, 305, and 306), we state that the estimated annual generation of the proposed project is 994,444 MWh. PCWA requests that we change this to 991,384 MWh.

Response: PCWA's comment the draft EIS references values provided in the final license application filed on February 23, 2011. Subsequent to that, PCWA filed an additional information request (AIR) response with the Commission on June 15, 2011, which cited the difference between no-action and the PCWA proposal as 44,634 MWh. We consider this more recent information to supersede the annual generation value presented in the license application. PCWA states in its Alternative 1 Supplemental filing (PCWA, 2011b) that the annual generation for the no-action alternative is still 1,039,078 MWh. Subtracting 44,634 MWh from 1,039,078 yields 994,444 MWh, which is the value that we used in the draft EIS. We added a footnote to table 40 of the

final EIS (which was table 4-2 in the draft EIS) to clarify the source of the estimated annual generation of the proposed project. No additional changes to the EIS are necessary.

APPENDIX B

Comparison of Proposed Action, Resource Agency Preliminary Conditions, and Alternative 1

(letter from A. Fecko, Resource Planning Administrator, PCWA, to the Commission, filed on January 11, 2012)

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Table 1. Comparison of PCWA's Proposed Action, Resource Agencies Preliminary Conditions and Recommendations, and Alternative 1.

Element Analyzed	PCWA's Proposed Action[1]	Resource Agencies Preliminary Conditions and Recommendations	Alternative 1[5]
Proposed Protection, Mitigation, and Enhancement Measure			
	Instream Flow and Reservoir Minimum Pool Measure (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4)	Condition No. 22 – Minimum Streamflows[2,3,4] Condition No. 23 – Pulse Flows[2,3] Condition No. 24 – Ramping Rates[2,3,4] Condition No. 25 – Outages[2,3,4] Condition No. 37 – Reservoir Minimum Pool Elevations and Reservoir Levels Recreation Objectives[2,3] Condition No. 39 – Recreation Streamflows in the Middle Fork American River Below Oxbow Powerhouse[2,3,4]	Resource Agencies Preliminary Conditions and Recommendations
	Recreation Plan (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4)	Condition No. 33 – Recreation Plan[2,3]	Resource Agencies Preliminary Conditions and Recommendations
	Draft Historic Properties Management Plan (FLA, Volume 5, Exhibit E, Supporting Document E)	Condition No. 41 – Historic Properties Management Plan[2,3] *Condition No. 41 required continued consultation with USDA-FS to finalize the plan provided in the FLA and submit for USDA-FS approval.*	Draft Final Historic Properties Management Plan (Supplemental Filing, Volume 3) *PCWA continued consultation with USDA-FS on the Draft HPMP provided in the FLA following submittal of preliminary conditions and recommendations. This consultation resulted in development of the Draft Final HPMP. PCWA obtained verbal consensus from the USDA-FS on this plan in November 2011. The Draft Final HPMP was analyzed under Alternative 1 in the Supplemental Filing. The State Historic Preservation Office is on the MFP distribution list and received copies of the public, confidential, and privileged volumes of the Supplemental Filing.*
	Transportation System Management Plan (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4)	Condition No. 43 – Transportation System Management Plan[2,3] *Condition No. 43 required continued consultation with USDA-FS to finalize the plan provided in the FLA and submit for USDA-FS approval.*	Transportation System Management Plan (Supplemental Filing, Volume 1, Attachment 1B) *PCWA continued consultation with USDA-FS on the TSMP provided in the FLA following submittal of preliminary conditions and recommendations. This consultation resulted in development of a revised TSMP. PCWA obtained verbal consensus from the USDA-FS on this plan in November 2011. The revised TSMP was analyzed under Alternative 1 in the Supplemental Filing.*
	Vegetation and Integrated Pest Management Plan (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4)	Condition No. 46 – Vegetation and Integrated Pest Management Plan[2,3] *Condition No. 46 required continued consultation with USDA-FS and CDFG to finalize the plan provided in the FLA and submit for USDA-FS approval.*	Vegetation and Integrated Pest Management Plan (Supplemental Filing, Volume 1, Attachment 1A) *PCWA continued consultation with resource agencies (USDA-FS, CDFG, State Water Board) on the VIPMP provided in the FLA following submittal of preliminary conditions and recommendations. This consultation resulted in development of a revised VIPMP. PCWA obtained verbal consensus from the resource agencies on this plan in November 2011. The revised VIPMP was analyzed under Alternative 1 in the Supplemental Filing.*

Table 1. Comparison of PCWA's Proposed Action, Resource Agencies Preliminary Conditions and Recommendations, and Alternative 1 (continued).

Element Analyzed	PCWA's Proposed Action[1]	Resource Agencies Preliminary Conditions and Recommendations	Alternative 1[5]
Proposed Protection, Mitigation, and Enhancement Measure (continued)			
	Monitoring Plans (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4) *The following monitoring plans were included in FLA:* • *Fish Population Monitoring Plan* • *Foothill Yellow-legged Frog Monitoring Plan* • *Geomorphology/Riparian Monitoring Plan* • *Water Temperature Monitoring Plan* • *Western Pond Turtle Monitoring Plan* • *Water Quality Monitoring Plan* • *Mercury Bioaccumulation Monitoring Plan* • *Benthic Macroinvertebrate Monitoring Plan* • *Fire Prevention and Suppression Plan*	Condition No. 28 and 44 – Monitoring Program[2,3] *Condition No. 28 required continued consultation with USDA-FS, CDFG, and State Water Board to finalize the plans provided in the FLA and submit for USDA-FS approval including:* • *Fish Population Monitoring Plan* • *Foothill Yellow-legged Frog Monitoring Plan* • *Western Pond Turtle Monitoring Plan* • *Benthic Macroinvertebrate Monitoring Plan* • *Mercury Bioaccumulation Monitoring Plan* • *Geomorphology and Riparian Monitoring Plan* • *Water Quality Monitoring Plan* Condition No. 44 – Fire Management and Response Plan[2,3] *Condition No. 44 required continued consultation with USDA-FS to finalize the plan provided in the FLA and submit for USDA-FS approval.*	Monitoring Plans provided in the FLA were analyzed under Alternative 1 in the Supplemental Filing including: • Fish Population Monitoring Plan • Foothill Yellow-legged Frog Monitoring Plan • Geomorphology/Riparian Monitoring Plan • Water Temperature Monitoring Plan • Western Pond Turtle Monitoring Plan • Water Quality Monitoring Plan • Mercury Bioaccumulation Monitoring Plan • Benthic Macroinvertebrate Monitoring Plan • Fire Prevention and Suppression Plan *Considerable consultation with resource agencies was conducted during development of the monitoring plans included in the FLA. PCWA and the MFP stakeholders are continuing to collaborate to reach consensus on these plans. Although minor revisions may be required to secure stakeholder consensus on these plans, PCWA believes that the overall objective of these plans is not in question and any future changes will not impact the analysis associated with these plans under Alternative 1 in the Supplemental Filing.*
	Management and Monitoring Plans (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4) *The following monitoring plan was included in the FLA:* • *Flow and Reservoir Monitoring Plan*	Condition No. 31 – Streamflow and Reservoir Elevation Gaging Plan [2,3] *Condition No. 31 required continued consultation with USDA-FS, CDFG, and State Water Board to finalize the plan provided in the FLA and submit for USDA-FS approval.*	Streamflow and Reservoir Elevation Gaging Plan (SREGP) (PCWA Alternative Condition No. 31)[6] *PCWA continued consultation with resource agencies on the SREGP following submittal of preliminary conditions and recommendations. This consultation resulted in revisions to the plan. The revised SREGP was submitted as an Alternative Condition by PCWA. However, the resource agencies are currently reviewing the revised plan. Alternative 1 includes analysis of the revised SREGP submitted as PCWA Alternative Condition No. 31.* *Although minor revisions may be required to secure stakeholder consensus on this plan, PCWA believes that the overall objective of the plan is not in question and any future changes will not impact the analysis associated with this plan under Alternative 1 in the Supplemental Filing.*

Table 1. Comparison of PCWA's Proposed Action, Resource Agencies Preliminary Conditions and Recommendations, and Alternative 1 (continued).

Element Analyzed	PCWA's Proposed Action[1]	Resource Agencies Preliminary Conditions and Recommendations	Alternative 1[5]
Proposed Protection, Mitigation, and Enhancement Measure (continued)			
	Management Plans (FLA, Volume 3, Exhibit E, Supporting Document A, Book 4) *The following management plans were included in the FLA:* • *Sediment Management Plan* • *Visual Resource Management Plan* • *Bald Eagle Management Plan*	Condition No. 45 – Erosion and Sediment Control and Management[2,3] Condition No. 40 – Visual Resources Management Plan[2,3] Condition No. 27 – Wildlife and Plant Protection Measures[2,3] *Condition No. 45, 40, and 27 required implementation the following plans :* • *Sediment Management Plan* • *Visual Resource Management Plan* • *Bald Eagle Management Plan* *The plans provided in the resource agencies preliminary conditions and recommendations were identical to those provided in PCWA's Proposed Action.*	Resource Agencies Preliminary Conditions and Recommendations
Modified or New Facility Construction Activities			
	Modified or New Facility Construction Activities (FLA, Volume 3, Exhibit E, Appendix A, Book 3) Construction projects analyzed included: 1. Hell Hole Reservoir Seasonal Storage Increase Improvement 2. Duncan Creek Diversion Dam Modification 3. North Fork Long Canyon Creek Diversion Dam Modification 4. South Fork Long Canyon Creek Diversion Dam Modification 5. French Meadows Reservoir Outlet Works Modification 6. Hell Hole Reservoir Outlet Works Modification 7. Middle Fork Interbay Outlet Works Modification Construction projects identified but not analyzed included: 8. North Fork Long Canyon Creek Gage below Diversion Dam 9. South Fork Long Canyon Creek Gage below Diversion Dam 10. Middle Fork American River Gage below Diversion Dam 11. North Fork American River Gage above American River Pump Station The precise location of the four new gages had not been determined at time the FLA was filed. The FLA stated that, "Project-specific National Environmental Policy Act (NEPA) analysis will be conducted at a later date, and all necessary permits and approvals will be obtained prior to implementation of any construction activities".	The resource agencies preliminary conditions and recommendations did not explicitly identify modified or new facility construction activities. However, implementation of the resource agencies conditions and recommendations required the following construction projects: 1. Hell Hole Reservoir Seasonal Storage Increase Improvement 2. Duncan Creek Diversion Dam Modification 3. North Fork Long Canyon Creek Diversion Dam Modification 4. South Fork Long Canyon Creek Diversion Dam Modification 5. French Meadows Reservoir Outlet Works Modification 6. Hell Hole Reservoir Outlet Works Modification 7. Middle Fork Interbay Outlet Works Modification 8. North Fork Long Canyon Creek Gage below Diversion Dam 9. South Fork Long Canyon Creek Gage below Diversion Dam 10. Middle Fork American River Gage below Diversion Dam 11. North Fork American River Gage above American River Pump Station 12. Ellicott Bridge Parking Area 13. French Meadows Reservoir Trail 14. French Meadows North Shore Water Supply 15. French Meadows South Shore Water Supply	Resource Agencies Preliminary Conditions and Recommendations *(Construction projects (1-15) required for implementation of the resource agencies preliminary conditions and recommendations).*

References:

[1]Placer County Water Agency's Application for New License (Filed with FERC February 23, 2011).
[2]United States Department of Agriculture-Forest Service (USDA-FS) Preliminary Section 4(e) Conditions (Filed with FERC August 5, 2011).
[3]California Department of Fish and Game (CDFG) Preliminary Section 10(j) Recommendations (Filed with FERC August 5, 2011). Although filed separately, CDFG Section 10(j) recommendations are identical to USDA-FS Section 4(e) conditions.
[4]United States Department of the Interior (DOI) Preliminary 10(a) Recommendations (Filed with FERC August 4, 2011).
[5]Placer County Water Agency's Supplemental Filing (Filed with FERC November 30, 2011).
[6]Placer County Water Agency's Submittal of Alternative Conditions for 16 Preliminary Section 4(e) Conditions Submitted by the USDA-FS for the Middle Fork American River Project. Attachment D8: PCWA Alternative Condition No. 31 – Streamflow and Reservoir Elevation Gaging Plan (Filed with FERC September 6, 2011).

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APPENDIX C

Draft License Articles for the Middle Fork American River Project

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DRAFT LICENSE ARTICLES

I. MANDATORY CONDITIONS

On December 3, 2012, the U.S. Department of Agriculture, Forest Service (Forest Service) filed 48 final 4(e) conditions (described in section 2.2.5 of the EIS). We consider 18 of the conditions (2 through 10, 12 through 14, and 16 through 21) to be administrative or legal in nature and not specific environmental measures. Of the 30 conditions that we consider to be environmental measures, we include 20[37] of these conditions in the staff alternative as specified by the Forest Service. We recognize, however that the Federal Energy Regulatory Commission (Commission) is required to include valid 4(e) conditions in any license issued for the project. As such, each of the measures that staff recommend be modified in the staff alternative (as discussed in section 5.2, *Comprehensive Development and Recommended Alternative*) would not be included in any license issued by the Commission. Instead, those conditions would be replaced with the Forest Service's corresponding conditions, as filed with the Commission.

II. ADDITIONAL LICENSE ARTICLES RECOMMENDED BY COMMISSION STAFF

We recommend including the following license articles in any license issued for the project in addition to the mandatory conditions.

Draft Article 4xx. *Commission Approval, Notification, and Filing of Amendments.*

(a) Requirement to File Plans for Commission Approval

Various conditions of this license found in the U.S. Department of Agriculture-Forest Service's (Forest Service's) preliminary section 4(e) conditions require the licensee to prepare plans in consultation with other entities for approval

[37] As explained in section 5 of the EIS, of the 10 conditions not included in the staff alternative as specified by the Forest Service, we recommend modifying 6: (a) Streamflow and Reservoir Gaging Plan (condition no. 32); (b) Recreation Plan (condition no. 34); (c) Recreation, Operation, Maintenance, and Administration (condition no. 35); (d) Reservoir Level Recreation Objectives (condition no. 38); (e) Visual Resource Management Plan (condition no. 41); and (f) Transportation System Management Plan (condition no. 44). We do not recommend that a biological evaluation be prepared for construction of project-related facilities not addressed in the Commission's EIS (condition no. 11), a monitoring plan included in condition no. 28, the Mercury Bioaccumulation Monitoring Plan, recreational enhancements at Cache Rock in the peaking reach (condition no. 36), and a shared use recreation work station and storage facility at Hell Hole reservoir (condition no. 37).

by the Forest Service for implementation of specific measures without prior Commission approval. Each such plan shall also be submitted to the Commission for approval. These plans are listed below.

Forest Service condition no.	Plan name	Due date
28	Bear management monitoring	Within 1 year of license issuance
48	Aquatic invasive species management	Within 1 year of license issuance

(b) Requirement to File Reports

Certain conditions of the Forest Service's section 4(e) conditions require the PCWA to file reports with other entities. These reports document compliance with requirement of this license and may have a bearing on future actions. Each such report shall also be submitted to the Commission. These reports are listed in the following table.

Forest Service condition no.	Description	Due date
1	Reports documenting annual meetings with the Forest Service	Within 60 days of the meeting
10	Reports documenting all known or observed hazardous conditions	As soon as possible
11	Any biological evaluations for new project features	Prior to construction
23	Testing reports pertaining to each of the first two pulse flow releases at the three small diversion dams	Not specified
24	Testing reports pertaining to each of the first two downramping events following spillage at French Meadows and Hell Hole reservoirs	Not specified
24	Any follow-up reports documenting deviations from specified ramping rate requirements	Within 1 month of the event
27	Report documenting the results of project powerline evaluations	Within 1 year of license issuance

Forest Service condition no.	Description	Due date
	pertaining to compliance with applicable Avian Power Line Interaction Committee guidelines	

(c) Requirement to Notify Commission of Planned and Unplanned Deviations from License Requirements

Three Forest Service conditions would allow the licensee to temporarily modify project operations under certain conditions. The Commission shall be notified prior to implementing such modifications, if possible, or in the event of an emergency, as soon as possible, but no later than 10 days after each such incident.

Forest Service condition no.	License requirement
10	Actions taken to abate emergency hazardous conditions
24	Deviations from ramping rate requirements
25	Deviations from specified minimum and maximum flows during unplanned Middle Fork and Ralston powerhouse outages

(d) Requirement to File Amendment Applications

Certain Forest Service conditions contemplate unspecified long-term changes to project operations or facilities for the purpose of mitigating environmental impacts. These changes may not be implemented without prior Commission authorization granted after the filing of an application to amend the license. These conditions are listed below.

Forest Service condition no.	Modification
16	Modification of 4(e) conditions after biological opinion or water quality certification
23	Modification of pulse flows from Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek diversion dams following two test flow events
24	Modification of downramping rates during spillage at French Meadows and Hell Hole reservoirs following two test spill events

Draft Article 4xx. *Large Woody Debris Management Plan*. Within 1 year of license issuance, the licensee shall file for Commission approval a large woody debris management plan. The plan shall include the provisions required by U.S. Forest Service condition no. 30 and the following additional items: (1) a description of alternatives considered for passing large woody debris downstream of each project dam; (2) feasible options to the practice of burning woody debris removed from Hell Hole reservoir with a preference for placement of large woody debris within the active channel of the Rubicon River downstream of Hell Hole dam; (3) an analysis of the environmental benefits and environmental and financial costs of each alternative considered; (4) reasons for rejecting any alternatives; (5) a schedule for implementing any recommended option(s), if deemed feasible; and (6) provisions for monitoring and reporting on the results of large woody debris management at all project dams.

The licensee shall prepare the plan after consultation with the U.S. Forest Service, California Department of Fish and Game, and the California State Water Resources Control Board. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on site-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Draft Article 4xx. *Sediment Management Plan*. The licensee shall implement the Sediment Management Plan required by U.S. Forest Service condition no. 46, and filed with the Commission on December 3, 2012, with the additional provision that the licensee shall not use sediment for sediment augmentation in and adjacent to project waters if unacceptable levels of methylmercury are detected during pre-removal testing.

Draft Article 4xx. *Streamflow and Reservoir Elevation Gaging Plan.* The licensee shall implement the Streamflow and Reservoir Elevation Gaging Plan required by U.S. Forest Service condition no. 32 and filed with the Commission on December 3, 2012, with the additional provision that the licensee include in the annual monitoring reports filed with the Commission, in accordance with section 5.0 of the plan, the daily average, minimum, and maximum streamflow and reservoir elevations.

Draft Article 4xx. *Monitoring and Commission Notification on Status of Reintroduction of Endangered Species Act-Listed Species*. The licensee shall, in

consultation with the U.S. Department of Commerce-National Marine Fisheries Service, monitor the status of reintroduction plans for Endangered Species Act-listed species of anadromous fish, specifically California Central Valley steelhead, for the term of this license. When specific written reintroduction plans are published along with a schedule for reintroduction to the American River watershed upstream of Nimbus and Folsom dams, the licensee shall notify the Commission, as well as the U.S. Department of the Interior-Bureau of Reclamation; U.S. Department of the Interior-Fish and Wildlife Service; and California Department of Fish and Game, and provide documentation of the plans and schedule.

Draft Article 4xx. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the secretaries of the Interior and Commerce pursuant to section 18 of the Federal Power Act.

Draft Article 4xx. *Special-status Wildlife Surveys Prior to Construction*.

If pre-construction raptor breeding surveys (February 15 through September 15) are required by Forest Service condition no. 34 (Recreation Plan) or condition no. 44 (Transportation System Management Plan), the licensee shall also document any direct or indirect (e.g., signs) observations of any U.S. Forest Service, state, or federal special-status species of wildlife within 500 feet of the proposed construction site. If evidence of special-status species presence is found, the licensee shall consult with the U.S. Forest Service, California Department of Fish and Game, and U.S. Fish and Wildlife Service to determine appropriate protective or avoidance measures prior to commencing any construction activities. The Commission shall be notified, prior to commencing construction, of any special-status wildlife detected, the protective and avoidance measures that will be implemented, and documentation of agency consultation and concurrence with the proposed protective and avoidance measures. Construction shall not commence until the proposed protective and avoidance measures are approved by the Commission.

Draft Article 4xx. *Recreation Plan.* Within 90 days of license issuance, the licensee shall file for Commission approval, a Recreation Plan that includes the provisions required by U.S. Forest Service condition no. 34 and the following additional items: (1) geographically organized descriptions of all project recreation facilities; (2) a comprehensive discussion of all project recreation developments that includes both existing and planned improvements at each site; (3) consistent text and tabular information; (4) a clear statement of the amenities and capacity of the Middle Meadows Campground, confirmation of the licensee's intent to replace plastic recycling cans with steel, bear-proof recycling containers, drill a vertical well, and replace the water storage tank, supply, and water distribution lines, and a map showing the complete unit of this development; (5) a component that formalizes a monitoring and reporting process for

bear-related incidents and evaluating existing and potential new measures for reducing interactions between humans and bears at project recreation facilities; (6) provisions for posting on PCWA's project website adjustment factors regarding predicted timing and magnitude of peaking reach flows immediately upstream of the confluence of the North Fork American River that can be applied to real-time flow information from USGS gage no. 11433300 (Middle Fork American River near Foresthill); (7) provisions for periodic inspection of signage at prominent points of public entry to the peaking reach for adequacy and periodic assessments of whether additional signage is needed warning the public about potentially hazardous conditions associated with fluctuating peaking reach flows; (8) provisions for installing and maintaining permanent visual water level markers at Western States Trail crossings of the Middle Fork American River and including interpretative information regarding the location and intended use of the markers in brochures, project websites, and on-site signage; and (9) revisions to make the Recreation Plan a stand-alone document, such as including pertinent information from supporting study reports in the main body of the plan or as plan appendices.

The licensee shall prepare the plan after consultation with the U.S. Forest Service and California State Department of Parks and Recreation. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the agencies to comment before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on site-specific information.

The Commission reserves the right to require changes to the plan. No recreation-related land-disturbing or land-clearing activities shall begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 4xx. *Programmatic Agreement and Historic Properties Management Plan*. The licensee shall implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the State of California Historic Preservation Officer for Managing Historic Properties that May be Affected by Issuing of a License to Placer County Water Agency for the Middle Fork American River Hydroelectric Project in Placer and El Dorado Counties, California (FERC No. 2079-069)," executed on_____, and including but not limited to the Historic Properties Management Plan (HPMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Article 4xx. *Use and Occupancy.* (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use

and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or

roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Energy Projects, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.