Placer County Water Agency

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June 20, 2006

Subject: Middle Fork American River Hydroelectric Project Relicensing
FERC Project No. 2079 - Draft Project Description

Dear Stakeholder;

Placer County Water Agency (PCWA) is pleased to provide for your review and comment the enclosed "Draft Project Description" for the Middle Fork American River Hydroelectric Project (MFP or Project) (FERC Project No. 2079). The report narrative, figures, tables and appendices are provided electronically on the enclosed CD. In addition, 11x17 color hard copies of the maps referenced in the text are provided for reference. These maps are considered Non-Internet Public (NIP) and should not be posted on the Internet.

PCWA's intent in distributing the draft Project Description is to provide stakeholders with the opportunity to better understand the Project facilities and PCWA's operation and maintenance activities early in the relicensing process, and to comment on the content of the material presented in the report. PCWA encourages all stakeholders to identify any additional information that should be included in the Project Description, or any clarifications that might be needed. A final version of the Project Description, incorporating stakeholder comments, will be provided as Section 5.0 of the Pre-Application Document (PAD), which will be filed with FERC and distributed to the stakeholders in late 2007.

The text of the report has been provided to you in Word format so that you may provide your comments as single-text edits, which would be greatly appreciated. Electronic files are currently saved in the following example format: 5.0_Project Description_Narrative_V1_Jun 06.doc. The electronic version of the document with your comments should use the same save name with your initials and/or affiliation added, for example: 5.0_Project Description_Narrative_V1_Jun 06_PCWA_MT.doc. Remember to show your edits in track changes.

If you choose to provide your comments in another format (e.g. e-mail correspondence or letter), please be clear to differentiate general comments from specific comments or recommendations on individual reports. Comments of a technical nature should include the basis for the comment and any appropriate citations to scientific literature. When providing comments or recommendations, please identify specific sections, pages or line (s). This will help PCWA to more effectively address your comments.

PCWA would like to obtain your feedback on the Project Description within 60-days, or by August 21, 2006. Please e-mail electronic comments Relicensing@pcwa.net. You may also provide comments to Mal Toy, Director of Resource Development, at the following address:

Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604

We appreciate your participation in this project and look forward to receiving your feedback. Please call me at (530) 823-4889 if you have any questions.

Sincerely,

Mal Toy

Mal Toy
Director of Resource Development

Attachment

The text of the Draft Project Description and all associated tables, figures and appendices are provided on the enclosed CD. Text and tables are provided in their original Microsoft Word or Excel formats. Figures are provided electronically in Adobe Portable Document Format (PDF).

Note that several of the figures discussed in the Draft Project Description show the location of Project facilities with respect to roads and other landmarks. These figures are considered Non-Internet Public (NIP) and should not be posted on the Internet. Color paper copies of these NIP figures are enclosed in this distribution for reference, as follows:

Figure 5-1. Principal Project Facilities

Figure 5-3a. Duncan Creek, French Meadows Area

Figure 5-3b. Hell Hole, Long Canyon Area

Figure 5-3c. Interbay Area

Figure 5-3d. Ralston, Oxbow Area

Placer County Water Agency
Middle Fork American River Hydroelectric Project
(FERC No. 2079)

DRAFT

PROJECT DESCRIPTION

Prepared for:

Placer County Water Agency
144 Ferguson Road
Auburn, CA 95604

June 2006

FOREWARD

This report entitled *Draft Project Description* is one of several reports which are being prepared to support the Stakeholder Collaborative process for relicensing Placer County Water Agency's (PCWA) Middle Fork American River Hydroelectric Project (MFP). Other reports include summaries of existing environmental conditions within and in the vicinity of the MFP. This report includes detailed information on MFP facilities and operations and maintenance practices. In addition, it summarizes the requirements of the Federal Energy Regulatory Commission (FERC) license, other regulatory approvals and agreements under which the MFP operates. Changes to the MFP that may be incorporated into a proposed new license are also described.

The information in this report will be used by PCWA during preparation of the Pre-Application Document (PAD). The PAD will be submitted in late 2007 to the FERC to initiate the regulatory process for relicensing the MFP. It will also be used to develop Draft Technical Study Plans by a collaborative of resource agencies, tribes, non-governmental organizations and the public. The Draft Technical Study Plans will also be included in the PAD submitted to the FERC.

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[Please note: Since the Project Description will be included as Chapter 5.0 in the Pre-Application Document it has been labeled as Chapter 5, not Chapter 1 in this report.]

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ACRONYMS AND ABBREVIATIONS

ac-ft	acre-feet
CAISO	California Independent System Operator
CDFG	California Department of Fish and Game
cfs	cubic feet per second
CSWRB	California State Water Rights Board
FERC	Federal Energy Regulatory Commission
GWHr	gigawatt-hour
kV	kilovolt
MFP	Middle Fork American River Hydroelectric Project
msl	mean sea level
MW	Megawatts
PAOT	persons at one time
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric Company
PMF	Probable Maximum Flood
Project	Middle Fork American River Hydroelectric Project
rpm	revolutions per minute
RV	recreational vehicle
SCADA	supervisory control and data acquisition
SWRCB	State Water Resources Control Board
TAF	thousand acre feet
USBR	United States Bureau of Reclamation
USDA-FS	United States Forest Service
USDOT	United States Department of Transportation
USGS	United States Geological Survey

5.0 PROJECT DESCRIPTON

The following provides a general overview of the Middle Fork American River Hydroelectric Project (MFP or Project). Included is a brief description of principal Project facilities, support facilities, Project operation and Project recreation facilities. A detailed description of each component is provided following the General Overview.

5.1 GENERAL OVERVIEW

The MFP is owned and operated by the Placer County Water Agency (PCWA) and is a multi-purpose water supply and hydroelectric generation project designed to control and conserve waters of the Middle Fork American River, Duncan Creek, Rubicon River, Long Canyon Creek, and their respective upstream tributaries. The MFP operates under the Federal Energy Regulatory Commission (FERC) Project No. 2079 license, issued on March 13, 1963 using water made available through permits and license issued by the State Water Resources Control Board. Construction of MFP facilities began in 1963 following issuance of the FERC License and operations began in 1967 upon completion of construction activities. The MFP located in central California within Placer and El Dorado counties, lies in the boundaries of both the Tahoe and Eldorado National Forests.

5.1.1 Existing Project Components

The MFP consists of a series of seven diversions and five powerhouses with a nameplate generating capacity of 223.75 megawatts (MW). Water from the diversions is controlled and conveyed through seven tunnels. At the end of the system, water is released to the Middle Fork American River approximately 29 miles upstream of Folsom Reservoir.

The MFP includes two large dams and principal water storage reservoirs, French Meadows and Hell Hole (combined gross storage of 342,583 acre-feet (ac-ft)); two medium dams and reservoirs, Middle Fork Interbay and Ralston Afterbay (combined storage of 2,959 ac-ft); and three small dams and diversion pools, Duncan Creek, North Fork Long Canyon and South Fork Long Canyon. These Project features are shown geographically on Figure 5-1 and schematically on Figure 5-2. The Project facilities are located at elevations ranging from approximately 5,200 feet to approximately 1,100 feet. An elevation profile of the Project facilities is shown on Figure 5-3. The following briefly describes the existing Project components starting at the upper portion of the Project. A complete description of each Project facility is provided in Section 5.2.

The headwaters of the Middle Fork American River and its tributaries flow into the French Meadows Reservoir which is impounded by French Meadows Dam (also referred to as LL Anderson Dam). The Duncan Creek Diversion also routes water from Duncan Creek into French Meadows Reservoir via the 1.5 mile-long Duncan Creek - Middle Fork Tunnel. Water stored in French Meadows Reservoir is conveyed to the Hell Hole Reservoir via the 2.6 mile-long French Meadows - Hell Hole Tunnel. Hell Hole Dam impounds water flowing from the upper reaches of the Rubicon River drainage into Hell Hole Reservoir.

Water transported from French Meadows Reservoir to Hell Hole Reservoir via French Meadows – Hell Hole Tunnel, passes through the French Meadows Powerhouse, located on the north shore of Hell Hole Reservoir approximately 1.5 miles east of the Hell Hole Dam. French Meadows Powerhouse has a nameplate generating capacity of 15.3 MW from a single generation unit. The Hell Hole Powerhouse, located at the base of Hell Hole Dam, generates electricity from stream maintenance flow releases into the Rubicon River, and has a nameplate generating capacity of 0.725 MW from a single generator.

Water stored in Hell Hole Reservoir is transported through the 10.4-mile-long Hell Hole – Middle Fork Tunnel to the Middle Fork Powerhouse. Water in the Hell Hole - Middle Fork Tunnel is augmented by diversions from the North and South Forks of Long Canyon creeks. The Middle Fork Powerhouse has a nameplate generating capacity of 122.4 MW from two generating units. The Middle Fork Powerhouse releases water to Middle Fork Interbay, impounded by Interbay Dam, on the Middle Fork American River. Middle Fork Interbay acts as an afterbay for the Middle Fork Powerhouse and as a forebay for the inlet to the Middle Fork - Ralston Tunnel.

The 6.7 mile-long, Middle Fork - Ralston Tunnel supplies water to a single generating unit at the Ralston Powerhouse. The powerhouse has a nameplate electrical generating capacity of 79.2 MW and discharges to the Ralston Afterbay. The Ralston Afterbay Dam forms Ralston Afterbay located on the Middle Fork American River just downstream of the confluence of the Rubicon River and the Middle Fork American River.

The Ralston Afterbay supplies water to the 403 foot-long Ralston - Oxbow Tunnel and Oxbow Powerhouse at the downstream end of the tunnel. The Oxbow Powerhouse has a nameplate electrical generating capacity of 6.1 MW from a single generator. Water from the Oxbow Powerhouse is discharged to the Middle Fork American River approximately 29 miles upstream of Folsom Reservoir.

5.1.2 Support Facilities

While the diversions, large and medium reservoirs, diversion pools, tunnels, and powerhouses are the existing major Project components; there are a number of support facilities, which are necessary for Project operation.

The electrical output of the powerhouses (except Hell Hole Powerhouse) is converted from generator voltage to either 230 kilovolts (kV) or 60 kV transmission voltage by step-up transformers located at the powerhouses. The powerhouses are interconnected to Pacific Gas & Electric's (PG&E's) transmission system. The PG&E transmission interconnection and transmission system is not a part of the MFP.

Electrical output from the Hell Hole Powerhouse is stepped up and transmitted at distribution voltage via a Project powerline (a component of the MFP) to the French Meadows Switchyard, where it is increased to transmission voltage and delivered with the output of the French Meadows Powerhouse to the PG&E transmission system.

A number of roads were constructed as part of the MFP to provide access to MFP facilities. PCWA maintains all Project roads associated with the on-going operation and maintenance of the Project. PCWA also constructed and maintains a dormitory, personnel housing, and a maintenance yard near Hell Hole Dam.

PCWA, in coordination with the United States Geological Survey (USGS) installed and operates a number of stream flow gages in the vicinity of the Project. These gages monitor flows in the streams and rivers and water levels at MFP reservoirs and diversions.

5.1.3 Project Operations

The Project is operated to meet four objectives: maintenance of water flows to protect environmental resources, water supply for PCWA customers, generation of electrical energy, and recreation opportunities. In addition to the FERC License, operation of the Project is also governed by water rights permits, water supply contracts, and a Power Purchase Contract with PG&E. Water flows to protect and maintain environmental resources are defined in the FERC License and the State of California water rights permits.

The license conditions, water rights permits, and water supply contracts limit how PCWA plans for water use and how PG&E optimizes annual and seasonal electrical generation. Management of flows is also limited by water availability. In late fall and early winter the water levels in French Meadows and Hell Hole reservoirs are reduced to provide storage for spring runoff. The fall/winter drawdown must balance the objectives of providing sufficient storage space to minimize the potential for spilling the reservoirs if the following spring is wet, but must also retain sufficient water in storage to ensure an adequate water supply to meet environmental and consumptive demands if the following spring is dry. During spring runoff, operating flows are adjusted to store as much runoff as possible without spilling. After the reservoirs have reached their maximum capacity in late spring or summer, flows are regulated to first meet environmental flow requirements, then to meet consumptive water supply requirements, and then to optimize power generation. Operation of the system varies from year-to-year based on the winter snow pack and amount of precipitation.

Under typical operating conditions the Project generates approximately 1 million MW hours annually. Operations patterns for the Project may include full load operations (typically when runoff is high), “peaking” operations (when the Project is operated 15 to 18 hours a day to conserve water but help meet peak electrical demand), to low flow operations to conserve water for consumptive use or during Project maintenance periods.

5.1.4 Project Recreation Facilities

The Project recreation facilities are identified in the “Middle Fork American River: Project: Revised Recreation Plan”, 1989, and the FERC Order approving the “Revised Recreation Plan for the Middle Fork American River Project” issued April 27, 1992. These facilities are found at French Meadows Reservoir, Hell Hole Reservoir, Ralston

Afterbay, and along South Fork Long Canyon Creek. The largest concentration of Project recreation facilities are clustered around French Meadows Reservoir which includes six campgrounds, two picnic areas, and two boat ramps. The Project recreation facilities at Hell Hole Reservoir include two single-unit campgrounds, one boat ramp and one scenic vista. The Ralston Afterbay includes one picnic area with a small boat ramp used primarily for fishing access. Two campgrounds are located in the Long Canyon Area.

5.2 EXISTING PROJECT COMPONENTS

The existing Project components include dams and diversions, large and medium reservoirs, water conveyance systems, powerhouses, gaging stations, communication and power lines, roads and trails, and recreation facilities. These Project features are shown geographically on Figures 5-3a through 5-3d. A summary of Project facilities and features is provided in Table 5-1. A summary of the physical dimensions and hydraulic capacities of the Project facilities is provided in Table 5-2.

The existing Project components are described in the following sections.

5.2.1 Large Dams and Reservoirs

The Project includes two large dams and storage reservoirs that have a combined gross storage of 342,583 ac-ft. These are described as follows:

- French Meadows Dam and French Meadows Reservoir

  French Meadows Dam (also referred to as LL Anderson Dam) is a 231 foot-high, 2,700 foot-long rock and gravel filled structure with a crest elevation of 5,273 feet above mean sea level (msl). The French Meadows Dam impounds the Middle Fork American River forming the French Meadows Reservoir that provides 134,993 ac-ft of gross storage. The reservoir whose main purpose is water storage has an active storage capacity of 127,358 ac-ft at a water surface elevation of 5,262 feet msl. The dam has an approximately 690 foot-long controlled spillway including two 20 foot-wide radial gates. The spillway discharges into a channel that joins the Middle Fork American River approximately 1,000 feet downstream of the dam. The spillway has a maximum capacity of 19,800 cubic feet per second (cfs).

  The dam is equipped with outlet structures consisting of one 8 inch diameter pipe for stream maintenance and a second 72 inch pipe with slide gate and 60 inch Ring-jet valve for low level discharge. The pipe and 8 inch Howell-Bunger valve for stream maintenance provides for continuous flows in the Middle Fork American River below the dam of at least 4–8 cfs depending on season and water-year type, and has an estimated maximum discharge capacity of 10 cfs. The 72 inch diameter pipe for low level discharge has a maximum release capacity of 1,337 cfs at full reservoir.

- Hell Hole Dam and Hell Hole Reservoir

  The Hell Hole Dam is a 410 foot-high, 1,570 foot-long rock fill structure with a crest elevation of 4,650 feet msl. The dam impounds the Rubicon River and Five Lakes Creek to form Hell Hole Reservoir. The reservoir, whose primary purpose is water storage, has 207,590 ac-ft of gross storage and an active storage capacity of 205,057 ac-ft at a water surface elevation of 4,630 feet msl. The dam includes a 350 foot-wide uncontrolled spillway with a maximum capacity of 85,500 cfs. An outlet tunnel with control and energy dissipating valves (outlet works) and a weir for measurement of dam leakage are located adjacent to the downstream face of the dam. The outlet works consist of a 16 inch diameter pipe and 12 inch hollow-cone valve for stream maintenance, a 48 inch diameter pipe and 48 inch hollow-cone valve for low level discharge, and a 20 inch diameter pipe that supplies water to Hell Hole Powerhouse. Continuous flows ranging from 4–20 cfs, depending on water year type, are released from the dam downstream into the Rubicon River through the 16 inch diameter pipe. The 48 inch diameter discharge pipe has a maximum discharge capacity of 852 cfs at full reservoir. The 20 inch diameter pipe that supplies water to Hell Hole Powerhouse has a capacity of 30 cfs at full reservoir.

5.2.2 Medium Dams and Reservoirs

The Project includes two medium dams and reservoirs, which have a combined gross storage of about 2,959 ac-ft. The purpose of these dams and reservoirs is re-regulation of flows during Project operations. They are described as follows:

- Interbay Dam and Middle Fork Interbay

  Interbay Dam is a 70.5 foot-high, 233 foot-long concrete gravity structure with a crest elevation of 2,535.5 feet msl. The dam impounds the Middle Fork American River forming Middle Fork Interbay, a reservoir that diverts water into the Middle Fork-Ralston Tunnel. The reservoir has a maximum operating surface area of about seven acres and contains 175 ac-ft of gross storage and an active storage capacity of 173 ac-ft at an elevation of 2,529 msl. The dam includes a 140 foot-wide controlled spillway 80 feet of which is controlled by four 20 foot-wide radial gates. The spillway has a spill capacity of 38,500 cfs. The outlet works consists of a 60 inch diameter pipe with a slide gate and a 20 inch outlet pipe with two 12 inch plug valves and one 20 inch slide gate for release of stream maintenance flows. The sluice pipe has a maximum capacity of 890 cfs at full reservoir and the stream maintenance pipe has a capacity of 23 cfs. Stream maintenance releases up to 12–23 cfs are made from the 20 inch outlet pipe into the Middle Fork American River depending on time of year and water year type.

- Ralston Afterbay Dam and Ralston Afterbay

  Ralston Afterbay Dam is an 89 foot-high, 560 foot-long concrete gravity structure with a crest elevation of 1,189 feet msl. The dam is located near the confluence of the Middle Fork American River and the Rubicon River. The dam impounds the

Middle Fork American River and forms the Ralston Afterbay, a reservoir with 2,782 ac-ft gross storage capacity at a water surface elevation of 1,179 feet msl. It diverts water into the Middle Fork - Ralston Tunnel and re-regulates flows at the lower end of the MFP. The dam has a controlled spillway with a spill capacity of 171,200 cfs. The spillway includes five 40 foot-wide radial spillway gates. The dam also includes a 20 inch pipe with a 20 inch slide gate and 20 inch ring-jet valve for release of stream maintenance flows and a 72 inch diameter pipe with 72 inch slide gate for sluicing. The sluice pipe has a maximum capacity of 1,132 cfs and the stream maintenance pipe has a maximum capacity of 155 cfs at full reservoir. Flows can be released from the Ralston Afterbay Dam to the Middle Fork American River downstream of the dam to maintain a minimum flow of 75 cfs below the confluence of the Middle Fork and North Fork American rivers.

5.2.3 Small Dams and Diversion Pools

The Project includes three small dams and associated diversion pools. Their purpose is to divert water to the MFP and are described as follows:

- Duncan Creek Diversion Dam and Duncan Creek Diversion Pool

  The Duncan Creek Diversion Dam is a 32 foot-high, 132 foot-long, concrete gravity structure with a crest elevation of 5,275 feet msl. The dam impounds Duncan Creek and forms the Duncan Creek Diversion Pool, which has approximately 20 ac-ft of gross storage. The dam includes a 10 inch outlet pipe with 10 inch angle valve for stream maintenance flows and a release capacity of up to 8 cfs. The dam also includes a 60 inch diameter pipe for sluicing with 60 inch sluice gate. When in operation, stream maintenance flows of 4-8 cfs or natural flows, whichever is lesser, are released below the diversion dam to Duncan Creek.

- North Fork Long Canyon Diversion Dam and Diversion Pool

  The North Fork Long Canyon Diversion Dam is a 10 foot-high, 95 foot-wide concrete gravity structure with a crest elevation of 4,716 feet msl. The dam impounds North Fork Long Canyon Creek and forms a small diversion pool with less than one ac-ft of storage. The width of the dam crest acts as an uncontrolled spillway with a 3,000 cfs discharge capacity. The dam acts as a diversion structure by routing water through a slide gate and into a pipe (vertical drop inlet) that joins the Hell Hole – Middle Fork Tunnel. The pipe and shaft have a nominal maximum capacity of 100 cfs. The diversion dam includes a 12 inch diameter pipe with a 12 inch slide gate to provide stream maintenance flow. When the diversion is operating, flows below the diversion dam are maintained at 2 cfs or natural flows, whichever is lesser.

- South Fork Long Canyon Diversion Dam and Diversion Pool

  The South Fork Long Canyon Dam is a 10 foot-high, 120 foot-long concrete gravity structure with a crest elevation of 4,650 feet msl. The dam impounds South Fork Long Canyon Creek and forms a diversion pool with less than 1 ac-ft of storage. The

dam includes a 95 foot-wide uncontrolled spillway which has a 4,000 cfs flow capacity. The dam acts as a diversion structure by routing water through a slide gate and into a pipe (vertical drop inlet) with 100 cfs nominal maximum capacity that joins the Hell Hole – Middle Fork Tunnel. The diversion includes a 12 inch diameter pipe with 12 inch slide gate to provide stream maintenance flows. When the diversion is operating, flows below the diversion dam are maintained at 2.5–5 cfs (depending on time of year and water year type) or natural flows, whichever is lesser.

5.2.4 Water Conveyance Systems

The Project includes seven water conveyance systems to transport water between diversions, reservoirs, and powerhouses. The water conveyance systems include features such as intake structures, tunnels, pipes, surge chambers, adits, roll-out sections, gatehouses, butterfly valve houses, and penstocks. These water conveyance systems are described as follows:

- Duncan Creek - Middle Fork Tunnel

  Water is routed from the Duncan Creek Diversion to French Meadows Reservoir via the Duncan Creek - Middle Fork Tunnel. This tunnel is approximately 9 feet wide by 10 feet high and 7,864 feet long (approximately 1.5 miles). The tunnel is lined with concrete along 300 feet of its length; the remainder is unlined.

  The nominal flow capacity of the tunnel is 400 cfs. Water is diverted into the tunnel at the Duncan Creek Diversion Dam into an intake structure located adjacent to the south abutment of the dam. A trashrack is fitted over the tunnel intake structure to prevent debris from entering the tunnel. The tunnel ends as an open portal and water is discharged from the tunnel directly into French Meadows Reservoir.

- French Meadows - Hell Hole Tunnel

  The French Meadows-Hell Hole Tunnel is used to route water from French Meadows Reservoir to the French Meadows Powerhouse and Hell Hole Reservoir. The tunnel has an approximately 12.4 feet wide horseshoe shape, is 13,694 feet long (approximately 2.6 miles), and is lined with concrete along 1,617 feet of its length. The remainder of the tunnel is unlined. Water enters the tunnel through an inlet structure located in French Meadows Reservoir approximately 1000 feet from the southern shoreline. The flow of water entering the tunnel is controlled by a slide gate at the French Meadows - Hell Hole Gatehouse and Shaft. The nominal flow capacity of the tunnel is 400 cfs.

  The tunnel terminates at the French Meadows Powerhouse Penstock and Butterfly Valve House. The Butterfly Valve House and entrance to the penstock are located at an elevation approximately 384 feet above the French Meadows Powerhouse along the north shore of Hell Hole Reservoir. At the valve house water flows into a 6.25 feet diameter, 691 foot-long penstock which leads to the powerhouse turbines. After flowing through the turbine, water is discharged to Hell Hole Reservoir.

- Hell Hole - Middle Fork Tunnel

  The Hell Hole - Middle Fork Tunnel is used to route water from Hell Hole Reservoir to the Middle Fork Powerhouse. The tunnel has an approximately 13.5 feet wide horseshoe cross-sectional shape, and is 55,006 feet long (approximately 10.4 miles). It is lined with concrete along 6,780 feet of its length, is steel lined along 5,180 feet of its length, and is unlined for the remainder of its length. Water enters the tunnel through an inlet structure, approximately 400 feet offshore. Water flow is controlled by the Hell Hole - Middle Fork Gatehouse and Shaft, located on the north shore of Hell Hole Reservoir approximately 0.5 miles from the dam. The nominal flow capacity of the tunnel is 925 cfs.

  Intersecting this tunnel are drop inlets (vertical shafts) from the North Fork and South Fork Long Canyon Creek diversions. The tunnel also includes the Hell Hole - Middle Fork Tunnel Surge Shaft and Tank, which is a surge shaft and adit located approximately 1,800 feet from the tunnel outlet. The 10 foot diameter surge shaft and 60 foot diameter above ground tank provides necessary tunnel surge capacity during powerhouse operations. At a point along its route approximately 32,400 feet from the inlet, the tunnel comes to the surface and crosses North Fork Long Canyon Creek. This crossing includes a rollout removable pipe section, the North Fork Long Canyon Crossing/Removable Section, to allow entry into the tunnel for inspection and maintenance.

  The tunnel terminates at the Middle Fork Powerhouse Penstock and Butterfly Valve House. The Butterfly Valve House and entrance to the penstock are located at an elevation approximately 1,483 feet above the Middle Fork Powerhouse. From the valve house water flows to the powerhouse through a 3,653 foot long penstock which ranges from 9.5 to 7 feet in diameter.

- North Fork Diversion Pipe/Shaft

  Piping and a drop inlet shaft are used to convey water from the North Fork Long Canyon Creek Diversion to the Hell Hole - Middle Fork Tunnel. At the North Fork Long Canyon Creek Diversion water is diverted into a 36 inch diameter buried steel pipe that is 3,530 feet in length. Water then enters a 403 foot deep 6 feet in diameter drop inlet shaft. At the surface, the drop inlet has a 20 foot high vent pipe to provide inlet air to the shaft. The piping and shaft have a nominal maximum flow capacity of 100 cfs.

- South Fork Diversion Pipe/Shaft

  A 50 foot-long, 42 inch diameter buried pipe and a vertical drop shaft is used to convey water from the South Fork Long Canyon Creek Diversion to the Hell Hole - Middle Fork Tunnel. At the South Fork Long Canyon Creek Diversion water is diverted into a drop inlet shaft that is 6 feet in diameter and 387 feet deep. At the surface, the drop inlet has a 6 foot high vent pipe to provide air to the shaft. The shaft has a nominal flow capacity of 100 cfs.

- Middle Fork - Ralston Tunnel

  The Middle Fork - Ralston Tunnel is used to route water from the Middle Fork Interbay to Ralston Powerhouse. The tunnel has a 13.5 feet wide horseshoe shape, is 35,397 feet long (approximately 6.7 miles in length), is lined with concrete along 8,245 feet of its length, and lined with steel along 245 feet of its length. Water enters the tunnel through the Middle Fork - Ralston Tunnel Intake Gatehouse located in the Middle Fork Interbay near the Interbay Dam. The nominal flow capacity of the tunnel is 836 cfs.

  The tunnel terminates at the Ralston Powerhouse Butterfly Valve House located approximately 1,105 feet elevation above the Ralston Powerhouse. From the butterfly valve house water flows to the powerhouse through the 1,670 foot-long Ralston Powerhouse Penstock which ranges from 8 to 9.5 feet in diameter. Water is discharged from the powerhouse into the Ralston Afterbay.

  At a point approximately 500 feet from the tunnel portal is the Middle Fork - Ralston Tunnel Surge Shaft and Tank which consists of a 10 foot diameter surge shaft and 60 foot diameter above ground tank that provides necessary surge capacity during powerhouse operations.

- Brushy Canyon Adit

  Brushy Canyon Adit is a construction adit located on the Middle Fork – Ralston Tunnel. A portion of the access road and the entrance to the adit is currently covered by a landslide and is not accessible.

- Ralston - Oxbow Tunnel

  The Ralston - Oxbow Tunnel is used to route water from Ralston Afterbay to the Oxbow Powerhouse. The tunnel has a 13.3 foot wide horseshoe shape, is 403 feet long (approximately 0.1 miles), is lined with concrete along 343 feet, and is lined with steel along the remaining 60 feet of its length. It has a nominal flow capacity of 1,088 cfs. Water from the Ralston Afterbay enters the Ralston – Oxbow Tunnel Intake Gatehouse located approximately 0.15 miles from the north end of the Ralston Afterbay Dam. Water is supplied to a 9 feet diameter penstock that is located approximately 38 feet below the inlet to the Ralston - Oxbow Tunnel.

5.2.5 Powerhouses

The Project includes five powerhouses with a total combined nameplate operating capacity of 223.7 MW, as follows:

- French Meadows Powerhouse and Switchyard

  The French Meadows Powerhouse contains a single Francis type turbine connected to an electrical generator with an installed generating capacity of 15.3 MW. Water for the powerhouse is delivered from French Meadows Reservoir via the French Meadows - Hell Hole Tunnel. Electricity generated at the powerhouse is increased to 60,000 kV at a transformer/switchyard adjacent to the powerhouse. This switchyard is interconnected directly to PG&E's transmission system.

- Hell Hole Powerhouse and Hell Hole Substation

  The Hell Hole Powerhouse contains a single Francis type turbine connected to an electrical generator with an installed generating capacity of 0.725 MW. Water to the powerhouse is delivered via a 20 inch diameter pipe at Hell Hole Dam that serves as the turbine penstock. Electricity generated at this powerhouse is transported on a Project powerline to the Hell Hole Substation located nearby.

- Middle Fork Powerhouse and Switchyards

  The Middle Fork Powerhouse (also know as the Stevenson Powerhouse) contains two Pelton type waterwheels, each connected to a 61.2 MW electrical generator with an installed generating capacity of 122.4 MW. Water for the powerhouse is delivered from Hell Hole Reservoir via the Hell Hole - Middle Fork Tunnel. Water from the powerhouse is discharged to Middle Fork Interbay. Electricity generated at the powerhouse is increased to 60,000 kV at a transformer/switchyard adjacent to the powerhouse. The first switchyard is interconnected to second switchyard located nearby. The interconnection to PG&E's transmission system occurs at the second switchyard.

- Ralston Powerhouse and Switchyard

  The Ralston Powerhouse contains a single Pelton type waterwheel connected to an electrical generator with an installed generating capacity of 79.2 MW. Water for the powerhouse is delivered from the Middle Fork Interbay via the Middle Fork - Ralston Tunnel. Water from the powerhouse generating units discharge directly to the Ralston Afterbay. Electricity generated at the powerhouse is increased to 60,000 kV at a transformer/switchyard adjacent to the powerhouse. This switchyard is interconnected directly to PG&E's transmission system.

- Oxbow Powerhouse and Switchyard

  The Oxbow Powerhouse contains a single Francis type turbine coupled to an electrical generator with an installed generating capacity of 6.1 MW. Water is supplied to the powerhouse turbine through a 5 foot long, 9 foot diameter penstock that is located approximately 38 feet below the inlet to the Ralston - Oxbow Tunnel. Water passing through the Oxbow Powerhouse is discharged to a channel that joins the mainstem of the Middle Fork American River just upstream of the confluence with the North Fork of the Middle Fork American River. Electricity generated at the Powerhouse is increased to 60 kV at a switchyard adjacent to the powerhouse.

5.2.6 Project Stream Gages

PCWA currently maintains a network of stream and reservoir gaging stations in the Project vicinity to monitor and record water flow and storage. This network consists of fifteen stations that measure flow in rivers and creeks, two stations that measure reservoir elevation and storage, and six that measure leakage from weirs. Refer to Table 5-1 for a list of Project gaging stations and weirs. The location of the gaging stations are depicted on Figures 5-3a through 5-3d.

5.2.7 Project Communication and Powerlines

The Project has a total of ten Project lines including eight communication lines and nine powerlines. Communication and powerlines are located on the same poles at seven locations. Each communication and powerline is described below.

- French Meadows Powerhouse and Switchyard to French Meadows Butterfly Valve House Communication Line and Powerline: An approximately 0.8-mile-long communication line and 4.16 kV powerline from the French Meadows Powerhouse and Switchyard to the Microwave/Radio Repeater Station near the Middle Fork Surge Shaft.

- French Meadows Powerhouse and Switchyard to Hell Hole - Middle Fork Tunnel Gatehouse and Shaft to Dormitory Facility and Operator Cottages and Shop to Hell Hole Powerhouse Communication Line and Powerline: An approximately 2-mile-long communication line and 12 kV powerline from the French Meadows Powerhouse to the Hell Hole-Middle Fork Tunnel Gatehouse and Shaft, the Hell Hole Dormitory Facility and Operator Cottages and Shop, and then to Hell Hole Powerhouse.

- Hell Hole Powerhouse to Hell Hole Substation Powerline: A 12 kV powerline (less than 0.1 mile or 530 feet, in length) from the Hell Hole Powerhouse to the Hell Hole Substation.

- Middle Fork Powerhouse to Penstock Butterfly Valve House and Microwave/Radio Repeater Station Communication Line and Powerline: An approximately 0.6-mile-long, 4.16 kV powerline and communication line from Middle Fork Powerhouse to Middle Fork Powerhouse Penstock Butterfly Valve House and Microwave Repeater Station.

- Middle Fork Powerhouse to Middle Fork American River above Middle Fork Powerhouse near Foresthill Gage Powerline: An approximately 0.17-mile-long and 230 kV powerline from Middle Fork Powerhouse to a stream gaging station (Gage No. 11427760).

- Interbay Dam to Middle Fork Powerhouse Communication Line and Powerline: An approximately 0.4-mile-long communication line and 4.16 kV powerline connecting Interbay Dam to Middle Fork Powerhouse.

- Ralston Powerhouse to Penstock Butterfly Valve House Communication Line and Powerline: An approximately 0.33-mile-long communication line and 2.16 kV powerline from Ralston Powerhouse to Ralston Powerhouse Penstock and Butterfly Valve House.

- Middle Fork – Ralston Tunnel Surge Shaft, Tank and Storage Building to Ralston Powerhouse Penstock Butterfly Valve House Power and Communication Line; An approximately 0.1-mike-long power and communication line. This line is no longer used, however, the infrastructure (poles and conductors/wires) have not been removed.

- Ralston - Oxbow Intake Gatehouse to Ralston Powerhouse Communication Line: An approximately 1.5-mile-long communication line from Oxbow Intake Gatehouse to Ralston Powerhouse.

- Ralston Afterbay Dam to Oxbow Intake Gatehouse Communication Line and Powerline: An approximately 0.15-mile-long communication line and 2.16 kV powerline from Ralston Afterbay Dam to the Oxbow Intake Gatehouse.

- Oxbow Powerhouse to Ralston Afterbay Dam Communication Line and Powerline: An approximately 0.2-mile-long communication line and 2.16 kV powerline from Oxbow Powerhouse to Ralston Afterbay Dam.

5.2.8 Project Support Facilities

Project support facilities consist of the Hell Hole Dormitory Facility, Operator Cottages and Shop, microwave reflectors and radio towers, fuel tanks, and Ralston Afterbay Boat Ramp. Each of these support facilities is described below.

- Hell Hole Dormitory Facility and Operator Cottages and Shop

  The Hell Hole Dormitory Facility and the Operator Cottages and Shop near Hell Hole Dam provides housing for station attendants, as well as meeting facilities and temporary lodging for Project employees and associates. The dormitory consists of a 12-room, 24-bed building, which has kitchen, dining, and meeting areas. The operator housing consists of two cottage houses and a maintenance shop.

- Microwave Reflectors and Radio Towers

  Two passive microwave reflector stations and two radio towers with a repeater are maintained for communications purposes in the Project vicinity. The passive microwave reflector stations are located near Ralston Afterbay and Middle Fork - Interbay. The radio tower and repeater is located near the Middle Fork – Ralston Surge Tunnel Surge Shaft and Tank, and a second radio tower is located in Foresthill.

- Fuel Tanks

  Five propane, one diesel, and one gasoline tank are maintained as ancillary fuel storage to support MFP operations and maintenance activities.

- Ralston Afterbay Boat Ramp

  A boat ramp is maintained at the end of a short access road adjacent to the Ralston Afterbay Dam. The boat ramp provides a boat launching facility for PCWA personnel. The access road includes a lock gate prohibiting public use.

5.2.9 Project Roads and Trails

Twenty-three roads are used for Project operation and maintenance and five Project trails are used to access Project facilities. The following is a description of each Project road and trail by geographic area. A list of Project roads and trails is provided in Table 5-1.

5.2.9.1 Duncan Creek and French Meadows Area

- Duncan Creek Diversion Road: An approximately 1.9-mile-long, 16-foot wide single-lane gravel road from FR 96 (Mosquito Ridge Road) to the Duncan Creek Diversion.

- Duncan Creek Diversion Lower Gage Access Trail: An approximately 0.1-mile-long trail from the Duncan Creek Diversion Road to Duncan Canyon Creek below the Diversion Dam near French Meadows Gage (Gage No. 11427750).

- Duncan Creek Diversion Access Trail: An approximately 0.15-mile-long, unimproved trail from Duncan Creek Diversion Road near the upstream gage to the Duncan Creek Diversion Dam.

- Duncan Creek Diversion Upper Gage Access Trail: An approximately 0.05-mile-long trail from the Duncan Creek Diversion Road to the Duncan Canyon Creek near the French Meadows Gage and Weir (Gage No. 14427700).

- French Meadows - Hell Hole Tunnel Gatehouse Road: An approximately 0.25-mile-long single-lane gravel road from FR 96 (Mosquito Ridge Road) to the French Meadows - Hell Hole Tunnel Gatehouse and Shaft.

- French Meadows Dam Outlet Access Road: An approximately 0.4-mile-long single-lane dirt road from FR 22 to the French Meadows Dam outlet works.

- French Meadows Dam Gage Access Road: An approximately 0.25-mile-long single-lane dirt road from FR 22 to Gage No. 11427500.

- Middle Fork American River at French Meadows Gage and Weir Access Trail: An approximately 0.1-mile-long trail from French Meadows Dam Gage Access Road to the Middle Fork American River at French Meadows Gage and Weir (Gage No. 11427500).

5.2.9.2 Hell Hole Area

- French Meadows - Hell Hole Tunnel Portal Road: An approximately 0.6-mile-long 10-foot-wide single lane gravel road from FR 2 (Long Canyon-Hell Hole Access Road) to the French Meadows Powerhouse/Penstock and power and communication line.

- French Meadows Powerhouse Access Road: An approximately 1-mile-long, 10-foot-wide single-lane gravel road from FR 2 to the French Meadows Powerhouse.

- Hell Hole-Middle Fork Tunnel Inlet Gatehouse Access Road: An approximately 0.2-mile-long single-lane gravel road that provides access to the Hell Hole - Middle Fork Tunnel Inlet Gatehouse.

- Hell Hole Dormitory Access Road: An approximately 0.1-mile-long single-lane gravel road from FR 2 (Long Canyon-Hell Hole Access Road) to the Hell Hole Dormitory Facility and Operator Cottages and Shop.

- Hell Hole Powerhouse/Gage and Weir Access Road: An approximately 0.7-mile-long single-lane gravel road from FR 2 (Long Canyon-Hell Hole Access Road to the Hell Hole Powerhouse, Hell Hole Dam outlet works and Gage No. 11428800.

5.2.9.3 Long Canyon Area

- North Fork Long Canyon Access Road: An approximately 0.4-mile-long single-lane dirt road from FR 23 (Ralston Ridge Road) to North Fork Long Canyon Diversion (south approach).

- Spur Road to North Fork Long Canyon Diversion: An approximately 0.1-mile-long single-lane dirt road from FR 96 (Mosquito Ridge Road) to North Fork Long Canyon Diversion (north approach).

- Spur Road to South Fork Long Canyon Diversion: An approximately 0.1-mile-long single-lane dirt road from FR 2 (Long Canyon-Hell Hole Access Road) to the South Fork Long Canyon Diversion.

5.2.9.4 Interbay Area

- North Fork Long Canyon Access Road: An approximately 0.2 mile-long unpaved road from FR23 (Ralston Ridge Road) to the site of the North Fork Long Canyon Crossing Removable Section.

- Hell Hole – Middle Fork Tunnel Access Road: An approximately 0.05-mile-long gravel road from the Hell Hole – Middle Fork Surge Shaft and Tank to the Radio Tower and Repeater.

- Hell Hole - Middle Fork Tunnel/Butterfly Valve House (FR 14N55) Access Road: An approximately 1-mile-long single-lane gravel road from FR 14N31 (via Ralston Ridge Road) to Hell Hole-Middle Fork Tunnel Portal.

- Middle Fork Powerhouse Penstock Access Road: An approximately 1.6-mile-long single-lane gravel road from the Middle Fork Powerhouse to the Hell Hole - Middle Fork Tunnel Portal.

- Middle Fork Powerhouse Switchyard Access Road: An approximately 0.05 mile long single lane gravel road from the Middle Fork Powerhouse Access Road to the Middle Fork Powerhouse Switchyard.

- Interbay Dam Road: An approximately 4.7-mile-long two-lane paved road from FR 96 (Mosquito Ridge Road) to Interbay Dam.

- Middle Fork Powerhouse Access Road: At approximately 0.6 mile long single lane paved road from Interbay Dam to the Middle Fork Powerhouse.

- Middle Fork American River Gage Access Trail: An Approximately 0.1 mile long trail from the Middle Fork Powerhouse Penstock Access Road to a cable crossing of the Middle Fork American River. The trail includes approximately 40 feet of metal walkway.

5.2.9.5 Ralston and Oxbow Area

- Brushy Canyon Adit Access Road (FR 14N30): An approximately 2.5-mile-long, 12-foot-wide single-lane dirt road from FR 23 (Ralston Ridge Road) to Brushy Canyon Adit (Middle Fork - Ralston Tunnel).

- Middle Fork - Ralston Tunnel Surge Tank Access Road: An approximately 0.4-mile-long single-lane gravel road from FR 23 (Ralston Ridge Road) to the Middle Fork - Ralston Tunnel Surge Tank and Shaft and Tunnel Portal.

- Ralston - Oxbow Tunnel Inlet Access Road: An approximately 0.1-mile-long gravel road from the Oxbow Rafting Access Road to the Oxbow Tunnel Inlet.

- Oxbow Powerhouse Access Road: An approximately 0.1-mile-long gravel road from the Oxbow Rafting Access Road to the Oxbow Powerhouse.

- Ralston Afterbay Boat Ramp Access Road: An approximately 0.05 mile long unpaved single lane road form Ralston Afterbay Dam to the Ralston Afterbay Boat Ramp.

5.2.10 Project Recreation Facilities

The following is a description of Project recreation facilities organized by geographic area. The locations of these recreation facilities are depicted in Figures 5-3a through 5-3d.

5.2.10.1 French Meadows Area

Campgrounds

- French Meadows Campground

  This campground, which is located on the south shore of French Meadows Reservoir, consists of 75 single-unit campsites, a potable water supply, and vault and flush toilets. Each unit can accommodate a maximum of six persons at one time (PAOT) and a maximum number of two vehicles giving the campground a capacity of 450 overnight visitors. The campground facilities are generally open from mid-May until the end of September depending on snow conditions.

  Sites 1–31 are reservable "Family Standard Single" sites. Four reservable sites are accessible and usable by individuals with handicaps, as is one of the toilets. Driveway lengths range from 20 to 52 feet, depending on the campsite.

  Sites 32 through 75 are non-reservable and are available on a first-come, first-served basis. Four of these sites are listed as handicap accessible. The non-reservable driveway spur lengths range from 23 to 45 feet, depending on the campsite.

- Poppy Campground (Boat-in and Trail Campground)

  This campground, located on the north shore of French Meadows Reservoir, is accessible by boat or via a 1.5 mile hiking trail that begins near the McGuire Beach parking area (FS Route 16E10). This primitive campground consists of 12 single-units with no water supply. The campground has vault toilets. The single units can accommodate six PAOT giving the overall campground a capacity of 72 overnight visitors. All sites are available on a first-come first-serve basis. There is no fee for use. Poppy Campground is open year–round but snow limits access to the region from late fall to late spring.

- Lewis Campground

  This campground, which is located on the north shore of French Meadows Reservoir, consists of 40 single-units, potable water supply and vault and flush toilets. The sites are available on a first-come, first-served basis. One site and an adjacent toilet have been designed for accessibility by handicapped individuals. Each single unit can accommodate six PAOT; the campground can accommodate a

total of 240 overnight visitors. Lewis Campground is generally open from mid-May until the end of September depending on snow conditions.

- Coyote Group Campground

  This group campground, which is located on the northeast shore of French Meadows Reservoir, consists of four reservable group campsites with campfire circles, potable water supply, vault toilets and central parking. The campground facilities are closed during the winter months and are generally open from mid-May until the end of September, depending on conditions. The capacity of each group site is as follows:

  Black Bear – capacity 50 persons, maximum vehicles 20

  Little Wolf – capacity 25 persons, maximum vehicles 6

  Brush Wolf – capacity 25 persons, maximum vehicles 6

  Prairie Wolf – capacity 25 persons, maximum vehicles 6

- Gates Group Campground

  This group campground, is located on the northeast shore of the reservoir, and consists of three reservable group campsites with a campfire circle, potable water supply, flush toilets and central parking. The campground facilities are closed during the winter months and are generally open from mid-May until the end of September, depending on snow conditions. The campground can accommodate 125 overnight visitors. The capacity of each group site is as follows:

  Aspen – capacity 25 persons, 1 restroom, maximum vehicles 8

  Lodgepole – capacity 25 persons, 1 restroom, maximum vehicles 8

  Ponderosa – capacity 75 persons, 2 restrooms, maximum vehicles 25

- Ahart Campground

  This campground, which is located on the northeast shore of French Meadows Reservoir, consists of 12 single units with no water supply. The campground has vault toilets. The single units can accommodate six PAOT giving the campground a capacity of 72 overnight visitors. All sites are available year-round on a first-come, first-serve basis depending on snow conditions.

Picnic and Day-Use Areas

- French Meadows Picnic Area

  This day-use picnic area is located on the south shore of French Meadows Reservoir adjacent to the boat ramp. The picnic area consists of seven picnic units with picnic tables and cooking grills that can accommodate five PAOT each. The

picnic area can accommodate a total of 35 visitors. The area has vault toilets and a potable water supply. The unpaved parking lot is 90 by 18 feet. The French Meadows Picnic Area is generally open from mid-May until the end of September depending on snow conditions.

- McGuire Picnic Area

  This day-use picnic area is located on the north shore of French Meadows Reservoir adjacent to the boat ramp. The picnic area consists of 10 units with picnic tables and cooking grills that can accommodate five PAOT each. The picnic area can accommodate a total of 50 visitors. The picnic area includes vault toilets and a potable water supply. The unpaved parking lot for the picnic area is 335 by 67 feet. McGuire Picnic Area is generally open from mid-May until the end of September depending on snow conditions.

Boat Launch Areas

- French Meadows Boat Ramp

  This boat ramp is located on the south shore of French Meadows Reservoir adjacent to the French Meadows Picnic Area. The concrete boat ramp is 775 feet long by 20 feet wide. The length of the boat ramp above water varies, depending on the time of year, from approximately 50 to 500 feet. There are no restrictions on the type of boat that can be used on the reservoir. The unpaved parking lot that serves the boat ramp is 368 feet long by 104 feet wide and includes 46 parking spaces. The French Meadows Boat Ramp is open year-round but access may be limited by snow conditions.

- McGuire Boat Ramp

  This boat ramp is located on the north shore of French Meadows Reservoir adjacent to the McGuire Picnic Area and Beach. The concrete boat ramp is 440 feet long by 20 feet wide. The length of the boat ramp above water varies, depending on the time of year, from approximately 50 to 440 feet. There are no restrictions on the type of boat that can be used on the reservoir. There are 75 parking spaces that serve the boat ramp. McGuire Boat Ramp is open for year-round use, but access may be limited by snow conditions.

5.2.10.2 Hell Hole Area

Campgrounds

- Upper Hell Hole Campground (Boat-in and Trail Campground)

  This campground, which is located on the southeast shore of upper Hell Hole Reservoir, consists of 15 primitive single-unit campsites which can accommodate 6 PAOT each. The campground is accessible by boat or via a 5 mile hiking trail, known as the Hell Hole Trail and can accommodate 90 overnight visitors. The

campground does not have piped drinking water. The campground has vault toilets. None of the sites are reservable or handicap accessible and there is no fee. The campground is generally open between May 15 and September 15, depending on snow conditions.

- Hell Hole Campground

  This campground is located on the northwest shore of Hell Hole Reservoir uphill on a flat ridge. The campground consists of 10 non-reservable single-units, potable water supply, and vault toilets. Each single unit can accommodate six PAOT giving the campground a capacity of 60 overnight visitors. The campground facilities are generally open from May 15 until November 1 depending on snow conditions.

Boat Launch Areas

- Hell Hole Boat Ramp

  This boat ramp is located adjacent to the Hell Hole Dam and is used access the reservoir for fishing and boat access to the Upper Hell Hole Campground. The facilities are open year-round, subject to snow conditions.

  The two-lane concrete boat launch is approximately 24 feet wide by 275 feet long, with a low masonry wall along one side. The area includes a chip-seal parking lot with space for 50 cars, with boat trailers, and two vault toilets. Masonry steps and a walkway connect the parking lot to the roadway.

Scenic Vista

- Hell Hole Vista

  This facility includes vault toilets, one picnic table and parking for approximately eight vehicles. The parking area is unpaved but the United States Department of Agriculture, Forest Service (USDA-FS) has plans to pave the area in 2008. The facility includes a 3 foot-wide hiking trail that leads to an observation point. The hiking trail is not handicap accessible. The vista is generally open from mid-May to the first of November depending on snowfall.

5.2.10.3 Long Canyon Area

Campgrounds

- Big Meadows Campground

  This campground, which is located approximately 1 mile north of Hell Hole Reservoir near South Fork Long Canyon Creek, consists of 54 single-unit family campsites with potable water supply and flush toilets. Each unit can accommodate six PAOT giving the campground a capacity of 324 overnight visitors. The campground facilities are generally open from May 15 until November 1 depending on snowfall.

Of the 54 campsites, 47 have spur lengths of 40 to 50 feet, allowing for tent, trailer, or recreational vehicle (RV) units; 6 sites have spur lengths of 25 to 40 feet, allowing for tent access only. One site is a designated handicap accessible campsite.

- Middle Meadows Group Campground

  This group campground is located approximately 2.25 miles southwest of Big Meadows Campground along the South Fork Long Canyon Creek. The campground is available by reservation only.

  The campground consists of two walk-in units with a total capacity of 75 overnight visitors. Unit 1 has a 50-person capacity and Unit 2 has a 25-person capacity. The site includes potable water supply, vault and flush toilets, picnic tables, group stoves, and group fire rings. None of the sites are accessible by handicapped individuals. The campground is generally open between May 15 and November 1 depending on snowfall.

5.2.10.4 Ralston Area

Picnic Area

- Ralston Afterbay Picnic Area

  This picnic area, which is located on the north shore of Ralston Afterbay, consists of five picnic units with cooking grills and vault toilets. Potable water is available from spigots. Each picnic unit can accommodate five PAOT giving the picnic area a capacity of 25 visitors. The site is generally accessible year-round.

5.3 PROPOSED PROJECT BETTERMENTS

PCWA has identified several potential betterments to the MFP that may be included in the License Application when it is filed in 2011. The purpose of these betterments would be to a) increase water storage or storage reliability; b) increase MFP generation; or c) enhance MFP reliability or reduce MFP maintenance or operations costs.

Between now and the date of filing of the License Application, PCWA will be undertaking engineering, economic, and environmental assessment of the potential betterments. PCWA will work with agency representatives and other stakeholders to ensure that these potential Project betterments are considered during the development of relicensing studies.

Betterments that would change storage or amount of diversion or use would also require appropriate changes to existing MFP water rights permits.

The suite of betterments under consideration by PCWA are described in the following sections.

5.3.1 Duncan Creek Diversion Trashrack Upgrade

5.3.1.1 Purpose

The Duncan Creek Diversion currently includes a trashrack over the tunnel inlet that must be cleaned manually to maintain flows into the Duncan Creek – Middle Fork Tunnel. The trashrack is relatively small and when not clear of debris can limit operation (capacity) of the diversion. The trashrack is particularly subject to debris accumulation, especially in winter and spring high-flow months and during inclement weather when the Duncan Creek Diversion can be difficult to access.

The purpose of upgrading the Duncan Creek Diversion trashrack structure is to reduce the requirement for maintenance such as debris removal especially during periods when access to the diversion is difficult and to maintain the hydraulic capacity of the intake during storms when the intake can become blocked by debris accumulation on the trashracks. The diversion may operate below capacity for extended periods of time as a result of debris accumulation.

The Duncan Creek Diversion diverts flow from Duncan Creek to French Meadows Reservoir and includes a diversion dam, diversion pool and intake structure (see Section 5.2.3 and Table 5-2 for details).

5.3.1.2 Proposed Upgrade

The proposed upgrade would replace the existing single panel trashrack with larger multiple panel trashracks so that sufficient water could enter the intake and the tunnel could operate reliably even with some amount of debris loading on the trashracks.

The tunnel intake structure currently contains a weir over which water passes to enter the French Meadows Tunnel. The crest of weir is at an elevation of 5,260.75 feet, which provides a hydraulic head of 4.25 feet above the weir crest to divert water into the tunnel under minimum flow conditions (reservoir surface at spillway crest). The sloping trashrack is attached to the reservoir side of the weir and extends up to the deck of the intake structure.

Modification of the trashrack structure would involve constructing an extension of the intake structure to support new trashrack panels. The existing weir structure would be removed and replaced. The extension would be the shape of a half octagon with five trashrack panels attached to the new weir around the perimeter. The net trashrack area would be increased by approximately 300%.

The Duncan Creek Diversion would continue to be operated as an uncontrolled diversion. Removal of debris from the trashrack would still be required, but the frequency of trips to the site for debris removal would be reduced.

5.3.2 French Meadows Reservoir Enlargement

5.3.2.1 Purpose

Enlargement of French Meadows Reservoir will provide additional water storage capacity. The additional storage will allow more efficient intra-seasonal shifting of water releases (from spring runoff periods to summer and fall months), and could improve firm water yield and power generation from the MFP during drought conditions.

5.3.2.2 Proposed Upgrade

The proposed upgrade would affect the French Meadows Reservoir, French Meadows Dam Spillway and the Duncan Creek Diversion. A detailed description of the existing facilities can be found in Section 5.2 and on Table 5-2.

The French Meadows Spillway has a capacity of 19,800 cfs under maximum flood stage conditions. This capacity was established during initial design of the MFP in consideration of the Probable Maximum Flood (PMF) that could occur in the watershed as defined by the FERC. In 2001, FERC developed new guidelines for calculation of the PMF. Under FERC's new guidelines, the PMF for French Meadows Reservoir was increased to over 51,000 cfs. As a result, the French Meadows Reservoir Spillway will need to be redesigned and reconstructed for the new theoretical maximum flood volume.

Options being evaluated for spillway reconstruction include widening the spillway, raising the height of the spillway gates (and raising the crest of the dam via an embankment or parapet wall), or a combination of both. Conceptual-level design work and cost estimates indicate that a combination of raising and widening the spillway will be the most cost-effective solution. Depending on refined design criteria, a raise of the spillway gates of about 5 ft, raising the existing parapet wall on the dam crest by about 3 to 4 ft, and widening of the spillway gate structure to 60 to 80 ft will accommodate the increased PMF flow.

The FERC may require that modifications to the French Meadows Reservoir Spillway to accommodate the revised PMF be undertaken prior to 2013. If a redesign that includes a raise of the spillway is constructed, then it would be possible to raise the operating water surface elevation of French Meadows Reservoir by an amount similar to the height of the raise of the spillway gates (3 to 5 ft.). A raise of the operating water surface elevation of approximately 3.5 ft would provide approximately 5,000 AF of additional storage in French Meadows Reservoir. It would also increase the surface area of the reservoir by approximately 11 acres or less than 1 percent at maximum water surface elevation. Raising the operating water surface elevation of French Meadows Reservoir would require approval by FERC.

Raising the operating water surface elevation of French Meadows Reservoir could also require raising the crest of the Duncan Creek Diversion structure. Presently, the crest of the Duncan Creek Diversion structure is only 3 ft higher that the normal maximum operating level of French Meadows Reservoir. A raise of the normal maximum

operating level of French Meadows Reservoir by more than 3 feet would require modifications to Duncan Creek Diversion to slightly raise the diversion's spillway crest.

The proposed spillway structure will be operated similarly to the current operations, which include opening the spillway gates on November 1 and closing the spillway gates on April 1 of each year.

The gates would be manually operated similarly to current operations. They would typically being closed April 1 after the threat of major flooding has past, remaining raised for summer water storage and raised on November 1 to prepare for the winter storm cycle.

5.3.3 Hell Hole Reservoir Enlargement

5.3.3.1 Purpose

The enlargement of Hell Hole Reservoir will provide additional seasonal water storage capacity. The additional storage would allow more efficient intra-seasonal shifting of water releases (from spring runoff periods to summer and fall months), and could improve the firm water yield and power generation from the reservoir during a drought.

The Hell Hole Reservoir currently includes the Hell Hole Dam, Hell Hole Reservoir, spillway facilities, and the Hell Hole – Middle Fork tunnel inlet. See Section 5.2.1 and Table 5-2 for further details on these existing facilities.

5.3.3.2 Proposed Upgrade

The proposed upgrade would provide additional summer/fall storage in Hell Hole Reservoir by installation of spillway gates on the spillway crest that would allow the reservoir maximum water surface level to be selectively raised by 10 feet. The proposed upgrade would provide additional storage of about 12,000 ac-ft in the existing reservoir involve minimal changes to the existing dam. The increased storage would result in an increased maximum surface area for the reservoir of approximately 37 acres or 3 percent.

To modify the spillway, flap gates would be installed on the spillway crest. These gates could be closed in early summer after the threat of large floods has passed and opened in the fall before the winter/spring flood season. This would allow floods up to the magnitude of the all-season Probable Maximum Flood (PMF) to pass over the existing crest without any added flow restriction.

The proposed new spillway gates would incorporate an "Obermeyer" flap-type spillway gate which consists of a row of steel gate panels supported on their downstream side by inflatable air bladders. The gates would be manually operated, typically being raised in the spring after the threat of major flooding has passed, and remaining raised for summer water storage, then lowered in the fall to prepare for the winter storm cycle. To control water levels when the gates are raised and avoid inundating the French

Meadows Powerhouse, the gates would control the reservoir water level to not exceed a 4,640 feet elevation.

The existing spillway crest would require little modification. The Obermeyer gate would be secured to the existing spillway crest. The only other spillway modification would be the construction of reinforced concrete vertical abutment blocks at each end of the spillway for attachment of the gate side seals. A new power supply (communication and power lines) and a small building to house the control equipment would be constructed.

Two other modifications would be required. A 4 foot-high concrete parapet wall would be added to the deck of the French Meadows Powerhouse to avoid inundation by wave run-up during windy conditions when the reservoir is at the new proposed maximum normal operating level.

In addition, a series of flap gates would also be added to the crest of the South Fork Long Canyon Diversion to avoid backflow of stored water from Hell Hole Reservoir into South Fork Long Canyon Creek when the reservoir is at the new proposed maximum normal operating level. These flap gates would be oriented so they would not increase the size or storage of the South Fork Long Canyon Diversion.

5.3.4 French Meadows Pumped Storage Upgrade

5.3.4.1 Purpose

The purpose of the French Meadows Pumped Storage Project is to increase the hydropower generation capacity available from the MFP to meet peak electrical loads. This is accomplished by moving stored water from Hell Hole Reservoir to the French Meadows Reservoir at a higher elevation during off-peak periods. The stored water can then be released back through the proposed storage facility on peak. A description of the existing facilities can be found in Sections 5.2.1 and 5.2.5 and Table 5-2.

5.3.4.2 Proposed Upgrade

The proposed pumped storage project will utilize the existing French Meadows Reservoir as its upstream reservoir, the existing Hell Hole Reservoir as its downstream reservoir, and it would utilize the existing French Meadows – Hell Hole Tunnel and tunnel intake.

The proposed concept is to develop a cost-effective pumped storage project by maximizing utilization of existing MFP facilities. The hydropower generation potential between French Meadows and Hell Hole reservoir is not fully developed at times when the surface of the Hell Hole Reservoir is lower than the tailrace weir at the outlet of the French Meadows Powerhouse. The proposed pumped storage plant would fully utilize the hydraulic head between water surface elevations of 4,630 feet and 4,500 feet at Hell Hole Reservoir. The proposed upgrade does not require implementation of the French Meadows Reservoir Enlargement upgrade (see Section 5.3.2).

Preliminary hydraulic analyses indicate that the existing French Meadows - Hell Hole Tunnel Intake and Tunnel has sufficient hydraulic capacity to carry up to 1,000 cfs with acceptable velocity and head loss. A surge shaft would be added to control hydraulic transients in the tunnel. A second penstock parallel to the existing penstock would be added to provide additional hydraulic capacity with acceptable head loss between the tunnel outlet and the powerhouse.

The new underground pump/generator would be constructed at the base of a concrete lined shaft to be constructed adjacent to the existing French Meadows Powerhouse. A short tailrace tunnel would interconnect the draft tube of the pump turbines with a concrete intake/outlet structure in the Hell Hole Reservoir. Total capacity of the new pumped storage facility would be approximately 52 MW.

The principal features of the proposed pumped storage upgrade would be as follows:

- The existing cylindrical trashrack on the intake to the French Meadows – Hell Hole Tunnel would be replaced with a larger trashrack to reduce head losses.
- A surge shaft would be constructed near the Hell Hole end of the French Meadows-Hell Hole Tunnel, coming to the surface on the hillside at an elevation above the tunnel portal. A steel tank may also be needed at the top of the shaft to control hydraulic surges.
- A short access road would be constructed from the French Meadows-Hell Hole Portal Access Road to the top of the new surge shaft.
- A steel wye, installed in the penstock at the tunnel portal would direct flow into the existing penstock and a second new penstock to be installed parallel to the existing penstock.
- The second steel penstock will be a nominal 6 foot diameter welded steel pipe supported by concrete saddles and anchor blocks.
- Access to the powerhouse will be via an approximately 200 foot deep concrete lined vertical shaft that would contain the penstocks, service elevator, electric buswork and sufficient space for crane access to the underground powerhouse.
- An underground powerhouse cavern would contain two 25 MW reversible Francis type pump turbines.
- A 300 foot-long tailrace tunnel connecting to Hell Hole Reservoir at about an elevation of 4,480 feet.
- A new substation adjacent to the top of the powerhouse access shaft.
- An upgrade of the existing 14 mile-long power transmission line between French Meadows Powerhouse Switchyard and Middle Fork Powerhouse Switchyard may be required, depending on the results of electrical interconnection studies.

The French Meadows Pumped Storage upgrade would be operated to meet the need for ancillary services including peaking capacity, regulation up, regulation down, and spinning reserve. In addition the power plant would utilize the hydropower generation available in water deliveries from French Meadows Reservoir to Hell Hole Reservoir. The overall pump generation cycle efficiency is expected to be about 75%.

5.3.5 Interbay Small Hydro Facility

5.3.5.1 Purpose

The proposed upgrade would increase the hydropower resource utilization of the MFP by recovering the energy present in stream maintenance releases through Interbay Dam. The upgrade would be the addition of a small hydro facility at the toe of Interbay Dam on the Middle Fork American River. The small powerhouse would be interconnected with the existing local electrical distribution system that connects to the Middle Fork Powerhouse Switchyard. A description of the existing Interbay Dam and stream maintenance facilities can be found in Section 5.2.2 and Table 5-2.

5.3.5.2 Proposed Upgrade

Proposed facilities would include construction of an inlet in Middle Fork Interbay, a tunnel or penstock, a new small powerhouse located downstream of Interbay Dam, and a new powerline to connect to the existing Middle Fork Powerhouse Switchyard. The factors that will govern the location and size of the proposed upgrades include:

- The range of stream maintenance flow releases;
- The hydraulic capacity of the existing stream maintenance flow discharge pipe intake and 20 in. pipeline;
- Protection of the proposed facilities from a rockslide on the south bank of the Middle Fork below the Interbay Dam and the pile of debris at the toe;
- The depth of fill adjacent to the downstream toe of the dam; and
- The large tailwater fluctuation in the narrow canyon downstream of the dam.

Because of the large range of tailwater elevations during spill at Interbay Dam, the proposed powerhouse would be a waterproof concrete shaft structure with the top of the structure above a design flood level selected for protection of the powerhouse from inundation. The new powerhouse would be of moderate size (on the order of 25 x 25 feet), with an associated short access road. Two options for siting the plant are available, including:

1. On the south bank (looking downstream), utilizing the existing stream maintenance flow pipe. Since the outlet of the existing pipe is at about an elevation of 2,490 feet (i.e., about 24 feet above normal tailwater level), it would be necessary to extend the pipeline down to tailwater elevation to take advantage of the hydraulic head that is normally available. A new powerhouse would be constructed along the river.

2. On the north bank (looking downstream). A new intake would be created in the dam adjacent to the overflow section. A new steel penstock would be laid along the right bank of the river.

For planning purposes the north bank alternative is assumed to be more technically feasible because it avoids the uncertainties associated with the existing rockslide. This would also allow the existing instream flow release facilities to remain in service during construction and used as a backup flow release system when the new small hydro plant is shut down.

The Interbay small hydro plant would be operated to meet stream maintenance release requirements from Interbay Reservoir to the Middle Fork American River. During outages of the new Interbay small hydro plant, releases would be made through the existing outlet valves.

5.3.6 Hell Hole Powerhouse Upgrade

5.3.6.1 Purpose

The proposed upgrade involves modifying the capacity of the existing Hell Hole Powerhouse to match the post-relicensing stream maintenance flow discharge requirements below Hell Hole Dam if those requirements change as a result of relicensing. A second purpose would be to address the existing interference between the discharge of the existing fixed-cone valve on the dam outlet conduit and the Hell Hole Powerhouse building due to their close proximity. When the valve is operating the conical water jet discharged by the fixed cone valve impacts the eaves of the roof of the powerhouse. A detailed description of the existing facilities can be found in Section 5.2-5 and Table 5-2

5.3.6.2 Proposed Upgrade

If required, the existing Hell Hole Powerhouse unit would be replaced with a facility designed to operate over the range of post-relicensing stream maintenance flows. Since the quantity and timing of post-relicensing stream maintenance flow releases has yet to be determined, the design parameters for the new facility cannot be determined at this time.

The general design concept will be similar to the existing facility. The new plant would be built adjacent to the existing facility and fully clear of the discharge of the existing fixed-cone valve. The existing facility would then be decommissioned.

The Hell Hole Powerhouse would be operated to meet instream flow release requirements from Hell Hole Reservoir to the Rubicon River. During powerhouse outages, releases would be made through the existing outlet valves.

5.3.7 Ralston Powerhouse Capacity Upgrade

5.3.7.1 Purpose

The purpose of the Ralston Powerhouse capacity upgrade is to increase utilization of the renewable hydropower energy resource available from the Middle Fork American River between Middle Fork Interbay and Ralston Afterbay. Project facilities that may be affected by this proposed upgrade include the Middle Fork Interbay, Middle Fork - Ralston Tunnel, Ralston Powerhouse and Penstock, and the Ralston Afterbay. A detailed description of the existing facilities can be found in Sections 5.2.2 and 5.2.5 and Table 5-2.

5.3.7.2 Proposed Upgrade

The hydraulic capacity of the Ralston Powerhouse would be increased to match the sum of maximum outflow from the Middle Fork Powerhouse plus normal accretions from the Middle Fork of the American River less required instream flow releases below Middle Fork Interbay. This would reduce uncontrolled spills at Interbay Dam during periods when the Middle Fork Powerhouse is running at maximum capacity.

Preliminary hydraulic analysis of turbine efficiency data indicates the maximum hydraulic capacity of the Middle Fork Powerhouse is in the range of 950 to 1,020 cfs depending on the headwater elevation in Hell Hole Reservoir. However, the Middle Fork Powerhouse is currently operated subject to a flow constraint of 850 cfs, which corresponds to the onset of gravel movement from the tunnel into the penstock and through the turbines increasing plant maintenance.

Given the foregoing constraints, and the hydraulic head loss characteristics of the Middle Fork - Ralston Tunnel the hydraulic capacity of Ralston Powerhouse could be upgraded to 925 cfs to 1,050 cfs or about 13 percent.

Two options for achieving this upgrade are under consideration: 1) upgrading the existing turbine and generator; and 2) adding a second smaller turbine-generator unit.

For planning purposes, the option of adding a second turbine-generator unit has been adopted until uncertainties regarding the technical feasibility of upgrading the existing turbine and generator are resolved.

Installing a second turbine-generator would involve tapping into the existing penstock, building a short penstock connection, and constructing a new powerhouse structure adjacent to the downstream side of the existing powerhouse. The main features of this upgrade would be as follows:

- Penstock bifurcation installed just above the foot of the existing penstock before it crosses the existing road.
- A new 3 foot diameter welded steel penstock that would be exposed on the rock slope and buried beneath the existing road.

- A semi-outdoor concrete powerhouse structure approximately 50 feet by 50 feet located adjacent to the existing concrete service platform.
- A vertical axis 3 jet Pelton impulse turbine with a 6 foot diameter turbine runner operating at a speed of 514 revolutions per minute (rpm).
- Discharge adjacent to the existing powerhouse into the upper portion of Ralston Afterbay.
- Transmission interconnection via an additional transformer and switchgear in the existing Ralston Powerhouse Switchyard.

The option of installing a higher efficiency, higher-speed horizontal Francis type turbine would be considered in the process of optimizing the design of the upgrade.

The additional generating capacity at Ralston Powerhouse would be operated in tandem with the upstream Middle Fork Powerhouse to maximize utilization of the hydropower potential of releases from Hell Hole Reservoir. Improvements to the MFP supervisory control and data acquisition (SCADA) and operations control system would ensure coordination of the operation of the two power plants.

5.3.8 Modifications to Dams and Diversions for Sediment Pass-through

5.3.8.1 Purpose

PCWA is investigating potential modifications to small and medium dams to facilitate the pass-through of sediment during high flow conditions thereby minimizing impacts to reservoir and diversion pool capacity. Currently, sediment accumulates upstream of these dams during high flows reducing storage capacity and requiring sediment removal activities.

5.3.8.2 Proposed Upgrade

Engineering investigations will evaluate the potential of modifying low level outlets (sluice pipes), spillway gates, or other orifices at the Duncan Creek Diversion Dam, North and South Fork Long Canyon Diversion dams, Interbay Dam and Ralston Afterbay Dam to reduce the retention and accumulation of sediment behind those structures.

Engineering investigations will be performed at the following locations and consider the following modifications:

- Duncan Creek Diversion Dam - Increasing the size of and/or re-positioning the existing low level outlet to allow more efficient and effective release of sediment.
- North and South Fork Long Diversion Canyon dams - Increasing the size of and/or re-positioning the existing low level outlet to allow more efficient and effective release of sediment.

- Interbay Dam - Increasing the size of or re-positioning the existing low level outlet, adding a new low-level outlet, or increasing the size of one or more of the existing spillway gates to allow more efficient and effective release of sediment.
- Ralston Afterbay Dam - Increasing the size of or re-positioning the existing low level outlet, adding a new low-level outlet, or increasing the size of one or more of the existing spillway gates to allow more efficient and effective release of sediment.

In addition to physical modifications to the impoundment structures, new operating protocols (such as opening low-level outlets commensurate with rise in river stage from storm flow events) will be evaluated during the relicensing.

5.4 REVISED PROJECT BOUNDARIES

The existing FERC Project Boundary is shown on Figure 5.3.5 a, b, c, and d. Within the Project Boundary FERC exercises regulatory authority over construction, operation, and maintenance of Project facilities through the FERC License and its amendments, and periodic inspection and compliance order. FERC also assess fees for dedication and use of federal lands within the FERC boundary. Some changes to the existing FERC Project Boundary may be proposed when the PAD document is prepared. Changes may include adding area or subtracting area from the Project Boundary. Changes are expected to result in minimal total changes to the overall area within the Project Boundary.

5.5 CURRENT LICENSE CONDITIONS

The MFP was constructed and operates under a license (FERC Project No. 2079) issued by the FERC (formerly the Federal Power Commission) on March 13, 1963. This section only describes those license conditions related to the ongoing operation of the MFP. License conditions related to construction of the Project are not included.

The current license conditions contain provisions regarding the operations of the Project such as minimum pool requirements for Project reservoirs, impoundment, and diversions; and, minimum stream maintenance flow releases from Project facilities. Table 5-3 summarizes the current minimum pool and minimum stream maintenance flow requirements. In addition, the licensee is required to keep and annually submit to the USGS accurate and sufficient records from reservoir and stream gaging stations. The license order also requires that the two tainter gates in the French Meadow Spillway remain blocked open between November 15 to April 1, unless specifically exempted.

The license required the development of a recreational use plan for submittal and approval by the FERC. The plan specified that certain recreation facilities at or near Project reservoirs be constructed by PCWA. The original Project Recreation Plan was submitted to the FERC as Exhibit R on April 11, 1967. A “Revised Recreation Plan for the Middle Fork American River Project” was approved by FERC with modification and amendments to the License on April 27, 1992.

The FERC approved Revised Recreation Plan requires PCWA to: 1) implement facility upgrades to be more handicapped accessible; 2) redesign facilities to accommodate

larger vehicles; 3) provide additional parking; and 4) develop additional recreation once use triggers are met. In addition the License Order also requires PCWA to maintain and operate the Project recreation facilities for the term of the license (Table 5-1). Currently, the USDA-FS conducts the recreation facility operations and maintenance under a collection agreement with PCWA.

5.6 OVERVIEW OF CURRENT OPERATIONS

5.6.1 General Overview

The MFP is operated for water supply and power generation in accordance with parameters defined by the FERC license, water rights permits, contractual obligations, and physical system constraints. In general, the French Meadows and Hell Hole reservoirs store water during winter and spring precipitation and runoff periods, for release during the dry summer and fall months. Reservoir 'storage targets' throughout the season are established and refined based on hydrologic conditions and water delivery obligations. Seasonal and monthly release patterns are established and refined based on water delivery obligations and power market conditions that dictate the most valuable generation periods. At all times, minimum release obligations are met by MFP operations.

The following sections describe the MFP's obligations, and how the MFP has been utilized to meet those obligations. While general Project operations have been similar since the beginning of MFP operation, there have also been some significant differences in specific operations practices in response to facilities maintenance requirements, changes in the California power market, and recreation demands downstream of the Project. It is anticipated that operations practices will continue to evolve through the term of the next license, in response to these same factors listed and the increasing water supply demand from PCWA service area customers.

Overall operation of the MFP for power generation is scheduled by PG&E under most operating conditions. PCWA personnel operate MFP facilities (including dams, spill gates, tunnels, powerhouses and other facilities) during normal business hours on weekdays; MFP facilities are monitored and operated remotely by PG&E during after-hours and weekend periods from PG&E's Wise Operating Center.

5.6.2 Operating Parameters and Authorities

This section describes the obligations, agreements, and constraints that affect how the MFP is operated. General obligations (that impact the entire MFP) are summarized first, followed by obligations or constraints that impact specific MFP facilities.

5.6.2.1 Existing FERC License

The MFP operates under the terms of a FERC license (P-2079) that was issued on March 13, 1963. Key provisions of that license that are relevant to the operations of the MFP are summarized in Section 5.5. A complete copy of the existing FERC license and amendments is available on the FERC website at www.ferc.gov/docs-filing/elibrary.

5.6.2.2 Water Rights

The MFP was constructed as a multi-purpose water supply and hydroelectric generation Project for Placer County by PCWA. PCWA currently has five water rights permits and one license issued by the California State Water Rights Board (CSWRB). The water rights permits allow for the diversion and storage of water for consumptive use or power production, as described in the following.

California State Water Rights Board Permits

Four permits, Nos. 13855, 13856, 13857 and 13858 were issued on January 10, 1963 to PCWA by the CSWRB. These 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. The permits were issued for two types of beneficial use: 1) Power and Incidental Recreation; and 2) Irrigation and Incidental Domestic, Recreational, Municipal and Industrial. An additional permit, No. 20754 was issued to the PCWA for operation of the Hell Hole Powerhouse by the CSWRB on August 18, 1994. Key provisions of the permits relevant to the operations of the MFP are summarized in Table 5-3.

PCWA's water rights include rights for direct diversion of water and diversion to storage. They also include both non-consumptive (power generation) and consumptive uses. PCWA holds sufficient water rights to fully utilize all MFP facilities, including reservoir storage and diversion through tunnels and powerhouses. PCWA also holds sufficient water rights to meet all current and reasonably foreseeable consumptive delivery obligations. PCWA's points of diversion for consumptive use supply are at the American River Pumping Plant and Folsom Lake. Neither of the points of diversion for consumptive supply is within the FERC Project boundary.

The amounts and time periods of diversion and off-stream storage are shown in Table 5-3.

The permits also require:

- protection of water quality and aquatic species;
- public access to Project lands and water; and
- the minimum pool and minimum stream maintenance flow requirements as described in Table 5-4.

PCWA's water rights are scheduled for review by the SWRCB before July 1, 2007.

5.6.2.3 Power Purchase Contract

The electrical output of the MFP is contractually obligated to PG&E pursuant to the Middle Fork Project Power Purchase Contract dated April 30, 1963.

This power purchase contract includes limits on the timing of diversion of water for consumptive use, which in turn have implications for releases from MFP reservoirs through the generation facilities. The limits for monthly diversions of water are:

January	0% - 5%
February	0% - 5%
March	2% - 6%
April	5% - 10%
May	9% - 16%
June	12% - 19%
July	13% - 19%
August	13% - 16%
September	12% - 13%
October	4% - 8%
November	0% - 6%
December	0% - 5%

5.6.2.4 Water Supply Contracts

PCWA has contracted with several entities for the delivery and use of water by the MFP, including the PCWA-United States Bureau of Reclamation (USBR) 1970 Water Service Contract (as amended in 2002), the PCWA-USBR February 20, 1963 Contract pertaining to PCWA's Middle Fork Project Reservoirs; the 2002 contract with the United States related to the American River Pumping Plant; and, PCWA's contracts with San Juan Water District, Roseville and Sacramento Suburban Water District (formerly the Northridge Water District).

Three key elements of the water supply agreements are germane to the operation of the MFP. First, the agreements between PCWA and USBR, limit PCWA to a total diversion of 120,000 ac-ft per year from the Middle Fork American River for consumptive needs. Secondly, to the extent that PCWA withdraws water for consumptive needs at the American River Pumping Plant, MFP facilities must be operated to release that same amount of water, plus any amount necessary to meet stream maintenance requirements below the Oxbow Powerhouse. Finally, to the extent that PCWA needs to withdraw water for consumptive needs from the Middle Fork American River at the Folsom Reservoir, releases from the MFP facilities do not necessarily need to match the pumping pattern at Folsom Reservoir (Folsom Reservoir is able to temporarily store water for pumping at a later date, if releases from the MFP do not precisely match pumping schedules).

The following two provisions of the agreements between PCWA and USBR may affect MFP operations in some years:

(i) "During dry years when water year total flows into Folsom are less than 600,000 acre feet, PCWA may be required to make releases to ensure that the total of water stored in the MF Project reservoirs at the end of the year is no more than at the beginning of the year.

(ii) PCWA may be required to release during each July, August, September, October, November, and December such amount of water so that the total quantity stored by the MF Project reservoirs shall be no more at the end of each month than it was at the beginning of the month."

5.6.2.5 Water Forum Agreement

PCWA is a member of the Water Forum, a regional group of water purveyors, water users, environmental groups, and business interests focused on responsible water use plans for the Sacramento/Placer region. The Water Forum participants have crafted a set of agreements outlining water use goals, obligations and limitations for the American River Watershed.

PCWA's specific Water Forum commitment includes limiting total usage to amounts commensurate with PCWA's water rights and water usage contracts, and an obligation to attempt to release additional water to the Middle Fork American and Rubicon rivers in the driest years. PCWA has committed, under certain conditions, to release up to 27,000 ac-ft in years when the total unimpaired inflow into Folsom Reservoir is expected to be below 950,000 ac-ft.

5.6.2.6 Informal Agreements, Arrangements or Accommodations

In addition to the FERC license condition, water rights, and agreements, previously described, PCWA has informal arrangements with various recreational interests that affect operations. In conjunction with PG&E, PCWA endeavors to make rafting flows available in the Middle Fork American River below Oxbow Powerhouse on a schedule suitable for commercial rafting operations, particularly on weekends and during summer months. In addition, flows are lowered below Oxbow Powerhouse for certain competitive long distance events (the Western States 100-mile Endurance Run and Western States Trail Ride) that must cross the river during those races once per year.

PCWA, in conjunction with PG&E, has made accommodations in flow schedule to meet other interests or needs, such as construction, access or research on the Middle Fork American or Rubicon rivers. Such requests are addressed on a case-by-case basis.

5.6.2.7 Physical Constraints

The MFP includes various physical constraints that limit water flow, generation, or operational flexibility. Examples of these physical constraints would include reservoir or diversion pool storage capacities, tunnel, penstock and powerhouse flow capacities, discharge pipe and valve capacities and electrical power line capacities. These capacity limitations have been discussed for each facility in Section 5.2 and are listed in Table 5-2.

Operating constraints not listed in Section 5.2 are described in the following paragraphs.

Hell Hole – Middle Fork Tunnel Operations

Prior to 1975, partial collapses occurred at two locations in the Hell Hole – Middle Fork Tunnel. As a result of these events, the ramping rate of flows through the tunnel is limited to 10 minutes from full flow to full stop or from full stop to full flow. Additionally, flows through the Hell Hole-Middle Fork Tunnel in excess of about 850 cfs tend to cause small rocks to be transported down the tunnel. From the tunnel these rocks then enter the penstock and turbine, where they can damage the turbine water wheel. To minimize required maintenance, flows in the Hell Hole – Middle Fork Tunnel are held below 850 cfs whenever possible.

Coordination of Middle Fork and Ralston Powerhouses

Since the Middle Fork Interbay receives the discharge from the Middle Fork Powerhouse and provides water to the Ralston Powerhouse (via the Middle Fork - Ralston Tunnel), the coordinated operation of these powerhouses is critical to maintaining an appropriate water level in the Middle Fork Interbay. If the operations of these two powerhouses are not coordinated the interbay can be severely drawndown (Middle Fork Powerhouse operating at lower output than Ralston Powerhouse) or filled to the point of spilling (Middle Fork Powerhouse operating at a higher output than the Ralston Powerhouse).

Middle Fork Interbay is a small impoundment with a normal surface area of about seven acres, and is usually maintained at a nearly constant elevation to provide maximum head for the Ralston Powerhouse turbines, and to ensure a stable release for stream maintenance requirements. As a result, the operations of the Middle Fork and Ralston powerhouses must be closely coordinated to ensure that Interbay maintains its desired water surface elevation and does not spill as a result of discordant changes in flow through the powerhouses.

French Meadows Spill Gate Operation

The spillway gates at French Meadows Dam (French Meadows Reservoir) must remain open from November 15 to April 1 each year pursuant to requirements of the Division of Safety of Dams.

5.6.3 Water Management and Power Generation

5.6.3.1 General Reservoir Operations

The French Meadows and Hell Hole reservoirs are the main storage reservoirs for the MFP, and are operated for seasonal regulation of inflows into the system (Figure 5-2). The two reservoirs have a combined gross storage capacity of 342,583 ac-ft. The reservoirs are interconnected via the French Meadows – Hell Hole Tunnel and the reservoirs are generally operated to maintain consistently proportional storage between the reservoirs. In addition to capturing inflows from the Middle Fork American (into French Meadows Reservoir) and Rubicon (into Hell Hole Reservoir) rivers, flows from Duncan Creek are also diverted into the French Meadows Reservoir via the Duncan

Creek - Middle Fork Tunnel. Flows from North and South Forks of Long Canyon Creek are diverted into the Hell Hole Middle Fork Tunnel, and flow either directly through the Middle Fork Powerhouse or, at certain reservoir elevations, may flow into Hell Hole Reservoir. Maximum water surface elevation at French Meadows Reservoir is controlled by spill gates which remain open between November 15 and April 1 of each year. Maximum reservoir elevation at French Meadows Reservoir is 5,244.5 feet with the spill gates open, and 5,262.0 feet with the spill gates closed. Hell Hole Reservoir has an ungated spillway with a crest elevation of 4,630.0 feet.

The MFP reservoirs are always operated to a) provide required minimum downstream releases, and b) meet PCWA's delivery obligations. The diversion points for consumptive use deliveries (Points of Diversion for consumptive use in PCWA's water rights permits) are all downstream of MFP facilities. There is considerable flexibility in the ability to maximize MFP generation while meeting PCWA's water supply obligations. Water supply and reservoir operations planning tools include snow surveys, weather and temperature data, stream flow data, and historic operations patterns.

5.6.3.2 Annual and Seasonal Reservoir Operations Planning

During the winter and spring months when direct precipitation or snowmelt is accumulating to the reservoirs, the MFP is operated to meet stream maintenance flow requirements, water delivery obligations and generation targets while allowing the reservoirs to fill without spilling. Potential annual inflow into the MFP storage reservoirs varies widely as shown in 5-4(a) and 5-4 (b). The storage available in these reservoirs can be controlled during the winter and spring filling cycle by the rate at which water is moved through the reservoirs via the power tunnels. High rainfall or high snowpack conditions prompt higher releases through the power tunnels; dry winter conditions or low snowpack levels prompt lower releases maintain more water in storage.

During the dry summer and fall months, the reservoirs are operated to meet stream maintenance requirements, water delivery obligations and generation targets while achieving a specified end-of-season water storage carryover target. Historically, the December 31 carryover target has been a total of 150 thousand acre feet (TAF) between both reservoirs, although in dry years or as a result of a planned water transfer the carryover volume may be less than 150 TAF. The 150 TAF target has been developed by PCWA in conjunction with PG&E based on historic operations history and success. The 150 TAF target has provided adequate reserve storage for PCWA to allow consumptive demands and stream maintenance flow requirements to be met in the event that the following year is dry. The 150 TAF target also generally provided sufficient available storage so that the MFP reservoirs only spill during the wettest years.

PCWA works with PG&E to plan annual reservoir releases. Significant events that could have a major impact on annual or seasonal operations include outages for maintenance; unusual or extra water delivery commitments by PCWA; observed or anticipated extremes of weather or hydrology; or unusual energy market conditions that might influence seasonal generation patterns. In the absence of exceptional scheduling or planning circumstances, water is released from the reservoirs in a fairly uniform

monthly pattern throughout the year, from the peak of storage in the late spring (typically April, May or June) to a low point of carryover at the end of December. Depending on power market conditions and the relative value of energy, more or less water may be released during any given month to maximize generation during the most valuable periods of the year.

Figures 5-5(a) and 5-5(b) show the reservoir storage for French Meadows and Hell Hole reservoirs for a two-year period.

5.6.3.3 Daily Water Operations Scheduling and Releases for Generation

As long as required stream maintenance releases and water delivery obligations are met, there is considerable flexibility in daily release patterns, which allows optimization of energy generation and maximum economic value of the energy output to be realized.

The historic average annual generation of the MFP is 1,026 gigawatt-hour (GWHr), a capacity factor of about 52%. The maximum generation was 1,836 GWHr in 1982 (capacity factor 92%), and the minimum was 209 GWHr in 1977 (capacity factor 11%). The historic energy output of the MFP is shown in Figure 5-6.

Since the MFP cannot store enough water to operate at all times, generation is scheduled for those periods when the MFP's electrical output has the greatest value such as periods of peak consumer demand. Depending on water year (wet, normal, or dry) and energy market conditions, "peaking" operation of the MFP would result in the Middle Fork and Ralston powerhouses (and often French Meadows and Oxbow powerhouses as well) operating for 8 to 16 hours per day, 5 to 7 days per week. During wet years, the number of hours of daily operation may be increased (up to 24 hours per day), to be able to move all of the water through the Project and achieve the carryover storage quantities at the end of the year. During dry water years, the number of hours of daily generation (or the number of days of generation per week) may be reduced to ensure sufficient carryover storage at the end of the year.

Planning for daily generation scheduling typically takes place two to four weeks in advance of the day of generation, with refinements up to and during the day of generation. A typical operations pattern for the MFP generation facilities is illustrated in Figure 5-7, which shows output from the Middle Fork Powerhouse during May of 2000.

As previously discussed, operation of the Middle Fork and Ralston powerhouses must be coordinated to avoid excessive drawdown or spilling at Middle Fork Interbay. As a result, these powerhouses are operated with similar flows through the Hell Hole - Middle Fork Tunnel which supplies the Middle Fork Powerhouse and the Middle Fork – Ralston Tunnel which supplies the Ralston Powerhouse.

Below Ralston Powerhouse, Ralston Afterbay plays an important re-regulating function in MFP operations. At times it is not possible or desirable for the discharge from the Oxbow Powerhouse (downstream of Ralston Afterbay) to be at the same rate as the discharge from the Ralston Powerhouses. The Ralston Afterbay operates as a re-

regulating reservoir to allow peaking operations at the largest powerhouses (Middle Fork and Ralston) while maintaining steady releases through Oxbow Powerhouse. As a result, Ralston Afterbay may experience water surface elevation fluctuations of several feet (up or down) during 24 hours or less. Typically, Ralston Afterbay would be used to re-regulate on an inter-day or intra-day basis (but not on a longer, inter-week or intra-week basis).

The MFP is also operated to support the safety and reliability of the electric generation and transmission systems in northern California. The MFP can be operated to provide spinning reserves, power grid regulation and other "ancillary services" required for operation of the transmission grid. Ancillary services are typically provided on an inter-hourly basis, and occur in coordination with the California Independent System Operator (CAISO).

5.6.3.4 Flood Management

The MFP has minimal flood management operations in comparison to larger downstream reservoirs such as Folsom Reservoir. The various minor diversions within the Project (including Duncan Creek, and North and South Forks Long Canyon Creek) have ogee crests, which allows flows in excess of the diversions to flow downstream unimpeded and do not provide any reduction of peak or flood flows. The spillway gates at French Meadows Reservoir remain open from November 15 to April 1, allowing spills from the reservoir at any time the reservoir surface elevation exceeds the elevation of the spillway crest. Similarly, the spillway at Hell Hole Reservoir is ungated. As a result, neither French Meadows or Hell Hole reservoirs provide any active flood control regulation.

The spillway gates at Middle Fork Interbay and Ralston Afterbay dams are opened whenever the inflow into those impoundments exceeds the capacity of the power tunnels out of those reservoirs and therefore do not provide any regulation of reduction of peak or flood flows. Depending on the magnitude of flows in the Middle Fork or Rubicon rivers, the Middle Fork, Ralston and Oxbow powerhouses may be shut down during high flows to avoid damage to the units from gravel passing through the units, sediment deposition or other concerns.

5.7 CONSIDERATIONS FOR FUTURE OPERATIONS

Key factors behind the original construction of the MFP were providing for the water supply needs for the PCWA service area (generally Placer County), and developing the energy generation potential of the Middle Fork Watershed. The MFP has successfully met both of those objectives since it began operation in the mid-1960s. In the future, MFP operations are expected to be increasingly influenced by the growing use of the consumptive water in allocations in PCWA water rights permits and continuing changes in the energy markets.

5.7.1 Project Water Supply Requirements

PCWA holds water rights for up to 120,000 ac-ft of consumptive-use water from the MFP Watershed (as described elsewhere in this section). PCWA deliveries have varied through time (based on water year hydrology and other factors), but to date have not exceeded approximately 42,500 ac-ft per year (2004). It is anticipated that PCWA's delivery obligation will continue to grow through time, with full build-out (and commensurate full use of the MFP water supply) by 2030 to 2050 (depending on rate-of-growth estimates).

PCWA's points of diversion for consumptive water from the Middle Fork Watershed are all downstream of MFP facility. As a result, an increase in consumptive deliveries would not directly change the total annual generation of the MFP; however, it is quite possible that an increase in consumptive deliveries could shift the timing of at least some of the generation of the MFP.

5.7.2 Potential Future Users/Buyers

A Power Purchase Contract between PCWA and PG&E was executed in April 1963, and has governed the generation and sale of energy from MFP facilities. The Power Purchase Contract will remain in effect through the term of the current MFP FERC license. Under the terms of the Power Purchase Contract, PG&E receives all of the electrical output of the MFP, and has broad latitude to allow the MFP to generate at such times, and at such levels, that best suit PG&E's need for energy. PG&E assess many criteria in making decisions to operate MFP generation facilities. Some of these factors include hydrology and reservoir status of the MFP, PG&E's energy demands, the price of alternative sources of supply available to PG&E, and coordination of maintenance work on other generation resources available to PG&E.

After the Power Purchase Contract with PG&E expires (2013), PCWA will sell the electrical output of the MFP via one or more new contracts. The purchaser of MFP generation after 2013 may be PG&E and/or other entities. The terms of future power purchase contracts are expected to be different than those of the current contract and are expected to include new business terms and reflect changes in energy market trends and PCWA's increased use of its consumptive water rights. Future Power Purchase Contract terms and status of the California energy markets are unknown at this time. However, key elements of MFP operations that will likely be important for future operations will include: the continued ability to provide maximum generation during peak demand hours (peaking operations), the ability to schedule maintenance outages with some flexibility, the ability to operate Project reservoirs to both maximize current-year generation and to provide sufficient carry-over storage to meet following-year demands, and the flexibility of the Project to react quickly to real-time energy market demands through the provision of ancillary services. All of these aspects of operations of the MFP are currently in place.

5.8 ROUTINE FACILITY TESTING AND MAINTENANCE

PCWA conducts facility testing and implements routine maintenance activities at Project facilities. Specific activities conducted are described below.

5.8.1 Routine Facility Testing

PCWA conducts periodic inspections of Project facilities. The purpose of these inspections and tests is to verify the structural and/or functional integrity of the facilities and to disclose conditions which might disrupt operation or threaten dam safety, in time for them to be corrected.

5.8.1.1 Tunnel/Conduit Inspections

PCWA conducts annually inspects the Ralston-Oxbow Tunnel. These inspections require dewatering of the Ralston Afterbay to allow inspection of the tunnel for any structural deterioration and typically occurs in the fall. None of the other MFP tunnels are routinely inspected. The Hell Hole-Middle Fork Tunnel has been dewatered and inspected in response to localized failures at two locations.

PCWA annually inspects the downstream approximately 1000 feet of the Hell Hole Dam outlet conduit. This conduit is accessible from the downstream side of the Hell Hole Dam.

5.8.1.2 Powerhouse Inspections and Maintenance

PCWA conducts annual inspections and maintenance at all five Project powerhouses. During inspection and maintenance the powerhouse is shut down to conduct mechanical and electrical maintenance and control valves are closed to prevent flow through the powerhouse. This process, which typically lasts for four to five weeks, is conducted at the Middle Fork, Oxbow, and Ralston powerhouses in fall (generally mid-September through the end of October). Maintenance at the Hell Hole and French Meadows powerhouses typically occurs in spring and takes one week.

5.8.1.3 Gate Testing

FERC requires partial operation of spillway gates annually and to full design height at least once every five years. This testing is performed annually at French Meadows Dam, Interbay Dam, and Ralston Afterbay Dam. At Interbay and Ralston Afterbay dams the reservoir level must be lowered to the spillway ogee to conduct these tests.

5.8.2 Routine Maintenance Activities

Maintenance activities conducted in the vicinity of MFP facilities include vegetation management, pest management, sediment management, erosion and falling rock control, debris management, road maintenance, and other maintenance activities (e.g., facility painting and pole replacement). Each of these activities is described below.

5.8.2.1 Vegetation Management

Vegetation management, which includes trimming of vegetation by hand and to a lesser extent, the use of herbicides and fungicides, is implemented at several locations in the Project vicinity. Table 5-5, Table 5-6 and Table 5-7 provide the frequency of vegetation management activities that occur in the vicinity of MFP facilities. PCWA conducts all vegetation management in the vicinity of the MFP except at recreation facilities. Vegetation management at recreation facilities are conducted by the USDA-FS under agreements with PCWA. Most vegetation management activities occur during the spring and early summer to avoid work during high fire danger periods. Vegetation management is implemented only within the area necessary to reduce fire hazard and provide worker/public health and safety. In general, vegetation management occurs within:

- The perimeter fence and 2 feet outside the perimeter fence of powerhouses, switchyards, and substations;
- 50 feet of gate houses, shafts, surge chambers, and adits;
- 50 feet of microwave reflectors;
- 50 feet of propane and diesel tanks;
- 10 feet on either side of penstocks;
- 10 feet on either side of communication lines;
- 25 feet on either side of power lines;
- 5 feet on either side of roads;
- 150-foot radius around recreation facilities;
- 2 feet on either side of trails; and
- On dam surfaces.

Following is a summary of vegetation management methods currently used for the MFP.

Trimming by Hand

Manual vegetation management methods include trimming of grasses and forbs using string trimmers, as well as the removal or trimming of overhanging limbs of shrubs and trees using a chain saw (or other handheld saw) or clippers. These management activities are implemented on an as-needed basis in conjunction with facility inspections. See Table 5-5, Table 5-6 and Table 5-7 for further information on the frequency and location of these activities at Project facilities, road, trails, and recreation facilities.

Herbicide and Fungicide Use

Herbicides are used in addition to manual vegetation management methods on an annual basis at three locations in the vicinity of the Project including within the perimeter fences of the Middle Fork Powerhouse and Switchyard, the Oxbow Powerhouse and Switchyard, and Ralston Powerhouse and Switchyard (Table 5-5). Herbicide use is restricted to the graveled parking areas within the perimeter fences of the powerhouses. Small hand-held sprayers are used to apply over-the-counter herbicides (e.g., Roundup®). All herbicides are applied in accordance with label instructions.

Fungicides (e.g., Borax soap) are used infrequently by USDA-FS on tree stumps at Project recreation facilities to prevent the spread of fungus (Ed Moore and John Jue, pers. comm., 2006).

5.8.2.2 Pest Management

Rodent populations inside Project facilities can pose a human health risk and may damage interior facility components (control panels, wiring, etc). Therefore, rodent control is currently implemented at the following locations: French Meadows Powerhouse and Switchyard, Hell Hole Powerhouse, Middle Fork Powerhouse and Switchyard, Oxbow Powerhouse and Switchyard, Ralston Powerhouse and Switchyard, and the Hell Hole Dormitory Facility, and the Operator Cottages and Shop. PCWA implements rodent control as needed in facility interiors using non-restricted rodenticides (e.g., D-Con®). All rodenticides are applied in accordance with label instructions.

5.8.2.3 Sediment Management

The MFP vicinity is characterized by steep canyons, frequent mass wasting (slides) down the canyon walls, and substantial bank side erosion. In particular, episodic high flow events (1 in 10 year frequency flows, or greater) tend to mobilize great quantities of sediment. During extreme events such as the high flows of 1986 and 1997, it is possible for the diversions at Duncan Creek, North and South Fork Long Canyon creeks, and Middle Fork Interbay to be completely filled with sediment from a single high flow event.

Sediment management is intended to remove excessive sediment deposition the diversions to maintain efficient operation of diversion intakes and from reservoirs to maintain storage capacity. PCWA conducts sediment management activities as necessary (i.e., physical removal of sediment with equipment) at all three diversions (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon) and two reservoirs (Middle Fork Interbay and Ralston Afterbay). Sediment removal activities do not always remove all accumulated sediment.

Diversions

Physical removal is the primary means of sediment management at Duncan Creek Diversion and the North and South Fork Long Canyon diversions. The sediment is

excavated from behind the diversion using equipment such as an excavator, backhoe, or other earth-moving equipment. Sediment is hauled to an approved USDA-FS disposal site, private disposal site, and, in some instances, the material is deposited on-site in areas that would not result in erosion into streams. All sediment removal with equipment is completed in accordance with state and federal permit conditions (e.g., USDA-FS Conditional Use Permits, California Department of Fish and Game (CDFG) Streambed Alteration Agreements). Sediment removal typically occurs in the fall (during low flow periods or routine maintenance outages).

Approximately 4,000–5,000 cubic yards of sediment is removed from Duncan Creek Diversion on an as-needed basis and is disposed of on-site at the upper end of the reservoir. Historically, sediment removal had been required every 6 to 10 years to maintain operations at the South Fork Long Canyon and the North Fork Long Canyon diversions. The estimated volume of sediment removed from South Fork Long Canyon Diversion is between 5,000-6,000 cubic yards, and from North Fork Long Canyon Diversion between 4,000-5,000 cubic yards.

Although all of the diversions include low-level sluice pipes, hydraulic sluicing operations to remove sediment are not conducted.

Middle Fork Interbay-Ralston Afterbay

Sediment is excavated from Middle Fork Interbay and Ralston Afterbay on an as-needed basis using mechanical equipment. In addition to earth moving equipment, a drag line or dredge may be employed. Similar to removal from the diversion, excavated material is hauled to a suitable nearby disposal site.

Approximately 35,000 cubic yards of sediment were removed from behind the Interbay Dam in 1988 and deposited at a site approximately 0.8 mile away and 300 feet above the reservoir. In 1997, approximately 16,000 cubic yards of sediment were excavated and deposited at a rock quarry located approximately 3 miles from the dam. In the fall of 2000 approximately 68,375 cubic yards of material were removed. Of this, 24,225 cubic yards were disposed of at a rock quarry, which is located approximately 3 miles from the dam. The remaining 44,150 cubic yards were initially disposed at Mosquito Narrows, approximately 7 miles from the dam. However, the USDA-FS subsequently crushed this material and used it for road base.

Sediment removal at Ralston Afterbay included 170,000 cubic yards during the period 1966–1987, and 112,000 cubic yards during the period 1987–1995. Approximately 100,000 cubic yards of sediment were removed from the upper portion of Ralston Afterbay in October 2002. This included removal of coarse material such as cobbles or larger material. As part of the Ralston Afterbay Sediment Management Pilot Project (Pilot Project), these sediments were hauled to two spoils sites, Ralston Ridge, which is off-channel, and Indian Bar, which is on-channel immediately downstream of Ralston Afterbay Dam.

Hydraulic sluicing, implemented on an as-needed basis, uses the force of water to remove fine sediment from behind a dam to keep the intake structures clear and ensure efficient operation. Hydraulic sluicing has been used at both the Middle Fork Interbay Dam (although not since 1976) and Ralston Afterbay Dam.

In addition to removal by mechanical equipment, the Pilot Project includes provision for sediment pass-through operations during high flow periods. Under certain high flow conditions, the Ralston Dam low level outlet is opened in conjunction with the spillway gates in an attempt to allow the river's suspended load to carry on through the reservoir without settlement. The efficacy of this sediment pass protocol is still being investigated.

PCWA initiated the Pilot Project in 2002 with two primary objectives. The first objective was to create sediment storage space within the Ralston Afterbay, maintain operational flexibility of Ralston Afterbay Dam and Oxbow Powerhouse, and delay complete sediment in fill of the Ralston Afterbay. The second objective was to improve the natural downstream migration of course and fine sediments in the Middle Fork American River below Ralston Afterbay Dam. These objectives were to be met via two project components: 1) removal of approximately 75,000 to 100,000 cubic yards of sediment from the reservoir, with placement of 48,000 cubic yards of these sediments at a 1.96-acre site at Indian Bar, located immediately downstream of Ralston Afterbay Dam; and 2) implementation of a sediment pass-through program.

The first project component was initiated in October 2002, when 48,000 cubic yards of sediment from the Ralston Afterbay were placed at Indian Bar in a configuration that would allow the sediments to entrain into the Middle Fork American River naturally during peak flows in the river, while maintaining or enhancing recreational opportunities in the vicinity. The Indian Bar location is one of several sites being considered by PCWA for long-term sediment management.

The second project component, consisting of sediment pass-through entails reoperating the dam during high flow events to allow for the passage of fine sediments downstream, so that a greater proportion of the river's suspended load passes entirely through the Ralston Afterbay rather than depositing it in the afterbay.

The goal of the program is to preserve the reservoir capacity for a longer period of time, reducing the frequency at which sediment excavation needs to occur in the Afterbay, and to improve the natural migration of river sediments. Sediment pass-through operations can be conducted when the river flows exceed approximately 3,500 cfs, which typically occurs once or twice per year.

In 2001, PCWA initiated an annual monitoring program to the Pilot Project compliance with water quality objectives and effects on downstream aquatic habitat. The monitoring program requires collection of a minimum of one year of water quality data and two to three years of aquatic habitat data for fish and benthic macroinvertebrates prior to initiating sediment management activities. It then requires a minimum of two to three years of water quality and aquatic habitat data after sediment management activities are

initiated. PCWA collected baseline aquatic habitat information in 2001 and 2002. Pre-project water quality data were not collected in those years because flows were not high enough to trigger sediment pass-through operations. Monitoring did not occur in 2003, because flows in winter and spring of 2003 did not reach levels capable of mobilizing sediment at Indian Bar and were again insufficient to trigger sediment pass-through operations. Flows in late 2005 were sufficient to trigger sediment pass-through operations and resulted in mobilization of sediments on Indian Bar. Monitoring is planned for 2006 to collect water quality data and aquatic habitat data following the sediment mobilization.

5.8.2.4 Erosion and Falling Rock Control

PCWA implements measures to prevent erosion and falling rocks on slopes and hillsides in the vicinity of MFP facilities. These measures are summarized below.

Gunite

Gunite is a mixture of sand, cement, and water which is applied to a surface using a high-pressure hose. Gunite is used on an infrequent basis on the Middle Fork Powerhouse Penstock to prevent erosion on the steep slopes beneath the penstock.

Slope Fences

Slope fences have been installed to prevent damage from falling rocks at the following Project locations: French Meadows Powerhouse and Switchyard, Middle Fork Powerhouse and Switchyard, Middle Fork – Ralston Tunnel Butterfly Valve House, Middle Fork – Ralston Tunnel Surge Shaft and Tank, Interbay Dam, Ralston Powerhouse and Switchyard, and Oxbow Powerhouse and Switchyard. While little maintenance is required on slope fences. PCWA removes large rocks trapped in the fences on an as-needed basis.

5.8.2.5 Debris Management

Debris management activities include removal of large woody debris, removal of debris at trashracks, and installation of log booms. Refer to Table 5-5 for the locations and frequency of these activities or facilities at Project reservoirs.

Large woody debris can accumulate in Project reservoirs and diversion pools. PCWA manages woody debris accumulations at the Middle Fork Interbay and Ralston Afterbay by opening upper level gates on an infrequent basis to allow for the passage of woody debris. Woody debris at Hell Hole Dam is gathered and burned on an infrequent basis when sufficient staff are available. If staff is not available, the woody debris, which does not affect dam operations, is left in the reservoir.

PCWA also prevents buildup of debris in intake structures with trashracks, which are cleaned as needed during the diversion season at the Duncan Creek Pool, and the North and South Fork Long Canyon diversions, Middle Fork Interbay, and Ralston Afterbay. Log booms have also been installed to control debris accumulation on Project

dams at the Duncan Creek Diversion, French Meadows Reservoir, Hell Hole Reservoir, Middle Fork Interbay, Ralston Afterbay.

5.8.2.6 Road Maintenance

PCWA conducts routine road maintenance activities, including road grading, surface maintenance (gravelling or paving), snow removal and/or road sanding, and maintenance of culverts, ditches, and water bars, on an as-needed basis. Other maintenance activities that occur along Project roads and trails include vegetation management, and the maintenance of signage and gates. Refer to Section 5.8.2.1 for more information on trimming of vegetation along Project roads and trails. Table 5-6 provides information on the location, length and configuration/surface for all Project roads and trails, as well as the type and frequency of maintenance activities conducted along roads and trails in the Project vicinity.

5.8.2.7 Other Maintenance Activities

Other Project maintenance activities conducted by PCWA include facility painting and utility pole replacement. Refer to Table 5-5 for the locations and frequency of these activities in the Project vicinity.

PCWA paints the exterior of Project facilities, including metal power poles, surge tanks, penstocks, valve houses, Hell Hole Dormitory and the Operator Cottages and Shop. Facility painting at recreation facilities, including restrooms, signboards and picnic tables, is conducted on as-needed basis by USDA-FS under agreement with PCWA.

PCWA replaces damaged power and communication line poles as necessary. New poles are placed in or immediately adjacent to previously existing holes, using line trucks. Helicopters are used if line trucks are unable to access locations where power or communication line poles need to be replaced.

5.9 EXISTING ENVIRONMENTAL PROGRAMS, MEASURES OR FACILITIES MAINTAINED BY PCWA

The following section summarizes, by major resource category, existing programs, measures or facilities maintained by PCWA for the protection and enhancement of the watershed resources.

5.9.1 Water and Aquatic Resources

- Minimum Stream Maintenance Flow Requirements

  PCWA currently provides minimum stream maintenance flow for aquatic habitat protection in accordance with existing FERC License conditions. Refer to Table 5-3 for minimum stream maintenance flow requirements at Project facilities.

- Project Gaging Stations

PCWA currently maintains a network of stream flow and lake level gaging stations in the watershed to monitor and record the flow and storage of water in the MFP. This network consists of fifteen stations that measure flow in rivers and creeks, two stations that measure reservoir elevation and storage on PCWA reservoirs, and six that measure leakage from Project weirs. Refer to Table 5-1 for a list of Project gaging stations.

5.9.2 Recreation Resources

- Maintain Project Recreation Facilities

  PCWA currently provides funds to the USDA-FS to operate and maintain Project recreation facilities. These funds are provided through a Collection Agreement between PCWA and USDA-FS Tahoe National Forest and Eldorado National Forest (#03-CO-11051754-014 2003 and Amendments). Refer to Table 5-7 for a list of Project Recreation Facilities.

- Coordinate Project Operations to Enhance Recreation Opportunities in the Middle Fork American River below Oxbow Powerhouse

  PG&E and PCWA currently coordinates with the State Department of Parks and Recreation, and a designated commercial whitewater boating representative to schedule MFP operations to enhance whitewater recreation in the Middle Fork American River below Oxbow Powerhouse. Whitewater boating releases are scheduled on a voluntary basis such that they do not compromise power production needs. This informal coordination typically occurs by telephone conference call in May or June, each year.

  When whitewater flows are provided, they typically occur on weekends from June through Labor Day during late morning (10 or 11 a.m.) to early afternoon (3 or 4 p.m.). MFP operations provide flow releases of approximately 950 to 1,000 cfs. On summer weekdays Project operations are voluntarily modified to accommodate commercial whitewater boating by releasing water 1 to 2 hours earlier than would normally occur for power production purposes only, starting from 10 to 11 a.m. (S. Lau, pers. comm., 2006). Over the past five years, 2001 was the only year in which power production demands limited releases for whitewater boating releases (S. Lau, pers. comm., 2006).

  Project operations are also voluntarily modified at certain times during the summer, to accommodate other recreational uses. The world-renowned Western States 100-Mile Endurance Run and the Western States Trail Ride (Tevis Cup Ride) both occur in the vicinity of the Middle Fork American River. Both races cross the Middle Fork American River at Poverty Bar below Oxbow Powerhouse. During the races, Project operations are modified, to the extent practicable, to reduce flow release into the river to facilitate river crossings. In 2005, the Western States Endurance Run was held on June 23 and 24, and the Western States Trail Ride was held on July 30.

5.9.3 Land Management

- Maintain Project Roads

  PCWA entered into a Forest Road Agreement with the Tahoe and Eldorado National Forest on September 17, 1988 (Agreement No. 80.1-AG-041988-428). As part of this agreement, PCWA will:

  1) Notify the USDA-FS whenever it intends to take actions, other than normal day-to-day travel, that may significantly affect the use or maintenance of a USDA-FS Road;

  2) Meet annually with the USDA-FS to develop a maintenance plan for USDA-FS roads. Each party will be responsible for the cost of road maintenance made necessary by its respective use of the roads; and

  3) Incorporate maintenance standards into each annual maintenance plan that is currently in use by the USDA-FS at the time each respective annual maintenance plan is developed.

- Implement the Spill Prevention Control and Countermeasure Plan

  PCWA currently implements a Spill Prevention Control and Countermeasure Plan to address and minimize the potential for fuel and other hazardous material spills (February 2006). This plan is revised every five years, and describes procedures and available equipment for mitigation of any fuel or other hazardous materials that might occur. PCWA also has specific provisions for periodic inspections of all oil-containing equipment and devices to prevent spilled oil from escaping Project buildings and grounds. In addition, all oil transfer operations follow applicable United States Department of Transportation (USDOT) regulations.

TABLES

Table 5-1. Existing Project Facilities, Roads, Trails and Recreation Facilities.

Large Dams
French Meadows Dam
Hell Hole Dam
Medium Dams
Interbay Dam
Ralston Afterbay Dam
Small Dams
Duncan Creek Diversion Dam
North Fork Long Canyon Diversion Dam
South Fork Long Canyon Diversion Dam
Large Reservoirs
French Meadows Reservoir
Hell Hole Reservoir
Medium Reservoirs
Middle Fork Interbay
Ralston Afterbay
Small Diversion Pools
Duncan Creek Diversion Pool
North Fork Long Canyon Diversion Pool
South Fork Long Canyon Diversion Pool
Water Conveyance Systems
Tunnels
Duncan Creek – Middle Fork Tunnel
French Meadows – Hell Hole Tunnel
Hell Hole – Middle Fork Tunnel
Middle Fork – Ralston Tunnel
Ralston - Oxbow Tunnel
Surge Shafts and Adits
Hell Hole-Middle Fork Tunnel Surge Shaft and Tank
Brushy Canyon Adit
Middle Fork-Ralston Tunnel Surge Shaft, Tank and Storage Building
Portals
Duncan Creek-Middle Fork Tunnel Portal
Rollouts
North Fork Long Canyon Crossing/Removable Section
Gatehouses and Shafts
Duncan Creek Gatehouse and Shaft
French Meadows-Hell Hole Gatehouse and Shaft
Hell Hole-Middle Fork Gatehouse and Shaft
Middle Fork-Ralston Tunnel Intake Gatehouse
Ralston-Oxbow Tunnel Intake Gatehouse
North Fork Diversion Pipe/Shaft
South Fork Diversion Pipe/Shaft
Penstocks / Butterfly Valve Houses
French Meadows Powerhouse Penstock and Butterfly Valve House
Middle Fork Powerhouse Penstock and Butterfly Valve House
Ralston Powerhouse Penstock and Butterfly Valve House
Powerhouses
French Meadows Powerhouse and Switchyard
Hell Hole Powerhouse

Table 5-1. Existing Project Facilities, Roads, Trails and Recreation Facilities (continued).

Powerhouses (continued)
Middle Fork Powerhouse and Switchyards
Oxbow Powerhouse and Switchyard
Ralston Powerhouse and Switchyard
Gaging Stations and Weirs
Stream Gages and Weirs
Duncan Canyon Creek below Diversion Dam near French Meadows Gage (USGS No. 11427750)
Duncan Canyon Creek near French Meadows Gage and Weir (USGS No. 14427700)
Middle Fork American River at French Meadows Gage and Weir (USGS No. 11427500)
Middle Fork American River / Interbay Dam Gage (USGS No. 11427770)
Middle Fork American River above Middle Fork Powerhouse near Foresthill Gage (USGS No. 11427760)
Middle Fork American River near Foresthill Gage (USGS Gage No. 11433300)
North Fork Long Canyon Below Diversion Tunnel near Volcanoville Gage (USGS No. 11433085)
Rubicon River below Hell Hole Dam Gage and Weir (USGS No. 11428800)
South Fork Long Canyon Below Diversion Tunnel near Volcanoville Gage (USGS No. 11433065)
Diversion Gages
Middle Fork American River Ralston Powerhouse near Foresthill Gage (USGS No. 11427765)
Middle Fork Powerhouse (4286 – 10) near Foresthill Gage (USGS No. 11428600)
North Fork Long Canyon Diversion Tunnel near Volcanoville Gage (USGS No. 11433080)
Oxbow Powerhouse Gage (USGS No. 14433212)
South Fork Long Canyon Diversion Tunnel near Volcanoville Gage (USGS No. 11433060)
French Meadows Power Plant near Meeks Bay Gage (at USGS No. 11427200)
Reservoir Gages
French Meadows Reservoir Gage (USGS No. 11427400)
Hell Hole Reservoir Gage (USGS No. 11428700)
Leakage Weirs
French Meadows Dam Leakage Weir # 1
French Meadows Dam Leakage Weir # 2
French Meadows Dam Leakage Weir # 3
French Meadows Dam Leakage Weir # 4
French Meadows Dam Leakage Weir # 5
French Meadows Dam Leakage Weir # 6
Hell Hole Dam Leakage Weir
Project Communication and Powerlines
Communication/Powerline – French Meadows Powerhouse and Switchyard to French Meadows Butterfly Valve House
Communication/Powerline – French Meadows Powerhouse and Switchyard to Hell Hole–Middle Fork Tunnel Gatehouse and Shaft to Dormitory Facility and Camp to Hell Hole Powerhouse
Powerline – Hell Hole Powerhouse to Hell Hole Substation
Communication/Powerline – Middle Fork Powerhouse to Penstock Butterfly Valve House and Microwave/Radio Repeater Station
Powerline – Middle Fork Powerhouse to Middle Fork American River above Middle Fork Powerhouse near Foresthill Gage (Gage No. 11427760)
Communication/Powerline – Interbay Dam to Middle Fork Powerhouse
Communication/Powerline – Ralston Powerhouse to Penstock Butterfly Valve House
Communication/Powerline – Middle Fork-Ralston Tunnel Butterfly Valve House to Middle Fork-Ralston Tunnel Surge Shaft, Tank and Storage Building
Communication – Ralston-Oxbow Tunnel Intake Gatehouse to Ralston Powerhouse
Communication/Powerline – Ralston Afterbay Dam to Ralston-Oxbow Tunnel
Communication/Powerline – Oxbow Powerhouse to Ralston Afterbay Dam

Table 5-1. Existing Project Facilities, Roads, Trails and Recreation Facilities (continued).

Project Communication and Powerlines (continued)
Substations
Hell Hole Substation
Project Support Facilities
Buildings
Operator Cottages and Shop
Dormitory Facility
Microwave Reflectors and Radio Towers
Passive Microwave Reflector Station above Interbay Reservoir
Radio Tower and Repeater near Hell Hole - Middle Fork Surge Shaft
Passive Microwave Reflector Station above Ralston Afterbay
Foresthill Radio Tower
Boat Ramps
Ralston Afterbay Boat Ramp
Project Roads
Duncan Creek and French Meadows Area
Duncan Creek Diversion Road
French Meadows-Hell Hole Tunnel Gatehouse Road
French Meadows Dam Outlet Access Road
French Meadows Dam Gage Access Road
Hell Hole Dam Area
French Meadows-Hell Hole Tunnel Portal Road
French Meadows Powerhouse Access Road
Hell Hole-Middle Fork Tunnel Inlet/Gatehouse Access Road
Hell Hole Dormitory Access Road
Hell Hole Powerhouse/Gage and Weir Access Road
Long Canyon Area
North Fork Long Canyon Access Road
Spur Road to North Fork Long Canyon Diversion
Spur Road to South Fork Long Canyon Diversion
Interbay Area
North Fork Long Canyon Crossing Access Road
Hell Hole-Middle Fork Tunnel Access Road
Hell Hole-Middle Fork Tunnel/Butterfly Valve House (14N55) Access Road
Middle Fork Penstock Access Road
Middle Fork Powerhouse Access Road
Middle Fork Powerhouse Switchyard Access Road
Interbay Dam Road
Ralston-Oxbow Area
Brushy Canyon Adit Access (FR 14N30)
Middle Fork-Ralston Tunnel Surge Tank Access Road
Ralston-Oxbow Tunnel Inlet Access Rd
Oxbow Powerhouse Access Rd
Ralston Afterbay Boat Ramp Access Road
Project Trails
Duncan Creek Diversion Upper Gage Access Trail
Duncan Creek Diversion Lower Gage Access Trail
Duncan Creek Gatehouse Access Trail
Rubicon River below Hell Hole Dam Gage Weir Access Trail
Middle Fork American River at French Meadows Gage and Weir
Middle Fork American River Gage Access Trail

Table 5-1. Existing Project Facilities, Roads, Trails and Recreation Facilities (continued).

Recreation Facilities
Ahart Campground
Coyote Group Campground
French Meadows Boat Ramp
French Meadows Campground
French Meadows Picnic Area
Gates Group Campground
Lewis Campground
McGuire Boat Ramp
McGuire Picnic Area and Beach
Poppy Campground
Big Meadows Campground
Hell Hole Boat Ramp
Hell Hole Campground
Hell Hole Vista
Upper Hell Hole Campground
Middle Meadows Group Campground
Ralston Picnic Area

Table 5-2. Project Facility Summaries.

DUNCAN CREEK DIVERSION	
DAM	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	32 ft
Dam Crest Length	165 ft
Volume	1,750 cubic yards
Elevation of Dam Crest	5,275 ft
Elevation of Streambed	5,243 ft
Elevation of Spillway Crest	5,265 ft
Stream Maintenance Pipe Capacity	8 cfs
SPILLWAY	
Type	Uncontrolled Overflow
Width	100 ft
Capacity	7,200 cfs
RESERVOIR	
Gross Storage	20 ac-ft
DUNCAN CREEK – MIDDLE FORK TUNNEL	
Nominal Size and Shape	9'-0" W x l0'-0" H / Horseshoe
Length:	
Total	7,864 ft or 1.5 miles
Concrete Lined (Est.)	300 ft
Maximum Diversion Capacity	400 cfs
Invert Gradient	0.0029
FRENCH MEADOWS DAM (LL ANDERSON DAM) AND FRENCH MEADOWS RESERVOIR	
DAM	
Type	Composite
Material	Rock and Gravel Fill
Height of Dam Crest above Streambed	231 ft
Dam Crest Length	2,700 ft
Dam Crest Width	32 ft
Elevation of Dam Crest	5,273 ft
Elevation of Streambed	5,040 ft
Elevation of Spillway Crest	5,244.5 ft
Volume	3,510,000 cubic yards
Slopes – Upstream	2:1
Slopes – Downstream	1.8:1 and 2.0:1
Stream Maintenance Pipe Capacity	8 cfs
Maximum Low Level Outlet Capacity at Water Surface 5262 (full reservoir)	1,430 cfs
SPILLWAY	
Type	Gated Ogee Crest
Type of Gates	Radial
Number of Gates	2
Size of Gates	20' W x 18.5' H
Capacity (Res. Water Surface 5271.0, 2' freeboard)	19,800 cfs
RESERVOIR	
Maximum Operating Water Surface	5,262.0 ft
Minimum Operating Water Surface	5,125 ft
Gross Storage	134,993 ac-ft

Table 5-2. Project Facility Summaries (continued).

FRENCH MEADOWS DAM (LL ANDERSON DAM) AND FRENCH MEADOWS RESERVOIR (continued)	
RESERVOIR (continued)	
Dead Storage (as constructed), at Tunnel Intake lip	7,635 ac-ft
Active Storage (as constructed)	127,358 ac-ft
Area at Maximum Operating Water Surface	1,408 acres
Area at Minimum Operating Water Surface	434 acres
Depth at Minimum Operating Water Surface	77 ft
Shoreline at Maximum Operating Water Surface	9 miles
FRENCH MEADOWS — HELL HOLE TUNNEL	
Nominal Size and Shape	12'-4" Horseshoe
Length:	
Total	13,694 ft or 2.6 miles
Concrete Lined (Est.)	1,617 ft
Steel Lined (Est.)	317 ft
Maximum Discharge	400 cfs
Invert Gradient	0.0025
FRENCH MEADOWS POWERHOUSE	
PENSTOCK	
Length	691 ft or 0.1 miles
Diameter	6'-3" O.D.
POWER PLANT	
Installed Capacity, Generator	15.3 MW
Type of Turbine	Francis
Maximum Tail Water Surface	4,630 ft
Minimum Tail Water Surface	4,608 ft
Maximum Static Head	654 ft
Minimum Static Head	517 ft
Elevation Runner	4,612 ft
R.P.M.	450
HELL HOLE DAM AND RESERVOIR	
DAM	
Type	Rockfill
Height of Dam Crest above Streambed	410 ft
Dam Crest Length	1,570 ft
Dam Crest Width	35 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,240 ft
Volume	8,440,000 cubic yards
Slopes - Upstream	2.5:1
Slopes - Downstream	1.4:1
Stream Maintenance Pipe Capacity	20 cfs
Maximum Low Level Outlet Capacity at water surface 4,630 (full reservoir)	852 cfs
SPILLWAY	
Type	Uncontrolled
Elevation of Spillway Crest	4,630 ft
Width at Lip	350 ft
Capacity (Water Surface 4647.1, 2.8' freeboard)	89,500 cfs

Table 5-2. Project Facility Summaries (continued).

HELL HOLE DAM AND RESERVOIR (continued)	
RESERVOIR	
Maximum Operating Water Surface	4,630 ft
Minimum Operating Water Surface	4,340 ft
Gross Storage	207,590 ac-ft
Dead Storage (as constructed), at Tunnel Intake lip	2,533 ac-ft
Active Storage (as constructed)	205,057 ac-ft
Area at Maximum Operating Water Surface	1,253 acres
Area at Minimum Operating Water Surface	185 acres
Depth at Minimum Operating Water Surface	88 ft
Shoreline at Maximum Operating Water Surface	11 miles
HELL HOLE POWERHOUSE	
Installed Capacity, Generator	0.725 MW
Normal Operating Tail Water Surface	4,240 ft
Maximum Static Head	391 ft
Minimum Static Head	101 ft
R.P.M.	1,200
HELL HOLE — MIDDLE FORK TUNNEL	
Nominal Size and Shape	l3'-5" Horseshoe
Length	
Total	55,006 ft or 10.4 miles
Concrete Lined (Est.)	6,780 ft
Steel Lined (Est.)	5,180 ft
Nominal Maximum Discharge, at full reservoir	920 cfs
Invert Gradient	0.0035 and 0.0077
NORTH FORK LONG CANYON DIVERSION	
DAM	
Type	Gravity
Material	Concrete
Height of Dam above Streambed	10 ft
Dam Crest Length	120 ft+
Elevation of Dam Crest	4,720 ft
Elevation of Streambed	4,710 ft
Volume	636 cubic yards
Stream Maintenance Pipe Capacity	2 cfs
SPILLWAY	
Type	Uncontrolled Overflow
Elevation of Spillway Crest	4,716 ft
Width of Spillway Crest	95 ft
Capacity	3,000 cfs

Table 5-2. Project Facility Summaries (continued).

PIPE AND SHAFT TO HELL HOLE MIDDLE FORK TUNNEL	
PIPE	
Diameter	36 In.
Length	3,530 ft or 0.7 miles
SHAFT	
Diameter	6 ft
Depth without 6 ft x 20 ft Standpipe	403 ft
Capacity	100 cfs
Invert Gradient	Vertical
SOUTH FORK LONG CANYON DIVERSION	
DAM	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	27 ft
Dam Crest Length	145 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,623 ft
Volume	1,341 cubic yards
Stream Maintenance Pipe Capacity	5 cfs
SPILLWAY	
Type	Uncontrolled Overflow
Width of Spillway Crest	60 ft
Elevation of Spillway Crest	4,640 ft
Capacity	4,000 cfs
SHAFT TO HELL HOLE - MIDDLE FORK TUNNEL	
Diameter	6 ft
Depth without 6’ x 6 ft Standpipe	387 ft
Capacity	200 cfs
Invert Gradient	Vertical
MIDDLE FORK POWERHOUSE *(L.J. STEPHENSON POWERHOUSE)*	
PENSTOCK	
Length	3,653 ft or 0.7 miles
Diameter: Above Bifurcation	9’-0” O.D. to 7-6” O.D.
Diameter: Below Bifurcation	5’-6” O.D.
POWERPLANT	
Number of Units	2
Generator Installed Capacity (Total)	122.4 MW
Type of Turbine	Impulse
Elevation Nozzles	2,536 ft
Elevation Normal Tail Water Surface	2,529 ft
Maximum Static Head	2,096 ft
Minimum Static Head	1,806 ft
R. P. M.	400

Table 5-2. Project Facility Summaries (continued).

MIDDLE FORK INTERBAY	
DAM	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	70.5 ft
Dam Crest Length	233 ft
Elevation of Dam Crest	2,535.5 ft
Elevation of Streambed	2,465 ft
Volume	14,360 cubic yards
Stream Maintenance Pipe Capacity	23 cfs
Low level Outlet Capacity at water surface 2530.0 (full reservoir)	890 cfs
Roadway Width, curb to curb	14 ft
Elevation of Roadway	2,537.67 ft
SPILLWAY	
Type	Gated Ogee Crest
Capacity (Water Surface 2534)	36,506 cfs
Width of Spillway	80 ft Gated, 60 ft Uncontrolled
Number of Gates	4
Type of Gates	Radial
Size of Gates	20’ H x 20’ W
Elevation of Top of Gates	2,530 ft
Elevation of Sill of Gates	2,510 ft
IMPOUNDMENT	
Maximum Operating Water Surface	2,529 ft
Minimum Operating Water Surface	2,502 ft
Normal Operating Water Surface	2,527 ft
Gross Storage	175 ac-ft
Dead Storage (as constructed), at Tunnel Intake lip	2 ac-ft
Active Storage (as constructed)	173 ac-ft
Area at Maximum Operating Water Surface	7 acres
Area at Minimum Operating Water Surface	3 acres
Depth at Minimum Operating Water Surface	37 ft
MIDDLE FORK — RALSTON TUNNEL	
Nominal Size and Shape	l3’-5” Horseshoe
Length	
Total	35,397 ft or 6.7 miles
Concrete Lined (Est.)	8,245 ft
Steel Lined (Est.)	245 ft
Maximum Discharge	836 cfs
Invert Gradient	0.0054

Table 5-2. Project Facility Summaries (continued).

RALSTON POWERHOUSE	
PENSTOCK	
Length	1,670 ft
Diameter	9'-6" O.D. to 8'-O" O.D.
POWERPLANT	
Installed Capacity, Generator	79.2 MW
Type of Turbine	Impulse
Elevation Nozzles	1,186 ft
Static Head	1,344 ft
Maximum flow	924 cfs
R. P. M.	240
RALSTON AFTERBAY	
DAM	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	89 ft
Dam Crest Length	560 ft
Volume	76,300 cubic yards
Elevation of Dam Crest	1,189 ft
Elevation of Streambed	1,100 ft
Streamflow Maintenance Pipe Capacity	155 cfs
Maximum Low Level Outlet Capacity at water surface el. 1179.0 (full reservoir) - calculated	1,132 cfs
Roadway Width, Curb to Curb	12 ft
Elevation of Roadway	1,188.42 ft
SPILLWAY	
Type	Gated Ogee Crest
Capacity at Water Surface 1186	171,200 cfs
Elevation of Top of Gates	1,179 ft
SPILLWAY (continued)	
Elevation of Sill of Gates	1,149 ft
Crest Length	232 ft
Number of Gates	5
Type of Gates	Radial
Size of Gates	30' H x 40' W
IMPOUNDMENT	
Gross Storage	2,782 ac-ft
RALSTON-OXBOW TUNNEL	
Nominal Size and Shape	13'-3" Horseshoe
Length:	
Total	403 ft or 0.08 miles
Concrete Lined	343 ft
Steel Lined	60 ft
Maximum Discharge	1,088 cfs
Invert Gradient	0.12035

Table 5-2. Project Facility Summaries (continued).

OXBOW POWERHOUSE	
PENSTOCK	
Length	5 ft
Diameter	9'-O" I.D.
POWERPLANT	
Installed Capacity, Generator	6.1 MW
Type of Turbine	Francis
Elevation Runner	1,098.5 ft
Static Head	90 ft
Normal Tail Water Surface	1,089 ft
Maximum flow	1,025 cfs
R. P. M.	200
SUMMARY – PROJECT FEATURES	
Power and Energy Production	
Total Installed Capacity (at 0.9 power factor)	223.75 MW
Total Dependable Capacity (at 0.9 power factor)	210.1 MW
Average Annual Energy Production (Based on 38 years of operation: 1967-2004)	1,026,975 MW Hours
Maximum Total Static Head	4,162
Water Supply and Regulation	
Total Gross Storage	345,560 Acre Feet
Project Features	
Earth and Rockfill Dams	11,900,000 Cubic yards
Concrete Dams and Diversions	94,000 Cubic yards
Tunnels and Penstocks	23.2 miles
Project Completed – 1967	

Table 5-3. Summary of Water Rights Permits

Permit No.	Type of Use	Reference	Source	Direct Diversion		Off-Stream Storage	
13855	Power/ Incidental Recreation	CSWRB (a) –1(a)., p. WR-1	Duncan Creek to French Meadows Reservoir	150 cfs	Jan 1–Dec 31	25,000 af 400 cfs max.	Nov. 1–Jul 1
		CSWRB (a) –1(b)., p. WR-1	Middle Fork Am. at French Meadows Reservoir	290 cfs	Jan 1–Dec 31	95,000 af	Nov. 1–Jul 1
		CSWRB (a) –1(c)., p. WR-1	Rubicon River at Hell Hole Reservoir	657 cfs	Jan 1–Dec 31	129,000 af	Nov. 1–Jul 1
		CSWRB (a) –1(d)., p. WR-1	South Fork Long Canyon to Hell Hole Reservoir or Middle Fork Power Plant	400 cfs	Jan 1–Dec 31		
		CSWRB (a) –1(e)., p. WR-1	North Fork Long Canyon to Hell Hole Reservoir or Middle Fork Power Plant	100 cfs	Jan 1–Dec 31		
		CSWRB (a) –1(f)., p. WR-1	Middle Fork Am. River at Ralston Interbay	1,000 cfs	Jan 1–Dec 31		
		CSWRB (a) –1(f)., p. WR-1	Middle Fork Am. River at Ralston Afterbay	1,225 cfs	Jan 1–Dec 31		
13856	Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	CSWRB (a) –2(d)., p. WR-2	Duncan Creek to French Meadows Reservoir			25,000 af 400 cfs max	Nov. 1–Jul 1
		CSWRB (a) –2(c)., p. WR-2	Middle Fork Am. River to French Meadows Reservoir			95,000 af	Nov. 1–Jul 1
		CSWRB (a) –1(c)., p. WR-1	Rubicon River to Hell Hole Reservoir	657 cfs	Jan 1–Dec 31	129,000 af	Nov. 1–Jul 1
13857	Power/ Incidental Recreation	CSWRB (a) –3(a)., p. WR-2	Duncan Creek	50 cfs	Jan1–Dec 31		
		CSWRB (a) –3(b)., p. WR-2	Middle Fork Am. River to French Meadows Reservoir	110 cfs	Jan1–Dec 31	10,000 af	Nov. 1–Jul 1
		CSWRB (a) –3(c)., p. WR-2	Rubicon River at Hell Hole Reservoir	155 cfs	Jan1–Dec 31	36,000 af	Nov. 1–Jul 1
		CSWRB (a) –3(d)., p. WR-2	South Fork Long Canyon French to Hell Hole Reservoir			13,000 af 830 cfs max.	Nov. 1–Jul 1
		CSWRB (a) –3(e)., p. WR-2	North Fork Long Canyon to Hell Hole Reservoir			7,000 af 830 cfs max.	Nov. 1–Jul 1
		CSWRB (a) –3(f)., p. WR-2	Middle Fork American River to Ralston Afterbay	705 cfs	Jan 1–Dec 31		

Table 5-3. Summary of Water Rights Permits (continued).

Permit No.	Type of Use	Reference	Source	Direct Diversion		Off-Stream Storage	
13858	Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	CSWRB (a) –4(a)., p. WR-2	North Fork American River	800 cfs	Nov. 1 – Jul 1		
		CSWRB (a) –4(b)., p. WR-2	Middle Fork American River to French Meadows Dam			10,000 af	Nov. 1 – Jul 1
		CSWRB (a) –4(c)., p. WR-2	Rubicon River at Hell Hole Reservoir.			36,000 af	Nov. 1 – Jul 1
		CSWRB (a) –4(d)., p. WR-2	South Fork Long Canyon to Hell Hole Reservoir			13,000 af 830 cfs max.	Nov. 1 – Jul 1
		CSWRB (a) –4(f)., p. WR-2	North Fork Long Canyon to Hell Hole Reservoir.			7,000 af 830 max.	Nov. 1 – Jul 1
13855-13858	Power/ Incidental Recreation Irrigation, and Incidental Domestic, Recreational, Municipal and Industrial	CSWRB (a) – 5., p. WR-3 Permit	To French Meadows Reservoir			Maximum 133,700 af	
		CSWRB (a) – 5., p. WR-3	To Hell Hole Reservoir			Maximum 208,400 af	
20754[1]	Power/ Incidental Recreation	CSWRB (a)	Hell Hole Reservoir	20 cfs	May 16 – Dec 14		
		CSWRB (a)	Hell Hole Reservoir	30 cfs	Dec 15 – May 15		
		CSWRB (a)	Hell Hole Reservoir	Maximum 17,640 af/yr.			

[1]Also known as Permit 20750.

Source:
State of California Water Rights Board (CSWRB). Decision D-1104. Decision Approving Applications in the Matter of Application 18084, 18085, 18086, and 18087. November 21, 1962.
CSWRB. Permit Number 20754 issued 8-18-1994.

Table 5-4. Minimum Pool and Minimum Stream Maintenance Flow Requirements.

Facility	License Requirement
Minimum Pool Requirements	
French Meadows Reservoir	Minimum Pool (a/f) Forecast / Folsom Reservoir [1] — June-Sept — Oct-May > 2,000,000 a/f — 60,000 — 50,000 1,200,000 – 2,000,000 a/f — 60,000 — 25,000 < 1,200,000 a/f — 28,000 — 8,700
Hell Hole Reservoir	Minimum Pool (a/f) Forecast / Folsom Reservoir [1] — June-Sept — Oct-May > 2,000,000 a/f — 70,000 — 50,000 1,200,000 – 2,000,000 a/f — 70,000 — 25,000 < 1,200,000 a/f — 26,000 — 5,500
Duncan Creek Diversion	Maintain water surface elevation at 5,259 feet elev.
Minimum Stream Maintenance Flow	
Duncan Creek Diversion Dam	Forecast / Folsom Reservoir[1] — Release (cfs) > 1,000,000 a/f — lesser of 8 or natural flow < 1,000,000 a/f — lesser of 4 or natural flow
French Meadows Dam	Beginning of operations to March 17,1981: Forecast / Folsom Reservoir[1] — Release (cfs) > 1,000,000 a/f — 8 at all times Except that total releases shall not exceed 5,800 a/f < 1,000,000 a/f — 4 at all times Except that total releases shall not exceed 2,900 a/f March 18, 1981, and thereafter – no limitation of total release.
Hell Hole Dam	Beginning of operations to March 17, 1981: Forecast / Folsom Reservoir[1] — Release (cfs) > 1,000,000 a/f — 20 June 1 – July 25; 15 July 26 – Aug 5; 10 Aug 6 – Oct 31; 14 Nov 1 – Jan 31; 20 Feb 1 – May 31 Except that total releases shall not exceed 11,000 a/f. < 1,000,000 a/f — 8 June 1 – Dec 1; 6 Jan 1 – March 25; 8 March 26 – May 31 Except that total releases shall not exceed 5,500 a/f. March 18, 1981, and thereafter: Forecast / Folsom Reservoir[1] — Release (cfs) > 1,000,000 a/f — 20 May 15 – Dec 14; 10 Dec 15 – May 14 No limitation of total release. < 1,000,000 a/f — 10 June 1 – Oct 14; 6 Oct 15 – May 31 No limitation of total release.
South Fork Long Canyon Diversion Dam	Forecast / Folsom Reservoir[1] — Release (cfs) > 1,000,000 a/f — lesser of 5 or natural flow < 1,000,000 a/f — lesser of 2.5 or natural flow
North Fork Long Canyon Diversion Dam	Releases to maintain stream flow of 2 cfs or the natural flow, whichever is less, shall be made at all times.

Table 5-4. Minimum Pool and Minimum Stream Maintenance Flow Requirements (continued).

Facility	License Requirement	
Minimum Stream Maintenance Flow (continued)		
Middle Fork Interbay	Forecast / Folsom Reservoir > 1,000,000 a/f < 1,000,000 a/f	Release (cfs) lesser of 23 or natural flow 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.	

[1]Forecast / Folsom Reservoir = CDWR current year forecast of unimpeded run-off of the American River to Folsom Reservoir.

Table 5-5. Project Facilities Operations and Maintenance.

Facility Name	Project Operations							Project Maintenance												
						Facility Testing		Debris Mgmt			Sediment Mgmt				Vegetation and Pest Mgmt					
	Minimum Instream Flow Requirement	Minimum Pool Requirement	Whitewater Flow Releases	Tunnel Inspection	Sirens / Alarms	Powerhouse Inspections & Maint	Gate / Valve Testing	Large Woody Debris	Cleaning Trash Racks	Log Booms	Physical Removal w/Equipment [1]	Hydraulic Sluicing	Gunite (erosion control)	Slope Fences (rock fall control)	Trimming by Hand	Herbicide Use	Rodenticide Use	Gravel Enhancement	Facility Painting	Pole Replacement
Large Dams																				
French Meadows Dam	X						A								A					
Hell Hole Dam	X			A[5]											A					
Medium Dams																				
Interbay Dam	X				X							I[3]		X	A					
Ralston Afterbay Dam	X[2]						A					I			A			X		
Small Dams																				
Duncan Creek Diversion Dam	X											I[4]								
North Fork Long Canyon Diversion Dam	X											I[4]								
South Fork Long Canyon Diversion Dam	X											I[4]								
Large Reservoirs																				
French Meadows Reservoir		X								X										
Hell Hole Reservoir		X						I		X										
Medium Reservoir																				
Middle Fork Interbay		X						I	R	X	I									
Ralston Afterbay								I	R	X	I									
Small Diversion Pools																				
Duncan Creek Diversion Pool									R	X	I									
North Fork Long Canyon Diversion Pool									R		I									
South Fork Long Canyon Diversion Pool									R		I									
Tunnels and Associated Infrastructure																				
Tunnels																				
Ralston - Oxbow Tunnel																A				
Surge Shafts and Adits																				
Hell Hole-Middle Fork Tunnel Surge Shaft and Tank															A				I	
Brushy Canyon Adit															A					
Middle Fork-Ralston Tunnel Surge Shaft, Tank and Storage Building															A				I	
Rollouts																				
North Fork Long Canyon Crossing/Removable Section															A				I	
Gatehouses and Shafts																				
Duncan Creek Gatehouse and Shaft															A					
French Meadows-Hell Hole Gatehouse and Shaft															A					
Hell Hole-Middle Fork Gatehouse and Shaft															A					
Middle Fork-Ralston Tunnel Intake Gatehouse															A					
Ralston-Oxbow Tunnel Intake Gatehouse															A					

Table 5-5. Project Facilities Operations and Maintenance (continued).

Facility Name	Project Operations							Project Maintenance												
						Facility Testing		Debris Mgmt			Sediment Mgmt				Vegetation and Pest Mgmt					
	Minimum Instream Flow Requirement	Minimum Pool Requirement	Whitewater Flow Releases	Tunnel Inspection	Sirens / Alarms	Powerhouse Inspections & Maint	Gate / Valve Testing	Large Woody Debris	Cleaning Trash Racks	Log Booms	Physical Removal w/Equipment [1]	Hydraulic Sluicing	Gunite (erosion control)	Slope Fences (rock fall control)	Trimming by Hand	Herbicide Use	Rodenticide Use	Gravel Enhancement	Facility Painting	Pole Replacement
Penstocks / Butterfly Valve Houses																				
French Meadows Powerhouse Penstock and Butterfly Valve House															A				I	
Middle Fork Powerhouse Penstock and Butterfly Valve House													I		A				I	
Ralston Powerhouse Penstock and Butterfly Valve House															A				I	
Powerhouses																				
French Meadows Powerhouse and Switchyard						A								X	A		A			
Hell Hole Powerhouse						A									A		A			
Middle Fork Powerhouse and Switchyards						A								X	A	A	A			
Oxbow Powerhouse and Switchyard			A			A								X	A	A	A			
Ralston Powerhouse and Switchyard						A								X	A	A	A			
Project Communication and Powerlines																				
Communication/Powerline – French Meadows Powerhouse and Switchyard to French Meadows Butterfly Valve House															A					I
Communication/Powerline – French Meadows Powerhouse and Switchyard to Hell Hole–Middle Fork Tunnel Gatehouse and Shaft to Dormitory Facility and Camp to Hell Hole Powerhouse															A					I
Powerline – Hell Hole Powerhouse to Hell Hole Substation															A					I
Communication/Powerline – Middle Fork Powerhouse to Penstock Butterfly Valve House and Microwave/Radio Repeater Station															A					I
Powerline – Middle Fork Powerhouse to Middle Fork American River above Middle Fork Powerhouse near Foresthill Gage (Gage No. 11427760)															A					I
Communication/Powerline – Interbay Dam to Middle Fork Powerhouse															A					I
Communication/Powerline – Ralston Powerhouse to Penstock Butterfly Valve House															A					I
Communication – Ralston-Oxbow Tunnel Intake Gatehouse to Ralston Powerhouse															A					I
Communication/Powerline – Ralston Afterbay Dam to Ralston-Oxbow Tunnel															A					I
Communication/Powerline – Oxbow Powerhouse to Ralston Afterbay Dam															A					I
Substations																				
Hell Hole Substation															A					
Project Support Facilities																				
Buildings																				
Operator Cottages and Shop															A		A		I	
Dormitory Facility															A		A		I	

Table 5-5. Project Facilities Operations and Maintenance (continued).

Facility Name	Project Operations							Project Maintenance												
						Facility Testing		Debris Mgmt			Sediment Mgmt				Vegetation and Pest Mgmt					
	Minimum Instream Flow Requirement	Minimum Pool Requirement	Whitewater Flow Releases	Tunnel Inspection	Sirens / Alarms	Powerhouse Inspections & Maint	Gate / Valve Testing	Large Woody Debris	Cleaning Trash Racks	Log Booms	Physical Removal w/Equipment [1]	Hydraulic Sluicing	Gunite (erosion control)	Slope Fences (rock fall control)	Trimming by Hand	Herbicide Use	Rodenticide Use	Gravel Enhancement	Facility Painting	Pole Replacement
Project Support Facilities (continued)																				
Microwave Reflectors																				
Passive Microwave Reflector Station above Interbay Reservoir															I					
Radio Tower and Repeater near Hell Hole - Middle Fork Surge Shaft															I					
Passive Microwave Reflector Station above Ralston Afterbay															I					
Foresthill Microwave Reflector Station																				

Status:

A = Activity occurs on an annual basis
I = Activity occurs on an infrequent basis
R = Completed as needed during diversion season
X = Activity occurs or ancillary facility is present

[1] Sediment removal with equipment occurs as needed following high flow events.
[2] Minimum instream flow requirements at Oxbow Powerhouse.
[3] Hydraulic sluicing has not occurred at this facility since 1976.
[4] Sluice gates are present at these facilities but they are not effective.
[5] Inspection of accessibility downstream 1000’ of outlet conduit.

Table 5-6. Project Roads and Trails Maintenance.

Name	Geographic Area	Start	End	Length (miles)	Configuration/ Surface	Road Maintenance				Signage	Gates	Vegetation Trimming by Hand
						Grading	Surface Maintenance	Snow Removal/Sanding	Culverts/Ditches/Water Bars			
PROJECT ROADS												
Duncan Creek Diversion Road	Duncan Creek/ French Meadows	FR 96 (Mosquito Ridge Road)	Duncan Creek Diversion	Approx. 1.9 mi.	16 ft.- single lane/gravel	I	I		I	X		A
French Meadows-Hell Hole Tunnel Gatehouse Road	Duncan Creek/ French Meadows	FR 96 (Mosquito Ridge Road)	French Meadows-Hell Hole Tunnel Gatehouse and Shaft	Approx. 0.25 mi.	Single lane/gravel	I	I		I	X		A
French Meadows Dam Outlet Access Road	Duncan Creek/ French Meadows	FR 22	French Meadows Dam Outlet Works	Approx. 0.4 mi.	Single lane/dirt	I	I		I		X	A
French Meadows Dam Gage Access Road	Duncan Creek/ French Meadows	FR 22	Gage 11427500	Approx 0.25 mi.	Single lane/dirt	I			I		X	A
French Meadows-Hell Hole Tunnel Portal Road	Hell Hole	FR 2 (Long Canyon-Hell Hole Access Road)	French Meadows Powerhouse / penstock / power & comm. Line	Approx. 0.6 mi.	Gravel	I					X	
French Meadows Powerhouse Access Road	Hell Hole	FR 2 (Long Canyon-Hell Hole Access Road)	French Meadows Powerhouse	Approx. 1.0 mi.	10 ft.- single lane/gravel	I	I		I	X		A
Hell Hole-Middle Fork Tunnel Inlet / Gatehouse Access Road	Hell Hole	FR 2 (Long Canyon-Hell Hole Access Road)	Hell Hole-Middle Fork Tunnel Inlet / Gatehouse	Approx. 0.2 mi.	Single lane/gravel	I	I		I		X	A
Hell Hole Dormitory Access Road	Hell Hole	FR 2 (Long Canyon-Hell Hole Access Road)	Camp/Dormitory/Cottages	Approx. 0.1 mi.	Single lane/gravel	I	I		I			A
Hell Hole Powerhouse / Gage and Weir Access Road	Hell Hole	FR 2 (Long Canyon-Hell Hole Access Road)	Hell Hole Powerhouse / Dam Outlet Works / Weir (Gage No. 4288)	Approx. 0.7 mi.	Single lane/gravel	I	I		I		X	A
North Fork Long Canyon Access Road	Long Canyon	FR 23 (Ralston Ridge Road)	North Fork Long Canyon Diversion (south approach)	Approx. 0.4 mi.	Single lane/dirt	I			I			A
Spur Road to North Fork Long Canyon Diversion	Long Canyon	FR 96 (Mosquito Ridge Road)	North side North Fork Long Canyon Diversion (north approach)	Approx. 0.1 mi.	Single lane/dirt	I			I			A
Spur Road to South Fork Long Canyon Diversion	Long Canyon	FR 2 (Long Canyon-Hell Hole Access Road)	South side South Fork Long Canyon Diversion	Approx. 0.1 mi.	Single lane/dirt	I			I			
North Fork Long Canyon Crossing Access Road	Long Canyon	FR 23 (Ralston Ridge Road)	North Fork Long Canyon Crossing Rollout Section Site	Approx. 6.2 mi.	Single lane/dirt not maintained							
Hell Hole-Middle Fork Tunnel Surge Shaft Access Road	Interbay	FR 14N56 (Hell Hole-Middle Fork Butterfly Valve House Access Road)	Hell Hole-Middle Fork Surge Tank / Shaft / Microwave Station	Approx. 0.1 mi.	Single lane/gravel	I	I		I			A
Hell Hole-Middle Fork Tunnel / Butterfly Valve House (14N55) Access Road	Hell Hole	FR 14N31 via Ralston Ridge Road	Hell Hole-Middle Fork Tunnel Portal (south approach)	Approx. 1 mi.	Single lane/gravel	I	I		I			A
Middle Fork Penstock Access Road	Interbay	Middle Fork Powerhouse	Hell Hole-Middle Fork Tunnel Portal (North approach)	Approx. 0.8 mi.	Single lane/gravel (steep gradient)	I	I		I			A
Middle Fork Powerhouse Access Road												
Middle Fork Powerhouse Switchyard Access Road												
Interbay Dam Road	Interbay	FR 96 (Mosquito Ridge Road)	Interbay Dam	Approx. 4.7 mi.	Two lane/paved	I	I	A	I	X		A

Table 5-6. Project Roads and Trails Maintenance (continued).

Name	Geographic Area	Start	End	Length (miles)	Configuration / Surface	Road Maintenance				Signage	Gates	Vegetation Trimming by Hand
						Grading	Surface Maintenance	Snow Removal/Sanding	Culverts/Ditches/Water Bars			
PROJECT ROADS (continued)												
Brushy Canyon Adit Access (FR 14N30)	Interbay	FR 23 (Ralston Ridge Road)	Brushy Canyon Adit (Middle Fork-Ralston Tunnel)	Approx. 2.5 mi.	12 ft.- single lane/dirt (not maintained)							
Middle Fork-Ralston Tunnel Surge Tank Access Road	Ralston-Oxbow											
Ralston-Oxbow Tunnel Inlet Access Rd	Ralston-Oxbow	Ralston Afterbay Rafting Access Rd	Oxbow Tunnel Inlet	Approx. 0.1 mi.	Single lane/gravel	I	I		I		X	A
Oxbow Powerhouse Access Rd	Ralston-Oxbow	Ralston Afterbay Rafting Access Rd	Oxbow Powerhouse	Approx. 0.1 mi.	Single lane/gravel	I	I		I	X	X	A
PROJECT TRAILS												
Duncan Creek Diversion Upper Gage Access Trail	Duncan Creek	Duncan Creek Diversion Road	Duncan Creek Diversion Upper Gage (Gage No. 4277-2)	Approx. 0.2 mi.	Unimproved Trail							A
Duncan Creek Diversion Lower Gage Access Trail	Duncan Creek	Duncan Creek Diversion Road	Duncan Creek Diversion Lower Gage (Gage No. 4277.5-3)	Approx. 0.1 mi.	Unimproved Trail							A
Duncan Creek Diversion Access Trail		Duncan Creek Diversion Road	Duncan Creek Diversion Dam	Approx. 0.01 mi.	Unimproved Trail							A
Rubicon River below Hell Hole Dam Gage Weir Access Trail	Hell Hole	Hell Hole Powerhouse Gage and Weir Access Rd	Rubicon River below Hell Hole Dam Gage and Weir (gage 11428800)	Approx. 0.01 mi.	Unimproved Trail							A
Middle Fork American River at French Meadows Gage and Weir	French Meadows	French Meadows Dam Gage Access Rd	Middle Fork American River at French Meadows Gage and Weir	Approx. 0.01 mi.	Unimproved Trail							A
Middle Fork American River Gage Access Trail	Interbay	Middle Fork Powerhouse Penstock Access Road	Middle Fork American River Gage (Gage No. 11427760)	Approx. 0.1 mi.	Unimproved Trail							A

Notes:
A = Activity occurs on an annual basis
I = Activity occurs on an infrequent basis
X = Activity occurs or ancillary facility is present

Table 5-7. Project Recreation Facilities Maintenance.

Name	Geographic Area	Project Maintenance [1]		
		Vegetation and Pest Management		
		Trimming by Hand	Fungicide Use [2]	Facility Painting
French Meadows Campground	French Meadows	A	I	I
Poppy Campground	French Meadows	A	I	I
Lewis Campground	French Meadows	A	I	I
Coyote Group Campground	French Meadows	A	I	I
Gates Group Campground	French Meadows	A	I	I
Ahart Campground	French Meadows	A	I	I
French Meadows Picnic Area	French Meadows		I	I
McGuire Picnic Area and Beach	French Meadows		I	I
French Meadows Boat Ramp	French Meadows	A		I
McGuire Boat Ramp	French Meadows			I
Upper Hell Hole Campground	Hell Hole	A	I	I
Hell Hole Campground	Hell Hole	A	I	I
Hell Hole Boat Ramp	Hell Hole	A		I
Hell Hole Vista	Hell Hole	A	I	I
Big Meadows Campground	Long Canyon	A	I	I
Middle Meadows Group Campground	Long Canyon	A	I	I
Ralston Afterbay Picnic Area	Ralston Oxbow	A	I	I

[1] Maintenance of project recreation facilities is completed by USDA-FS under collection agreements No. 03-CO-11051754-014 and 03-CO-11050353-012.

[2] Fungicide (Borax soap) is infrequently used on tree stumps in FS campgrounds and picnic areas to prevent the spread of fungus (E. Moore and J. Jue, USDA-FS, pers. comm., 3/29/06).

Notes:

A = Activity occurs on an annual basis

I = Activity occurs on an infrequent basis

FIGURES

Placeholder for Figures 5-1, 5-2

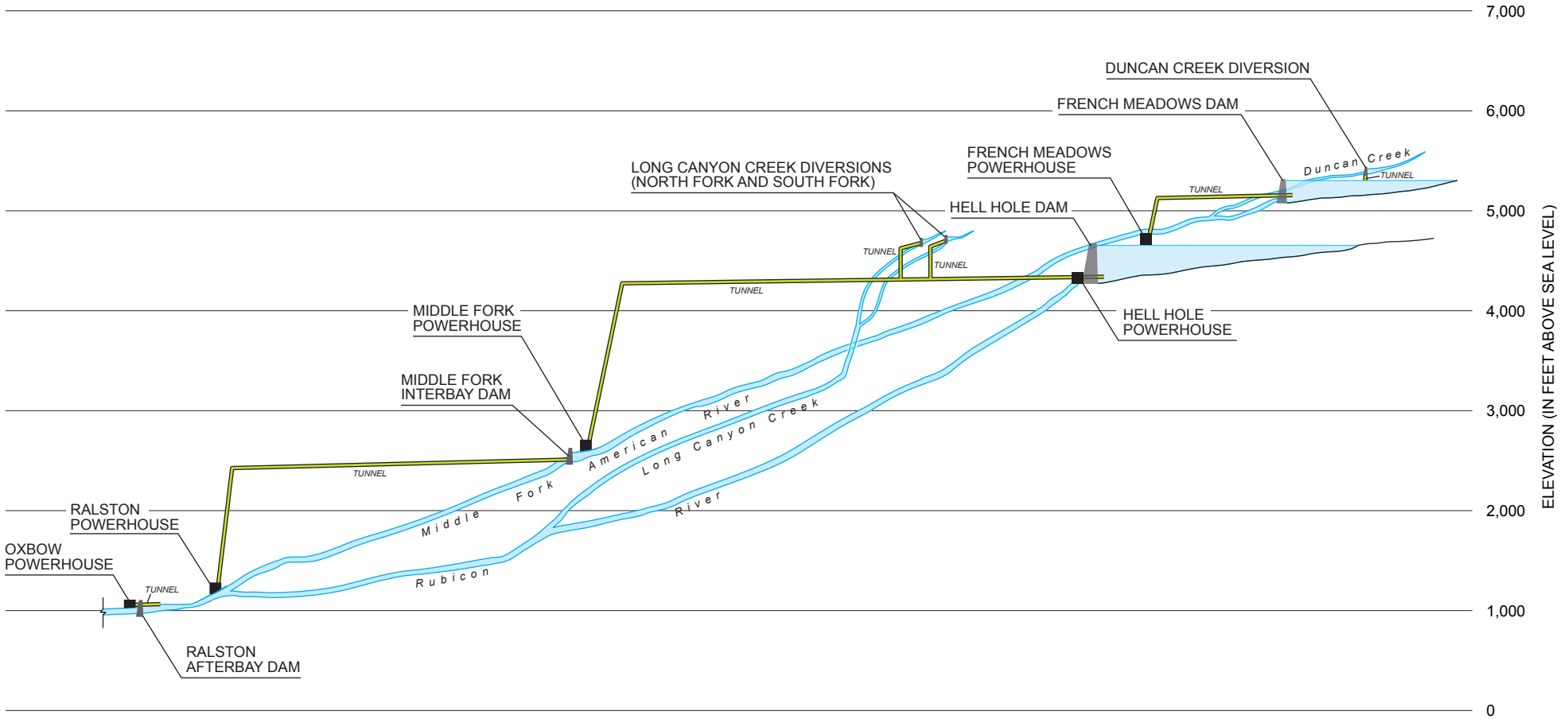
Figure 5-1 Principal Project Facilities

Figure 5-2 Project Schematic Diagram

Non-Internet Public Information

These Figures have been removed in accordance with the Commission regulations at 18 CFR Section 388.112.

These Figures are considered Non-Internet Public information and should not be posted on the Internet. This information may be accessed from the Placer County Water Agency's (PCWA) Public Reference Room, but is not expected to be posted on PCWA's Website, except as an indexed item.



pcwa Placer County Water Agency

Placer County Water Agency
Middle Fork American River Hydroelectric Project

Figure 5-3
Project Profile

Not to scale

Revision date: 5/22/06

Placeholder for Figures 5-3a -3d

Figure 5-3a Duncan Creek and French Meadows Areas

Figure 5-3b Hell Hole Reservoir and Long Canyon Area

Figure 5-3c Interbay Area

Figure 5-3d Ralston Afterbay and Oxbow Area

Non-Internet Public Information

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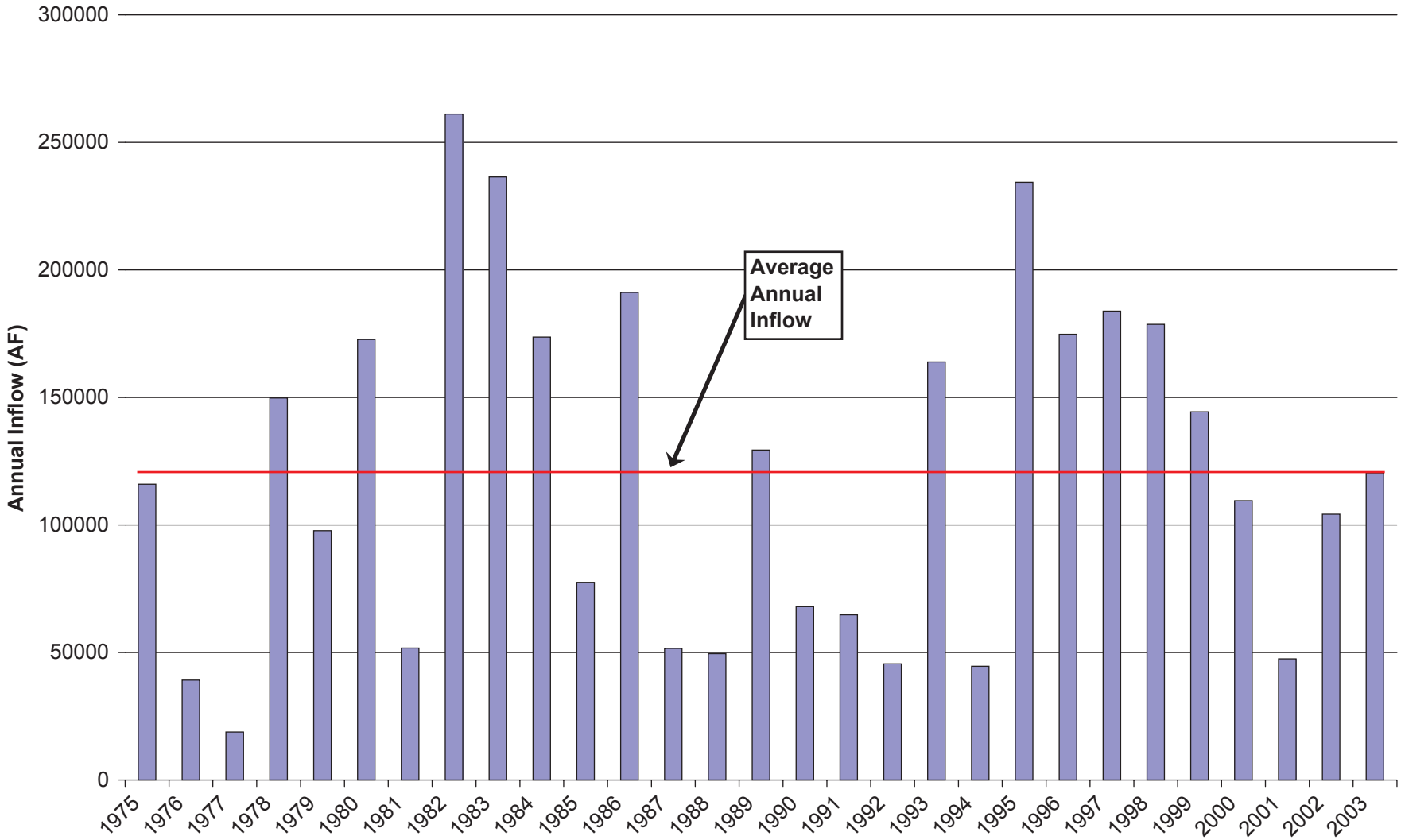

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Figure 5-4a

French Meadows Reservoir Annual Inflow

Revision date: 6/12/06

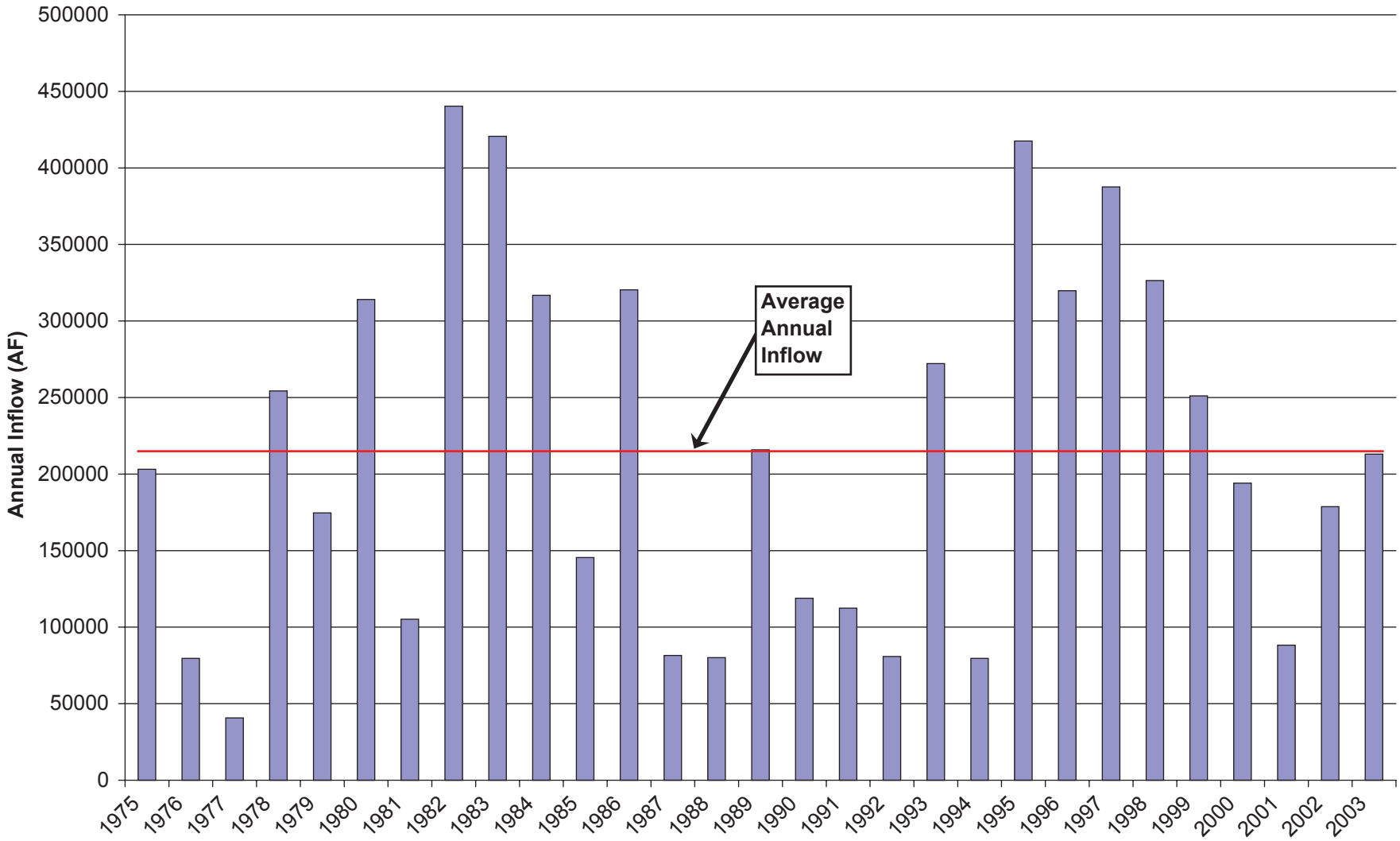

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Figure 5-4b

Hell Hole Reservoir Annual Inflow

Revision date: 6/12/06

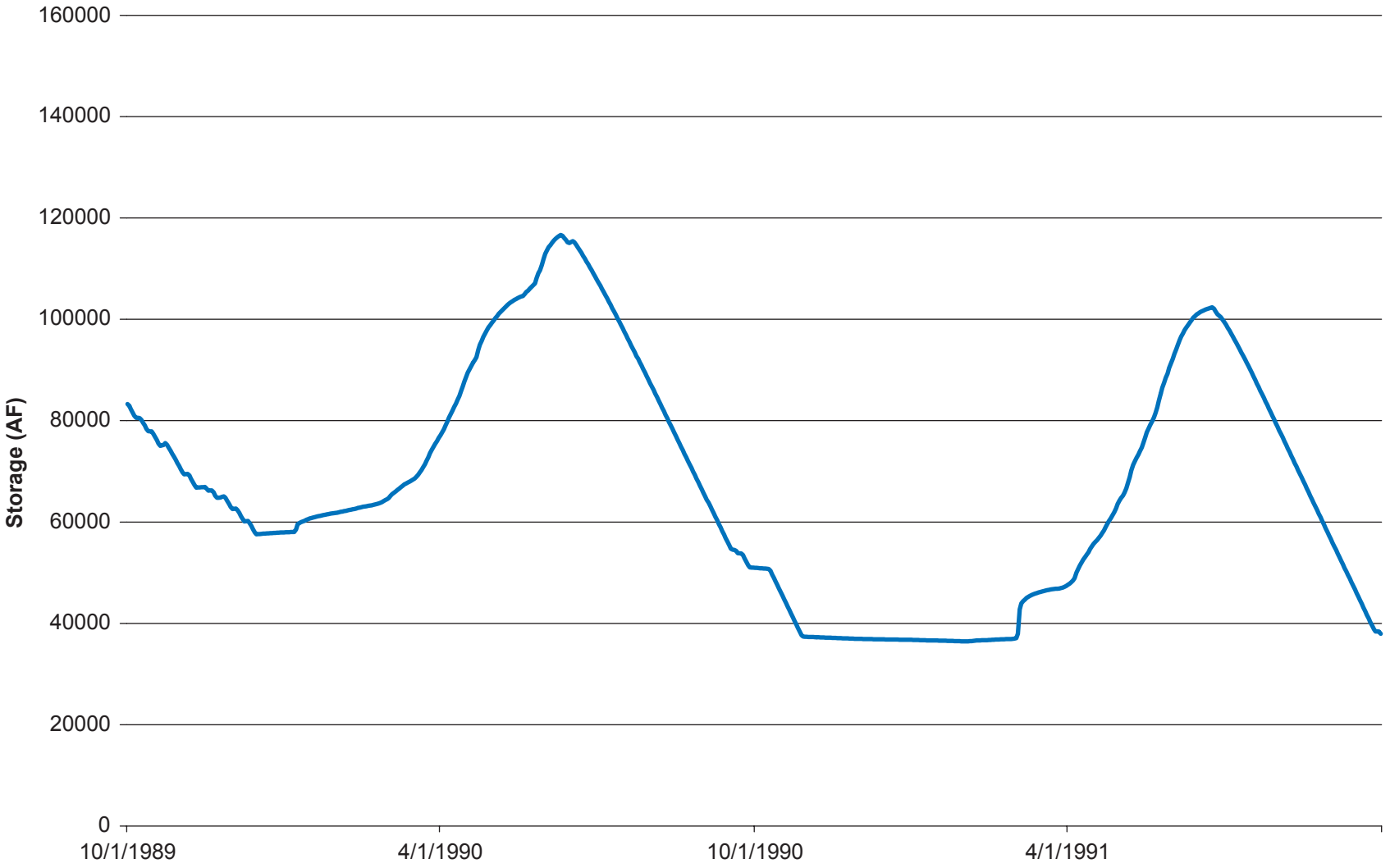

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Figure 5-5a

French Meadows Reservoir
Typical 2-year Storage Cycle

Revision date: 6/7/06

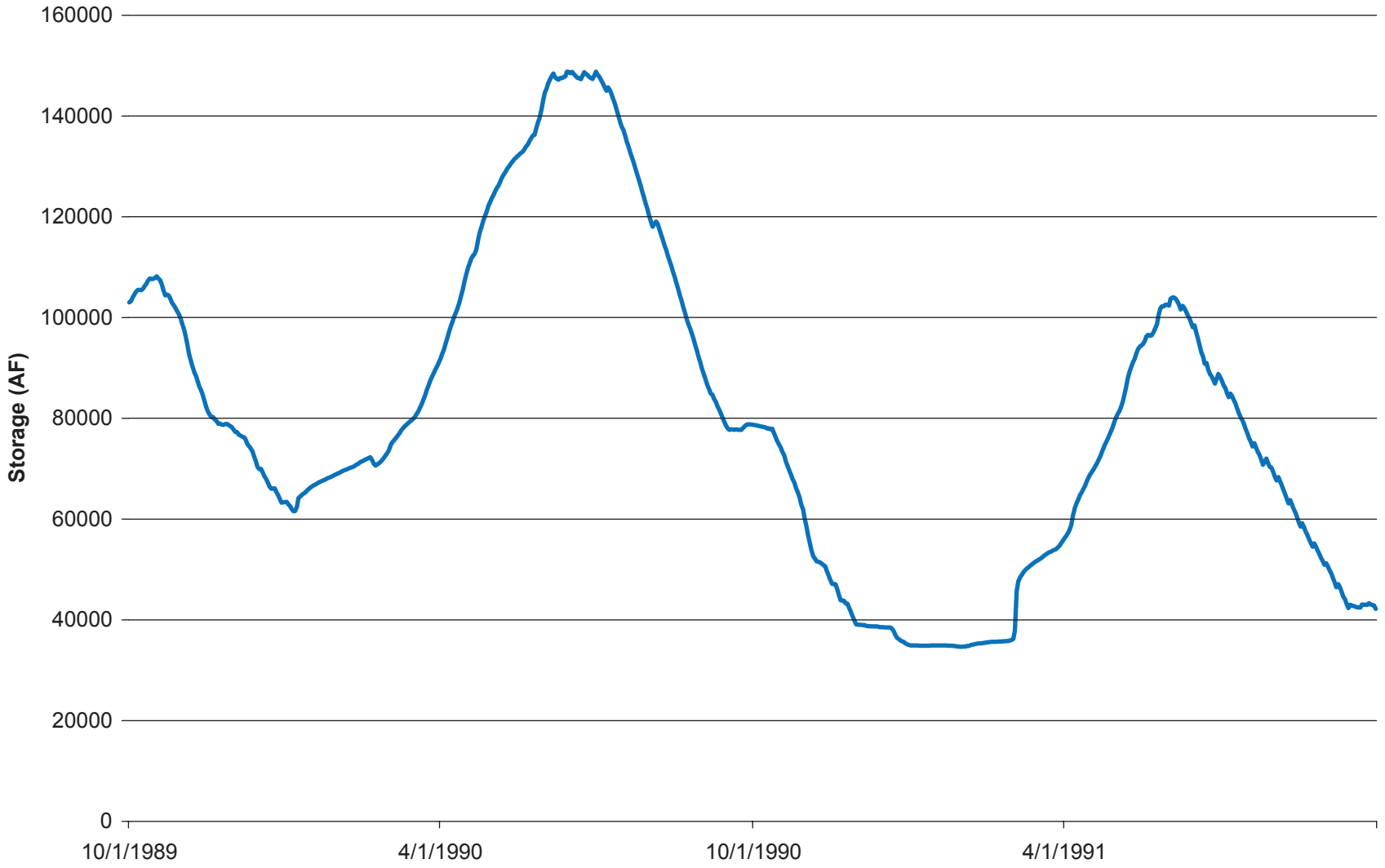

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Figure 5-5b

Hell Hole Reservoir
Typical 2-year Storage Cycle

Revision date: 6/7/06

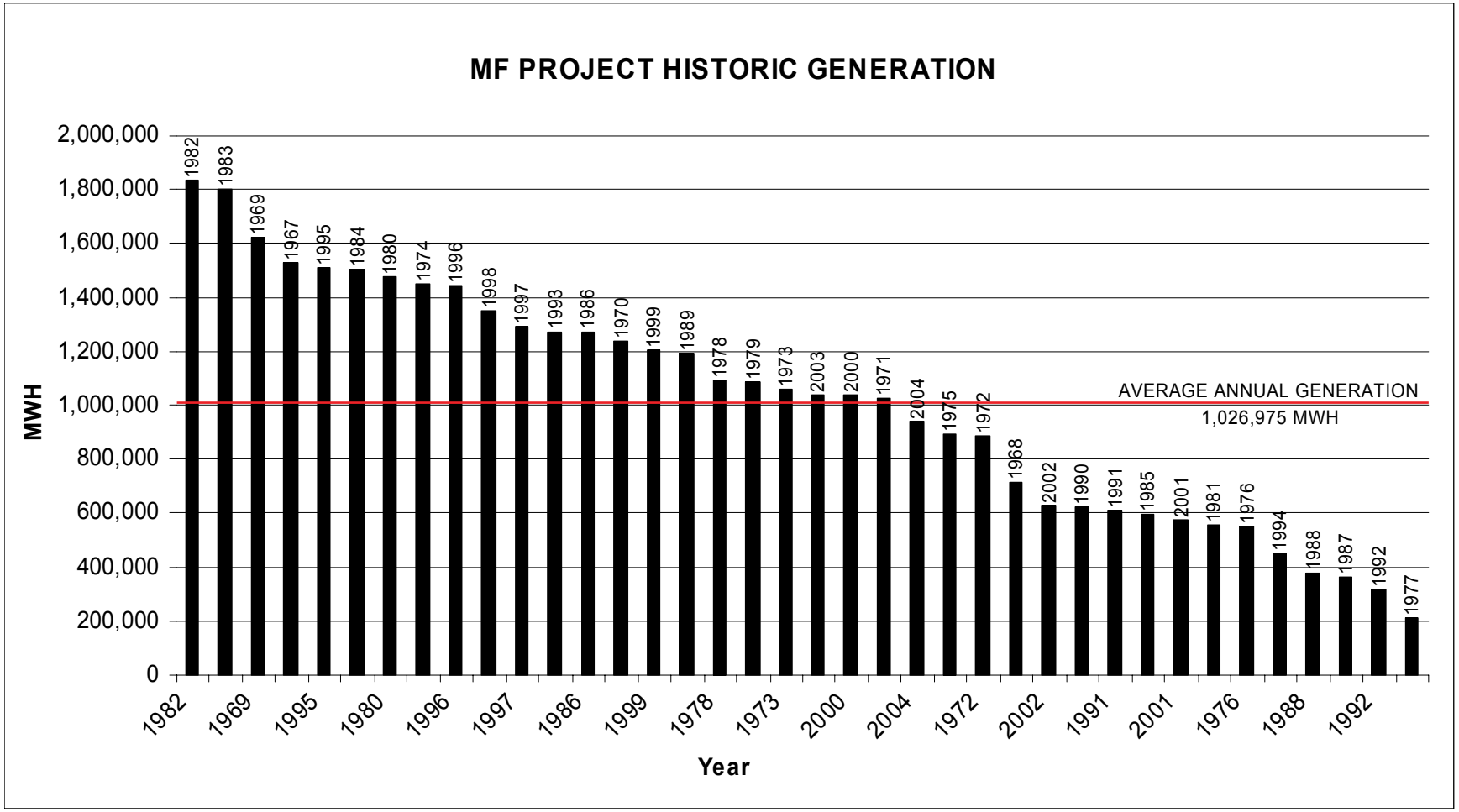

Figure 5-6. Middle Fork American River Hydroelectric Project Historic Generation.

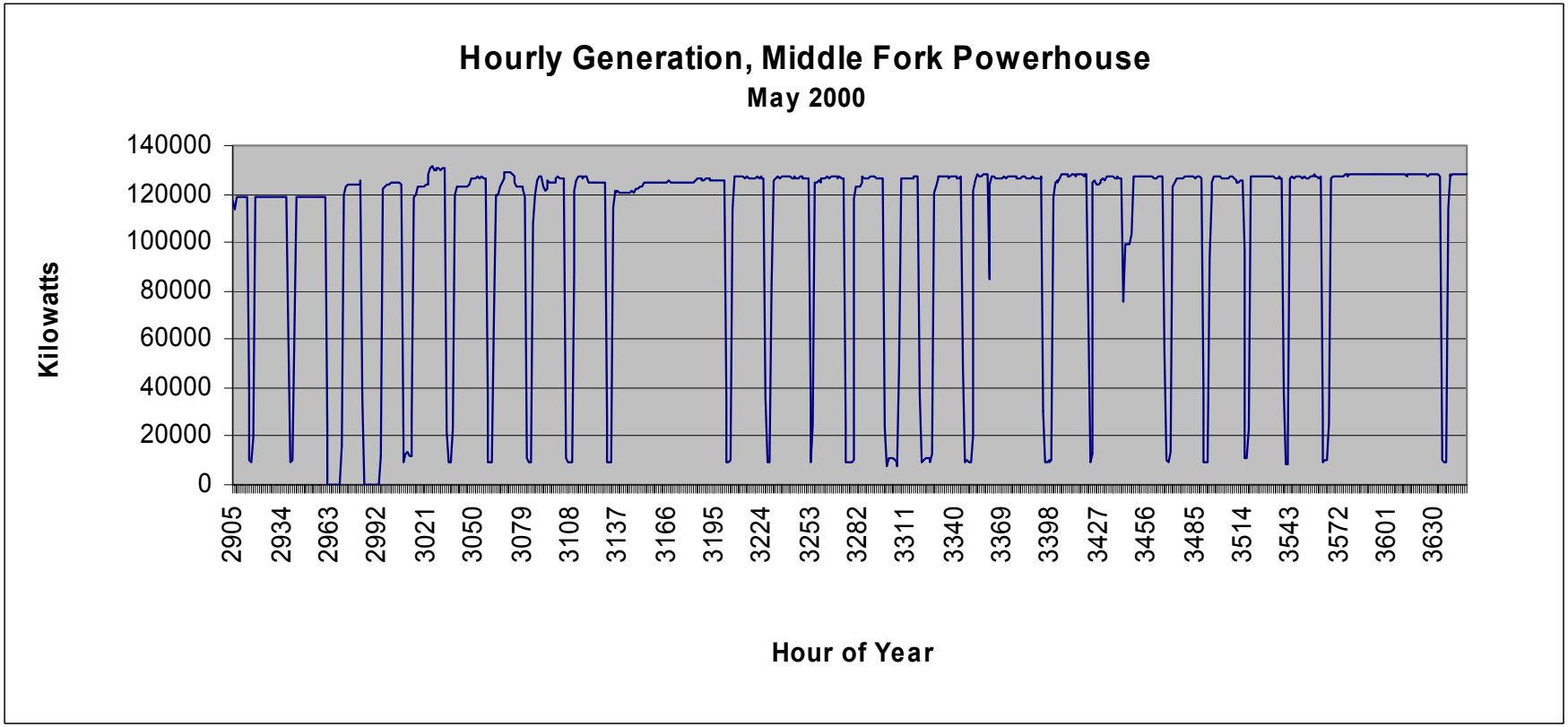

Figure 5-7. Hourly Generation Middle Fork Powerhouse.