

EXHIBIT B—PROJECT OPERATION AND RESOURCE UTILIZATION

Klamath Hydroelectric Project  
(FERC Project No. 2082)

PacifiCorp  
Portland, Oregon

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## B1.0 INTRODUCTION

Exhibit B describes the Klamath Hydroelectric Project facilities and lands, as stipulated in Title 18 Section 4.51 (c) of the U.S. Code of Federal Regulations:

Exhibit B is a statement of project operation and resource utilization. If the project includes more than one dam with associated facilities, the information must be provided separately for each such discrete development. The exhibit must contain:

- (1) A statement whether operation of the power plant will be manual or automatic, an estimate of the annual plant factor, and a statement of how the project will be operated during adverse, mean, and high water years;
- (2) An estimate of the dependable capacity and average annual energy production in kilowatt-hours (or a mechanical equivalent), supported by the following data:
  - (i) The minimum, mean, and maximum recorded flows in cubic feet per second of the stream or other body of water at the power plant intake or point of diversion, with a specification of any adjustments made for evaporation, leakage, minimum flow releases (including duration of releases), or other reductions in available flow; a flow duration curve indicating the period of record and the gauging stations used in deriving the curve; and a specification of the period of critical streamflow used to determine the dependable capacity;
  - (ii) An area-capacity curve showing the gross storage capacity and usable storage capacity of the impoundment, with a rule curve showing the proposed operation of the impoundment and how the usable storage capacity is to be utilized;
  - (iii) The estimated hydraulic capacity of the power plant (maximum flow through the power plant) in cubic feet per second;
  - (iv) A tailwater rating curve; and
  - (v) A curve showing power plant capability versus head and specifying maximum, normal, and minimum heads;
- (3) A statement, with load curves and tabular data, if necessary, of the manner in which the power generated at the project is to be utilized, including the amount of power to be used on-site, if any, the amount of power to be sold, and the identity of any proposed purchasers; and
- (4) A statement of the applicant's plans, if any, for future development of the project or of any other existing or proposed water power project on the stream or other body of water, indicating the approximate location and estimated installed capacity of the proposed developments.

PacifiCorp's Project and USBR's Klamath Irrigation Project ("USBR Project") are two distinctly different projects with two different owners and objectives, yet they are intertwined historically, geographically, physically, and operationally.

## B1.1 EXISTING KLAMATH HYDROELECTRIC PROJECT OVERVIEW

As described in Exhibit A2.1, the existing Project consists of six generating developments, between Klamath River mile (RM) 190 and RM 254, and the Keno Development (a re-regulation dam with no generation facilities along the mainstem of the Upper Klamath River), as well as one generating development on Fall Creek, a tributary to the Klamath River at approximately RM 196 (Figure B1.1-1).

## B1.2 PROPOSED KLAMATH HYDROELECTRIC PROJECT OVERVIEW

As described in Exhibit A.2.2, the proposed Project consists of four generating developments, between Klamath RM 190 and RM 228.0, and one generating development on Fall Creek, a tributary to the Klamath River at approximately RM 196 (Figure B1.1-2). The proposed Project does not include the East Side, West Side, and Keno developments.

## B1.3 USBR KLAMATH IRRIGATION PROJECT

The USBR Klamath Irrigation Project (USBR Project) provides irrigation water for both agricultural and national wildlife refuge lands in the Klamath Basin, and also provides flood control for the Klamath River in and downstream of the Project area. This operation is for the benefit of the USBR and irrigation and flood control concerns. The operation is independent of downstream hydroelectric operations. The USBR Project extends into two major watersheds: the Klamath River watershed and the Lost River watershed. The Lost River watershed collectively comprises the Clear Lake, Malone, and Gerber watersheds (Figure B1.2-1). The USBR Project currently provides irrigation water for approximately 240,000 acres of agricultural land plus the wildlife refuge lands. Major features of the USBR Project include:

- Clear Lake dam and reservoir located on the Lost River in California
- Gerber dam and reservoir located on Miller Creek, a tributary of the Lost River in Oregon
- Malone diversion dam on the Lost River in Oregon downstream from Clear Lake dam
- Lost River diversion dam on the Lost River in Oregon that diverts water to the Klamath River through the Lost River Diversion Channel
- ADY canal that allows water transfer from the Klamath River (Keno reservoir) to the USBR Project
- Klamath Straits Drain that allows water transfer from the USBR Project to the Klamath River (Keno reservoir)
- Link River dam at the outlet from Upper Klamath Lake regulates flow releases from Upper Klamath Lake (UKL) into the Klamath River. Water diverted from UKL provides the majority of irrigation supplies for USBR Project lands through the "A" Canal.
- Anderson Rose dam on the Lost River that diverts water for irrigation of California lands
- Tule Lake tunnel that conveys drainage water from Tule Lake to Lower Klamath Lake

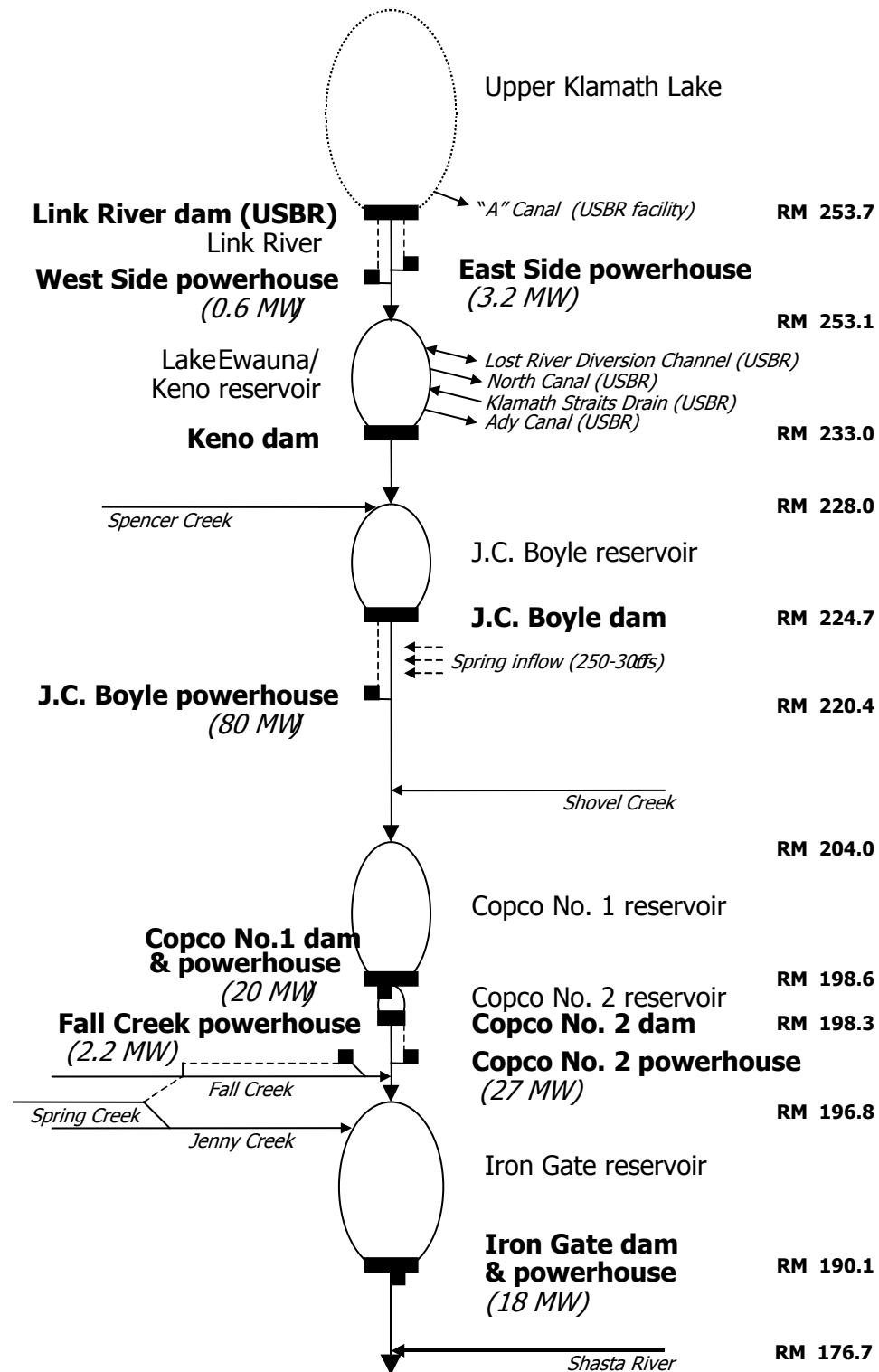
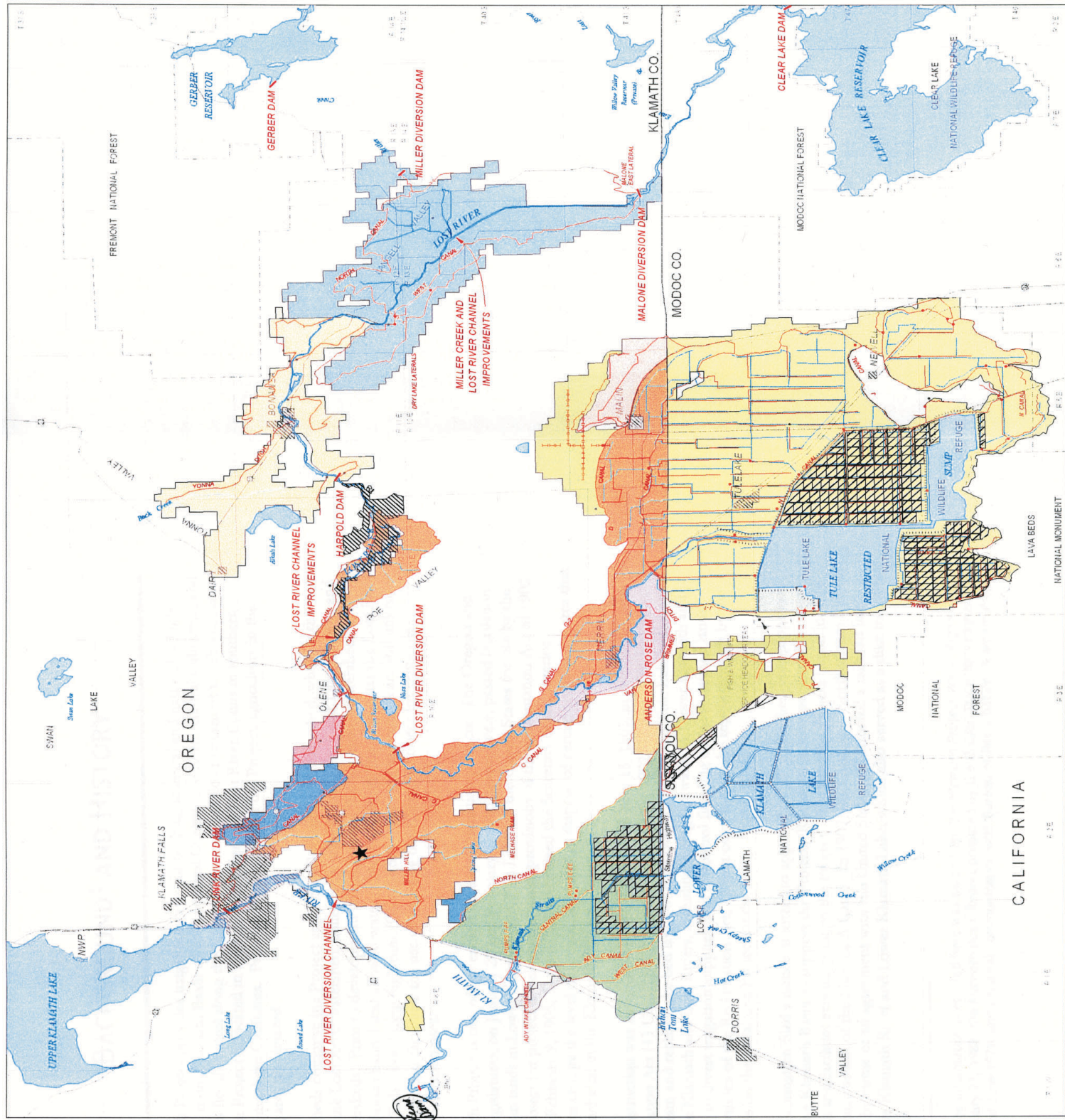
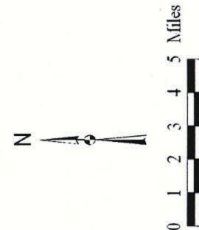


Figure B1.1-1. Existing PacifiCorp Project facilities.



**Figure B1.2-1**  
**Klamath Irrigation Project**  
**Oregon - California**



The Klamath Hydroelectric Project is located generally downstream from the USBR Project. The ADY canal allows water transfer from Keno reservoir and the Lost River diversion channel. The Klamath Straits dam allows water transfer into the Keno reservoir.



## B2.0 FLOW REGULATION THROUGH EXISTING KLAMATH HYDROELECTRIC PROJECT

### B2.1 INTRODUCTION

The Upper Klamath Lake (UKL) inflow-outflow is the major source of water for the Klamath Hydroelectric Project. Mean annual net inflow to the lake is 1.2 million acre-feet (AF); annual inflow ranges from 576,000 AF to 2.4 million AF (USBR, 1998). When forecasting runoff from the April through September period, USBR uses the following descriptions to categorize inflows to UKL during this period.

UKL inflow (in AF x 1,000, or TAF) is considered:

- “Above Average” when UKL inflow > 500 TAF
- “Below Average” when UKL inflow ≤ 500 TAF and > 312 TAF
- “Dry” when UKL inflow ≤ 312 TAF and > 185 TAF
- “Critical” when UKL inflow ≤ 185 TAF

UKL has a total storage capacity of 629,780 AF and an active storage capacity of 486,830 AF. The combined total active storage of UKL and the downstream Project reservoirs is approximately 498,600 AF. Without UKL, the combined active storage for the Project reservoirs is only 12,244 AF (Table B2.1-1). UKL represents 83 percent of the total storage and 98 percent of the active storage.

Table B2.1-1. Storage capacities of UKL and PacifiCorp Klamath Hydroelectric Project reservoirs.

Reservoir	Total Storage (AF)	Active Storage* (AF)	Number of Active Storage Days of Flow at 1,000 cfs
UKL (USBR facility)	629,800	486,800	245
Keno (USBR facility)	18,500	500	0.2
J.C. Boyle	3,500	1,700	0.9
Copco No. 1	46,900	6,200	3.1
Copco No. 2	73	0	0
Iron Gate	58,800	3,800	1.9
Total	757,500	499,000	252
Total without UKL and Keno	109,200	11,800	6.0

\*Active storage is calculated using operational high vs. low reservoir elevation. Note that for UKL, active storage would actually be far less given minimum elevations stipulated in recent Biological Opinions.

UKL elevations are controlled by the Link River dam under the directive of USBR. Iron Gate dam releases are stipulated by PacifiCorp's FERC license. However, since 1997 the releases have become USBR's responsibility under the Endangered Species Act (ESA). PacifiCorp has little or no effective control over the river's flow regime downstream of Iron Gate dam. Because of limited storage capacity, the Project can only manage short-term (hourly, daily) water balancing operations at certain Project reservoirs. Water flow through the Project is directly related to USBR's control of UKL elevations, downstream releases out of Iron Gate dam, flows

into and out of the USBR Project area, and the relatively small active storage capabilities of the Project reservoirs.

Active storage within the Project (between Link River dam and Iron Gate dam) is small relative to UKL's active storage (Table B2.1-1). For this reason, managing flow through the Project to comply with regulatory requirements necessitates the balancing of total inflows with total outflow. Inflow to the Project comes principally from Link River dam and USBR Project net inflows to Keno reservoir. Tributary accretion downstream of UKL to Iron Gate dam is relatively low, especially during summer months (Table B2.1-2). Accretions from the springs in the J.C. Boyle bypass reach are approximately 220 cfs throughout the year. With the exception of a few out of basin transfers, outflow from the upper Klamath Basin is entirely via the Iron Gate dam. In water years when flows are in excess of the turbine capacity of any given facility, water is passed by the facility as spill. Because the storage-limited reservoirs are typically full during high flows, Project releases become run-of-river. This typically occurs in late winter and spring months in average to wet years. During the summer when flows are below the turbine capacity of a facility, PacifiCorp is able to manage the short-term (hourly, daily) timing of flow through its facilities, within the limitations of reservoir storage and regulatory terms and conditions.

Table B2.1-2. Accretions to Upper Klamath River system downstream of UKL to Iron Gate dam.

<b>Tributary</b>	<b>Mean Annual Accretion (Thousand Acre Feet –TAF)</b>
From Lost River diversion canal (into Keno reservoir)	119
From other USBR diversion canals (into Keno reservoir)	21.4
From springs and tributaries between Keno reservoir and Iron Gate dam	337
<b>Total</b>	<b>477</b>

With the exception of Lost River inflow to Keno reservoir, tributary accretions to the Project area are not gauged. However, tributary accretions can be estimated using KPOPSIM, a hydrologic model for the Klamath Basin. This model uses a mass-balance equation to measure (1) inflow of all accretions entering the Project between Keno dam and Iron Gate dam, and (2) the inflow from all other USBR canals between Link River dam and Keno dam (i.e., excluding Lost River diversion canal). Figure B2.1-1 is a schematic depiction of the KPOPSIM model. Using data from 1961-1997, mean yearly accretion is summarized in Table B2.1-2, below, and in Figures B2.1-2 and B2.1-3.



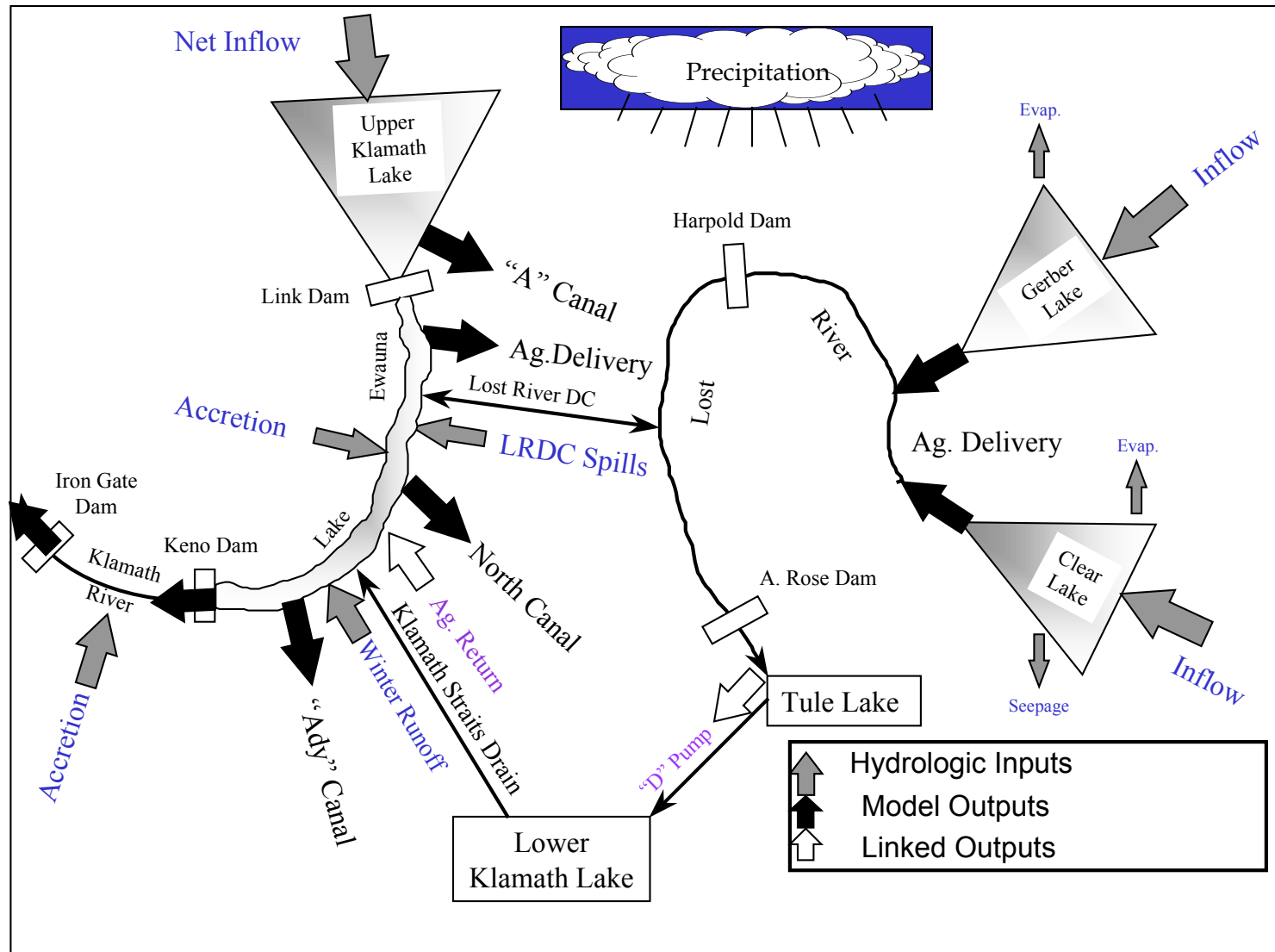


Figure B2.1-1. KPOPSIM model.

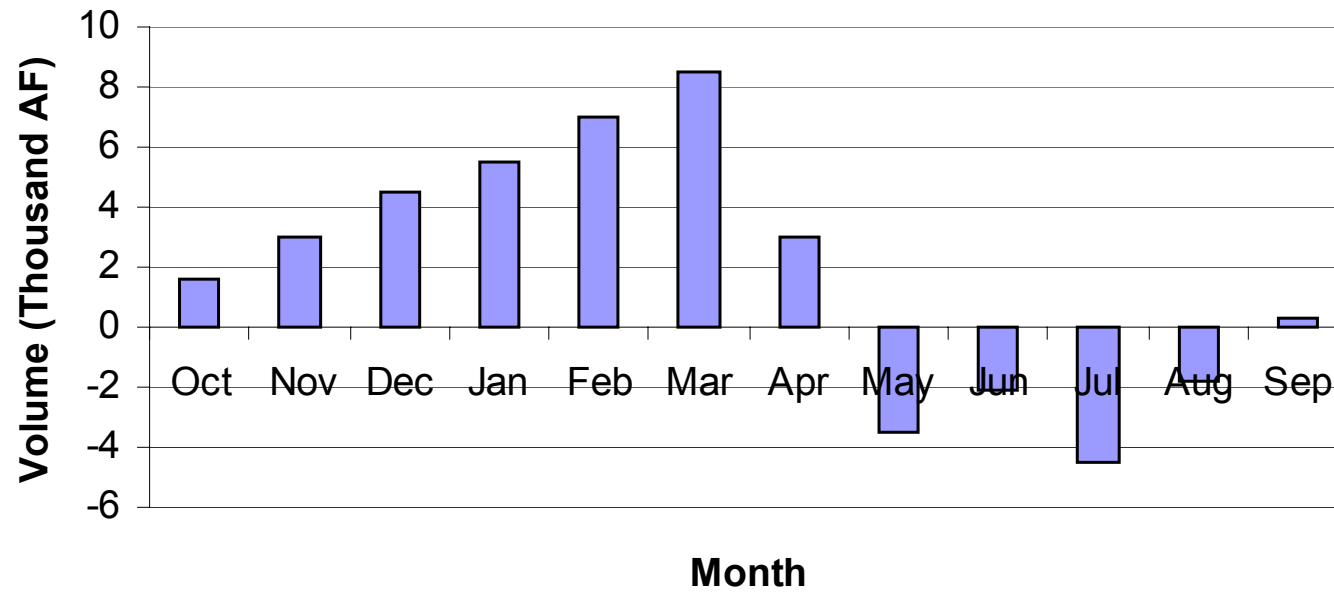


Figure B2.1-2. Total average accretions into/out of Keno reservoir from the USBR Project (for WY1961-1997).

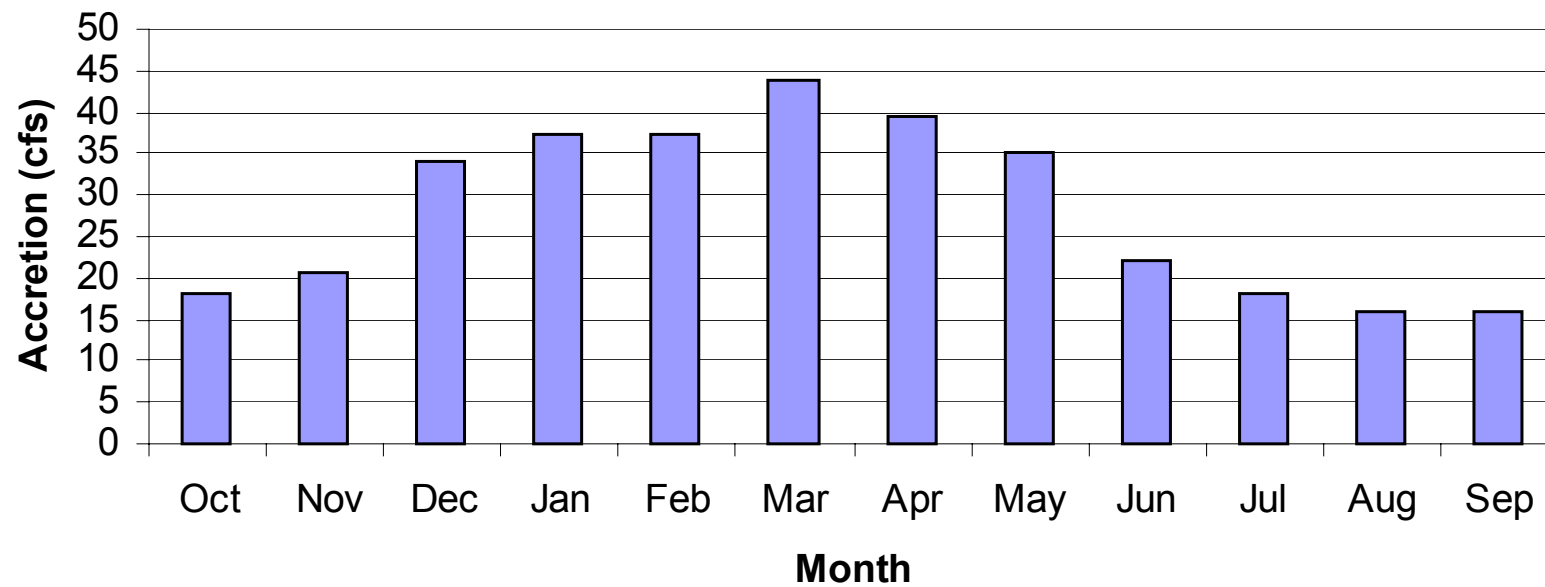


Figure B2.1-3. Total average accretion from tributaries and springs between Keno and Iron Gate dams (as per KPOPSIM calculation for WY 1961–1997).

Table B2.1-3 provides a summary of reservoir and river monitoring sites within the Klamath Hydroelectric Project area.

Table B2.1-3. Stream gauge sites in general Klamath Hydroelectric Project area.

Site Name	Location	Type of Monitoring	Responsible Party	Comments
Rocky Point (UKL)	Northwest end of UKL	Water level w/ staff gauge, meter, USGS equip, PacifiCorp equip	Cooperative program w/ USBR, PacifiCorp	Real-time, updates, seen at PacifiCorp
Rattlesnake (UKL)	East side of UKL	Water level w/ staff gauge, meter, USGS equip, PacifiCorp equip	Cooperative program w/ USBR, PacifiCorp	Real-time, updates, seen at PacifiCorp
Pelican (UKL)	South east end of UKL	Water level w/ staff gauge, meter, USGS equip, PacifiCorp equip	Cooperative program w/ USBR, PacifiCorp	Real-time, updates, seen at PacifiCorp
“833 Gauge” (USGS 11507500)	RM 253.4	Water level w/ staff gauge, USGS equip, PacifiCorp equip	USGS	Real-time, seen at PacifiCorp
Weed Bridge	Keno reservoir at Hwy 97 bridge RM 249.3	Water level w/ staff gauge, meter, USGS equip, PacifiCorp equip	USGS	Real-time, seen at PacifiCorp
Keno Reservoir Level	At Keno dam RM 233.4	Water level w/ staff gauge, PacifiCorp equip	PacifiCorp	Real-time, seen at PacifiCorp
Klamath River Below Keno Dam (USGS 11509500)	RM 231.9	Water level w/ staff gauge, USGS equip, PacifiCorp equip	USGS	Real-time, seen at PacifiCorp, on USGS website
J.C. Boyle Reservoir Level	At J.C. Boyle dam RM 224.7	Water level w/ staff gauge, PacifiCorp equip	PacifiCorp	Real-time, seen at PacifiCorp
Klamath R. Below J.C. Boyle Powerhouse (USGS 11510700)	0.7 mi downstream of J.C. Boyle powerhouse RM 219.7	Water level w/ staff gauge, USGS equip, PacifiCorp equip	USGS	Real-time, seen at PacifiCorp, on USGS website
Copco No. 1 Reservoir Level	At Copco dam RM 198.7	Water level w/ staff gauge, PacifiCorp equip	PacifiCorp	Real-time, seen at PacifiCorp
Copco No.2 Intake Level	At Copco 2 dam RM 198.4	Water level w/ staff gauge, PacifiCorp equip	PacifiCorp	Real-time, seen at PacifiCorp
Iron Gate Reservoir Level	At Iron Gate dam RM 190.2	Water level w/ staff gauge, PacifiCorp equip	PacifiCorp	Real-time, seen at PacifiCorp
Klamath R. Below Iron Gate Dam (USGS 11516530)	0.6 mi below Iron Gate dam; RM 189.6	Water level, staff gauge, USGS equip, PacifiCorp equip	USGS	Real-time, seen at PacifiCorp; on USGS website

## B2.2 FLOW REGULATION INTO AND OUT OF THE USBR PROJECT TO THE KLAMATH HYDROELECTRIC PROJECT

UKL and, to a lesser extent, the Klamath River are the major sources of water for the USBR Project. Up to 1,150 cfs of water may be diverted from UKL through the A-canal (just upstream of the Link River dam) to the USBR Project during the irrigation season (May - October). The amount diverted is typically approximately 20 to 30 percent of the annual outflow from the lake and 50 percent of the summer outflow (FERC, 1990). Agricultural returns from this and other

diversions have a mean of approximately 400 cfs in the summer and enter the Klamath River through the ADY canal just upstream of Keno dam. In the fall and winter, spill from USBR's dams on the Lost River system and irrigation drain water from the Lost River basin and Lower Klamath Lake (a closed system) are added to the total flow of the Klamath River upstream of Keno dam from the Lost River diversion channel. Such inflow can be as much as 3,000 cfs in the spring; it usually ranges from 200 to 1,500 cfs in the summer. The Klamath Irrigation District, via the USBR calls PacifiCorp's Hydro Control Center daily with readings of the various irrigation flows. These flows include pumping from Keno reservoir (a negative value) and inflows into the reservoir from the Lost River diversion channel and Klamath Straits Drain.

### B2.3 FLOW REGULATION THROUGH THE PROJECT DURING SUMMER AND/OR BELOW AVERAGE WATER YEAR

Since inflow to the Project must be balanced with outflow (as Project reservoirs have little active storage), inflow into the Klamath Hydroelectric Project is routinely adjusted to meet specified instream flows below Iron Gate dam. Total summer inflow is typically composed of UKL spill through Link River dam spill and the associated fish ladder flows, East Side and West Side powerhouse flow, return water from the USBR Project, and summertime tributary accretion downstream of Keno dam. Based on available and Iron Gate dam required flows, J.C. Boyle, Copco No. 1 and Copco No. 2 may operate as load factoring generation facilities.

### B2.4 FLOW REGULATION THROUGH USBR AND KLAMATH HYDROELECTRIC PROJECTS IN WINTER AND/OR HIGH WATER YEARS

Collectively, the Project reservoirs and UKL are currently capable of storing approximately 49 percent of the mean annual flow as measured at the Iron Gate gauge site. Approximately 83 percent of this total storage is provided by UKL. Storage in all PacifiCorp reservoirs combined is only 127,729 AF and only 12,244 of this is in active storage. Therefore, Project reservoirs store only 8.2 percent of the mean annual flow, and have "active" storage for only approximately 0.8 percent of the mean annual flow.

During the winter and spring in average and above average water years, more water flows into UKL than can be stored in UKL and Project reservoirs. During these times, operations become run-of-river such that all hydroelectric facilities operate at full hydraulic capacity and excess water is spilled at each of the dams. In below average water years, none of the dams typically spill since total inflow to the Klamath system may be less than what can be stored in UKL. Under such conditions, the flow regulation conditions described in Section B2.2 apply.

The potential for high runoff conditions occurs each year from approximately November through April. Because the Project reservoirs provide little active storage, UKL provides the only meaningful storage in the basin to ameliorate high flow events. Since the inception of the 1992 Biological Opinion for suckers, target elevations in UKL have been relatively high in the spring months to benefit water quality and larval sucker nursery habitat. This condition compromises UKL's flood control benefits. High target lake levels during spring runoff essentially eliminate the ability of UKL to store a high flow event (approximately 10,000 cfs). Typically, Project reservoirs are drawn down to some extent prior to spring runoff to provide very limited flood control during high flow events. However, this is not done with the Keno reservoir.

#### B2.4.1 Project Flood Control

During high runoff season, PacifiCorp will frequently draft down Copco and Iron Gate reservoirs by 4 to 7 vertical feet each. The vacant storage created by this draft is then available to manage all or some portion of the high flows as they accumulate from sub-basin tributaries downstream of the Link River dam. This vacant storage also allows for better management of flows below Iron Gate.

During high water conditions, plant personnel may open the spillway gates and maintain full generation. Spill occurs at Link River dam when outflow of Upper Klamath Lake is greater than the combined East Side and West Side powerhouse capacity of 1,450 cfs. Link River dam has a spillway capacity of 13,000 cfs. Spill at Keno dam is continuous, and the total spill capacity of the dam is 35,000 cfs at elevation of 4,082 feet msl. Spill occurs at J.C. Boyle dam when incoming river flows are greater than 2,850 cfs. The spillway discharge capacity for the J.C. Boyle dam is 29,100 cfs at elevation 3,797.8 feet msl. Downstream at Copco No. 1 and No. 2, spill occurs when flow is greater than 3,200 cfs, the hydraulic capacity of each powerhouse. Spillway discharge capacity at Copco No. 1 dam is 44,800 cfs at 2,611.3 feet msl and 25,000 cfs at Copco No. 2. Flows greater than 1,750 cfs at Iron Gate dam will spill over the spillway dependent on reservoir elevation. At Iron Gate, the ungated spillway capacity is 74,400 cfs at 2,345.4 msl. In the case of very high flows and under emergency circumstances, a low-level tunnel may be opened to pass an additional 3,800 cfs. Flow through the tunnel is managed via a slide gate, which can only be operated at the facility. The flow capacity of the Fall Creek powerhouse is 50 cfs, so any additional flow goes over the spillway. During periods of high flow, Project facilities may be checked several times per 24-hour period, or manned continually if needed.

#### B2.5 OTHER OUT-OF-BASIN DIVERSIONS

##### B2.5.1 Rogue River Basin Irrigation Project

USBR operates the Rogue River Basin Irrigation Project (Rogue River Project). The Rogue River basin is to the northwest of the Klamath basin on the west slope of the Cascade Mountain Range. This project supplies irrigation water for approximately 35,000 acres in the Medford, Rogue River, and Talent Irrigation Districts.

Some water for the Rogue River Project is diverted from the Klamath basin at Four Mile Lake, Hyatt reservoir, and Howard Prairie reservoir. The latter two reservoirs drain to Jenny Creek, a tributary to the Iron Gate reservoir. If water (approximately 30,000 acre-feet) from these two reservoirs were not transferred out of basin, it would flow to Jenny Creek. A significant portion of the inflow to these two reservoirs occurs in the wet winter months. Hence, this is the time period in which water is diverted from Jenny Creek to the Rogue River Project. Inflows to Hyatt and Howard Prairie reservoirs from the Klamath basin are little to none July through September.

Approximately thirty-two water rights permits (as per 1994 data) allow for a Klamath River basin point of diversion to a Rogue River basin point of use. Thirteen of these are associated with Four Mile Lake and nineteen are associated with the Hyatt and Howard Prairie reservoirs.

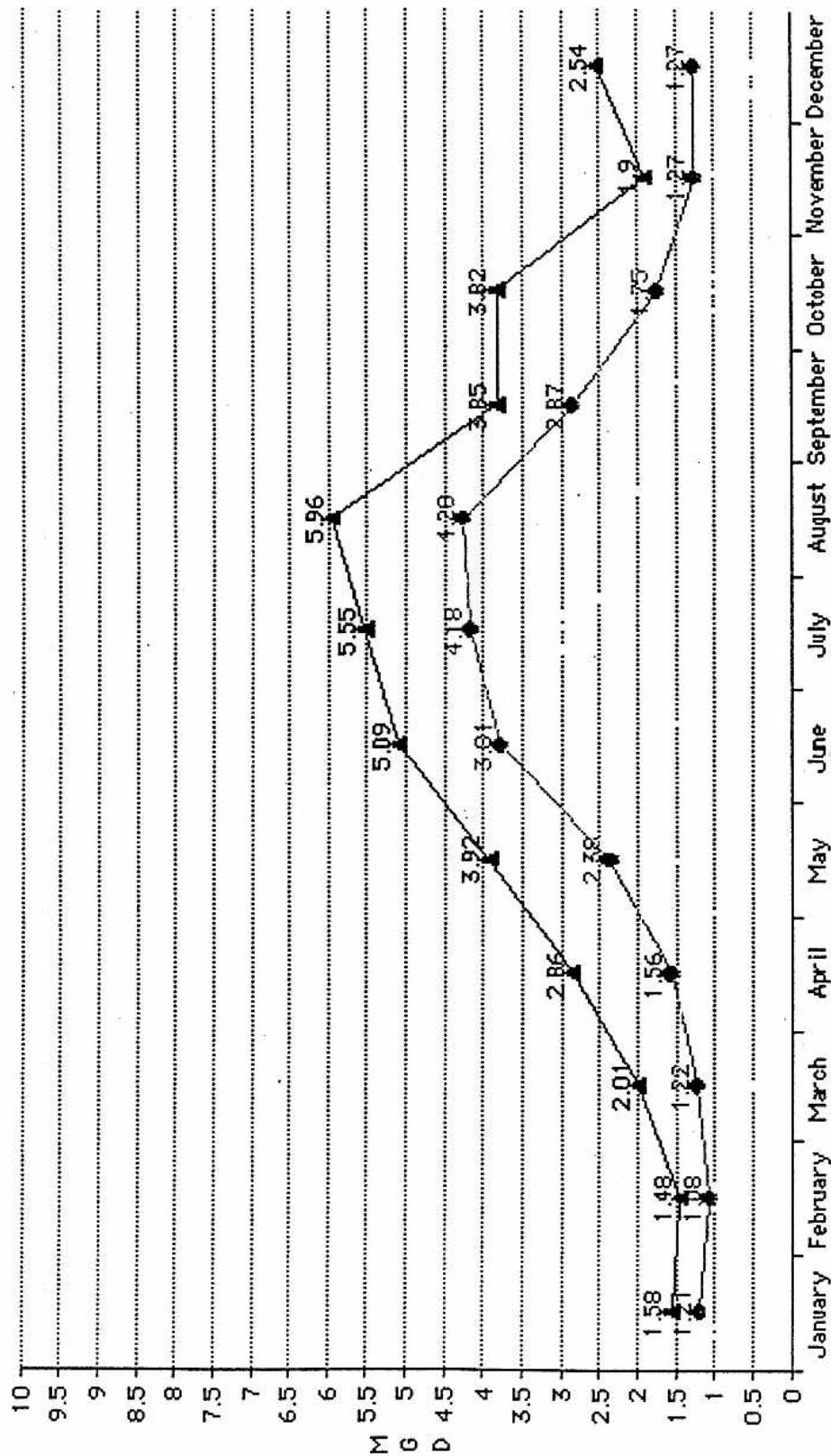
### B2.5.2 City of Yreka Municipal Water Supply

The City of Yreka has a 1966 California water right for 15 cfs to divert water from Fall Creek for its municipal water supply. The city maintains and operates two diversions in Fall Creek: A-dam (the primary diversion structure) and B-dam (the secondary diversion structure). The A-dam is located upstream from the California Department of Fish and Game (CDFG) Fall Creek hatchery intake and downstream from the Fall Creek powerhouse. The B-dam is located upstream of the powerhouse tailrace in the natural channel below a waterfall. Two diversions are necessary since the dependability of adequate flow at each diversion is not guaranteed. For instance, if the Fall Creek powerhouse trips offline, flow to the A-dam may eventually cease. During that time, the City of Yreka can switch its point of diversion to the B-dam. Both of the diversions are concrete structures with stop logs spanning the width of the creek. Screened pumps are used at both locations. The data in Figure B2.5-1 for calendar year 2000 were provided by the City of Yreka. According to the City, year 2000 was a fairly typical year relative to the amount of water diverted to the City. Approximately 820 million gallons per year (2,519 acre-feet per year) of water was diverted from Fall Creek with the largest diversions occurring during the late summer. Monthly average diversion rates did not exceed 10 cfs.

Figure B2.5-1

Yreka Filter Plant Flow (Year 2000)

■ Average 
 ▲ High 
 □ Low





### B3.0 FLOW REGULATION THROUGH THE PROPOSED KLAMATH HYDROELECTRIC PROJECT

The proposed Project will not include the East Side and West Side developments. It is expected that USBR will solely operate Link River dam and will be responsible for releasing water to meet both the Link River and Iron Gate Development instream flow requirements.

The proposed Project will not include the Keno Development, but the Keno dam will continue to be operated per current operations under the jurisdiction of the state of Oregon.

Overall, the amount and timing of water available at the J.C. Boyle, Copco No. 1, Copco No. 2, and Iron Gate developments will be similar to existing hydrologic conditions since no new storage facilities above J.C. Boyle are proposed, nor are any storage facilities being removed. The East Side and West Side developments have no storage capacity.



## B4.0 HYDROLOGY—EXISTING CONDITIONS

### B4.1 PROJECT AREA HYDROLOGIC DRAINAGE AREA AND FLOW REGIME

The drainage basin area upstream from Iron Gate dam covers 4,630 square miles throughout Klamath County, Oregon, and Siskiyou County, California. The drainage basin areas upstream from the J.C. Boyle powerhouse and Keno dam cover approximately 4,080 and 3,920 square miles, respectively within Klamath County. However, the operations and diversions for irrigation and wildlife refuge maintenance from UKL largely control Klamath River drainage flows below Link River dam. Ninety-eight percent of the available 499,074 acre-feet of active storage in the basin area is contained in UKL.

Gauged runoff and flow patterns on the Klamath River closely reflect climatic conditions and cycles (BHI, 1996; Ayers Associates, 1999). Precipitation in the basin is distinctly seasonal, with 60 percent of the total annual precipitation falling from November to March. December and January are the wettest months; the driest months are between June and September. Annual precipitation patterns historically define distinct dry and wet cycles that are closely related to runoff and the river's flow regime. The most recent climatic trends include wet periods from 1885 to 1915 and 1940 to 1975, and dry periods from 1915 to 1940 and 1975 to 1994. General decreases in runoff and discharge over the last 20 years also coincide with a generally decreasing trend in precipitation patterns.

The construction of the Copco dams (1918 and 1925) followed by the Link River dam (1921), J.C. Boyle dam (1958), Iron Gate dam (1962), and Keno dam (1967) has had limited effect on storage capacity and flow in the Klamath River. As summarized in Table B4.1-1, the reservoirs in the upper basin currently are capable of storing approximately 49 percent of the mean annual flow at the Iron Gate gauge site. However, most of this storage is provided by UKL, as the other reservoirs operated by PacifiCorp have a limited ability to store and therefore affect the river's overall flow regime. The ability of the reservoirs in the upper basin to alter the river's flow regime further diminishes moving downstream. For example, the reservoirs are capable of storing about 6 percent of the mean annual runoff at the Klamath gauge site near the mouth of the Klamath River at Klamath, California (Table B4.1-1).

Table B4.1-1. Reservoir storage capacities (acre-feet) as a percent of mean annual runoff (MAR) for facilities in the Upper Klamath Basin.

Dam/Reservoir	Year Completed	Reservoir Total Storage Capacity (AF)	Storage Capacity (AF) as a Percent of MAR at Two Gauge Sites*	
			Iron Gate Dam (RM 190)	Klamath, California (RM 5)
Copco No. 1	1918	46,867	3.0	0.4
Link/UKL	1921	629,780	40.6	4.9
Copco No. 2	1925	73	< 0.1	< 0.1
J.C. Boyle	1958	3,495	0.2	< 0.1
Iron Gate	1962	58,794	3.8	0.5
Keno	1967	18,500	1.2	< 0.1
<b>Total</b>		757,509	48.8	5.9

\*USGS gauge numbers 11516530 downstream of Iron Gate dam and 11530500 at Klamath, California.

USBR's annual Klamath Project Operations Plans dictate UKL level targets and instream flow requirements downstream from Iron Gate. The overall effects of the upper Klamath Basin operations and diversions have generally resulted in an increase in winter flows and a decrease in late-spring and early-summer flows just downstream from Iron Gate dam (BHI, 1996; Ayers Associates, 1999).

Some flow accretion occurs over the 64 miles of river where Project facilities are located. Natural springs contribute an assumed relatively constant 220 cfs flow to the Klamath River channel between the J.C. Boyle dam and its powerhouse (RM 220 and RM 225).

Tributaries to the Klamath River are relatively small in the Project reach between Link River dam and Iron Gate dam. The largest include Spencer Creek (approximately 20 to 200 cfs), which flows into J.C. Boyle reservoir, Shovel Creek (10 to 100 cfs), which enters the river just upstream from Copco reservoir, and Fall Creek (30 to 100 cfs) and Jenny Creek (30 to 500 cfs), which flow into Iron Gate reservoir. Spencer Creek, Shovel Creek, and Jenny Creek all have irrigation diversions.

## B4.2 EXISTING HYDROLOGY AND FLOW AVAILABILITY

### B4.2.1 Hydrologic Data Sources for the Project Area

Four currently operating USGS gauging stations are located on the Klamath River within the Project area: Link River in Klamath Falls (Gauge No. 11507500; RM 253.5), near Keno dam (No. 11509500; RM 232), downstream from J.C. Boyle powerhouse (No. 11510700; RM 220), and downstream from Iron Gate dam just downstream from Bogus Creek (No. 11516530; RM 190). Table B4.2-1 summarizes the drainage area and the period-of-record of the data for each of these gauges.

A USGS gauging station operated on Fall Creek (Gauge #11512000) from April 1934 to September 1959. A diversion structure at Spring Creek, a tributary to nearby Jenny Creek, has existed since at least the 1950s to divert flow into Fall Creek to increase hydroelectric

production. PacifiCorp estimates that the minimum observed flow in spring-fed Spring Creek is approximately 5 cfs; however, some flows will be required to maintain instream flows below the diversion. The maximum diversion allowed by the water right is 16.5 cfs. In addition, the City of Yreka diverts flow above the USGS gauge. The current and future hydrologic condition of Fall Creek was therefore approximated by considering these constraints along with the measured flows from the 1934-59 USGS gauge period of record.

Table B4.2-1. USGS flow gauging data for the Klamath River in the Project area.\*

USGS Gauge	Drainage Area (square miles)	Gauge Number	Period of Record
Link River at Klamath Falls	3,810	11507500	6/01/04-9/30/13 10/01/29-present
Klamath River at Keno	3,920	11509500	10/01/29-present
Klamath River Downstream from J.C. Boyle Powerhouse	4,080	11510700	1/1/59-9/30/71 10/1/74-9/30/79 10/1/82-9/30-87 10/1/88-present
Klamath River Downstream of Iron Gate Dam	4,630	11516530	10/01/60-present

\*Includes only those gauges that have a period of record extending to present. Two other USGS flow gauge sites on the Klamath River in the Project area were discontinued in 1931 (at Spencer Bridge) and 1961 (near Copco).

#### B4.2.2 Average Daily Flow Rates

Graphs of average daily flow by month at the four key USGS gauges are provided in the Water Resources Final Technical Report (FTR). Figure B4.2-1 depicts annual hydrographs of average daily flow over the period 1967-2001 for the four key USGS gauges. To illustrate flow variation in recent years, Figure B4.2-2 shows the annual hydrograph of average daily flow for the Keno gauge (No. 11509500), together with annual hydrographs for 1991, a critical dry year, and 1998, a wet year.

Figure B4.2-3 shows the 50 percent (median) monthly flow values for Fall Creek for three scenarios. These are: (1) period of record only, representing historic Fall Creek conditions without diversion; (2) 5 cfs diverted, representing the minimum expected diversion flow plus historic conditions; and (3) 16.5 cfs diverted, the sum of historic conditions and the maximum allowed diversion<sup>1</sup>.

<sup>1</sup> It is likely that the diversion range of 5 to 16.5 cfs follows a seasonal pattern, with higher flows in later winter and spring, and low flows in late summer and autumn. However, no data were available to confirm this. Consequently, the range of diversions and water year types were overlain to provide a range of flow values and associated exceedances, regardless of time of year.

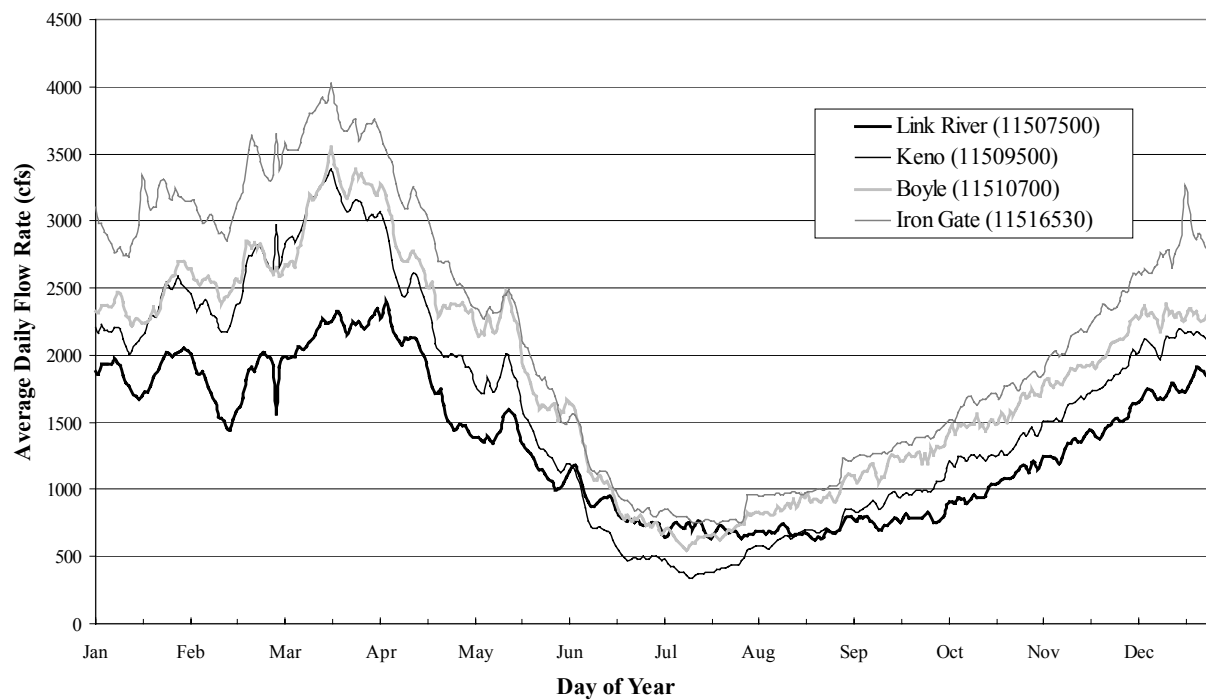


Figure B4.2-1. Annual hydrographs of average daily flows (cfs) for the period 1967-2001 at four gauging stations on the Klamath River in the Klamath Hydroelectric Project area.

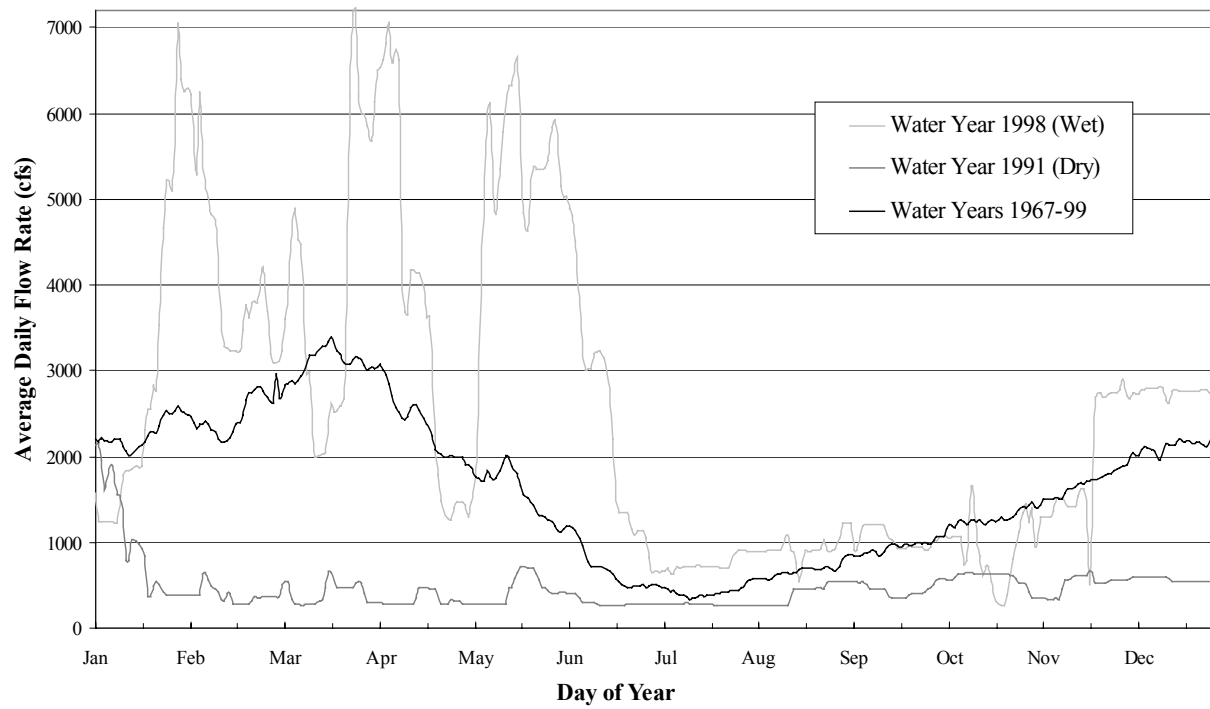


Figure B4.2-2. Annual hydrographs of average daily flows in the Klamath River at Keno (USGS Gauge No. 11509500) for the period 1967-1999, a critical dry year (1991), and a wet year (1998).

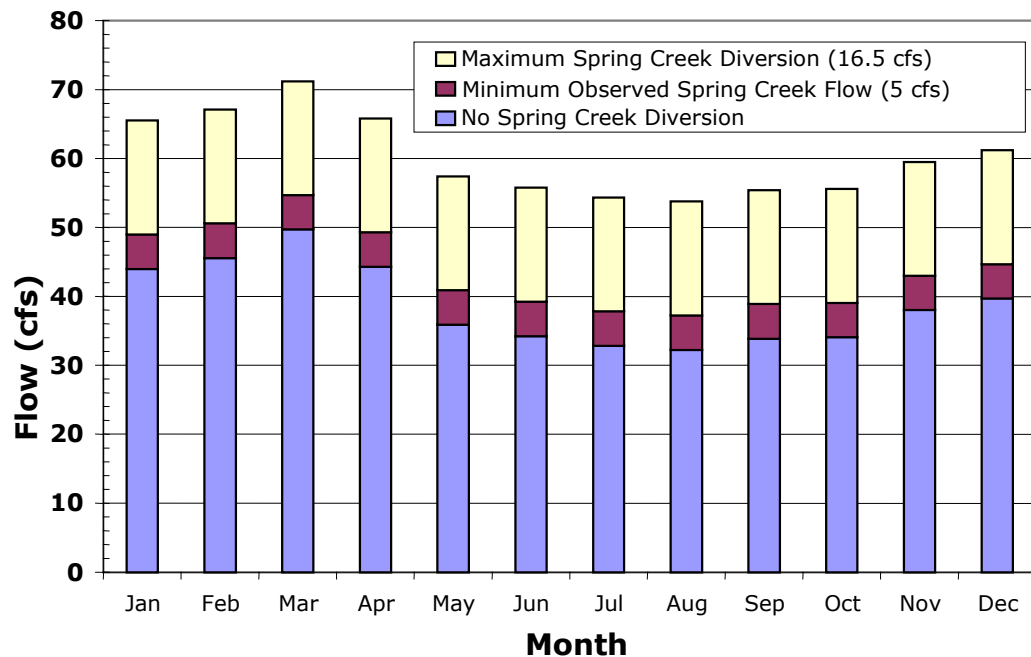


Figure B4.2-3. Estimated monthly median flow values for Fall Creek based on available data from USGS Gauge 11512000 for the period of record April 1934 to September 1959.

Spring Creek flow will be diverted to Fall Creek throughout the year. The minimum flow in Spring Creek is estimated to be 5 cfs and the maximum diversion is estimated to be 16.5 cfs.

### B4.3 EXISTING INSTREAM FLOW RELEASES

Minimum flows downstream of Link River dam are generally maintained at 90 cfs upstream of the East Side powerhouse and 450 cfs downstream of the West Side powerhouse (when sufficient water from UKL is available).

The minimum flow requirement downstream of Keno dam is 200 cfs, as cooperatively established by Oregon Department of Fish and Wildlife (ODFW) and PacifiCorp. This minimum flow has been incorporated into the current FERC license per Article 58. The dam is typically operated at much higher flows and drops to near 200 cfs only in unusually dry years. PacifiCorp has little control in regulating flows that pass Keno dam, because total flows in this reach are governed largely by reservoir elevation needs for irrigation and by USBR directives in meeting its instream flow requirements downstream of Iron Gate dam.

The Project's current FERC license (Article 34) requires a year-round minimum flow at J.C. Boyle dam of 100 cfs. However, approximately 220 cfs of spring flows enters this 4-mile bypass reach, beginning about  $\frac{3}{4}$  mile downstream from the dam. Therefore, at the downstream end of the bypass reach, minimum flows are approximately 320 cfs.

The Copco No. 1 powerhouse discharges directly to the Copco No. 2 reservoir. Copco No. 2 powerhouse discharges directly to Iron Gate reservoir. Between Copco No. 2 dam and Copco No. 2 powerhouse, the bypass reach is approximately 1.4 miles. There is no required minimum flow for this reach, but PacifiCorp maintains a flow of 5 to 10 cfs.



Current FERC-stipulated minimum flow requirements below Iron Gate dam are 1,300 cfs from September through April, 1,000 cfs in May and August, and 710 cfs in June and July. However, since 1997, PacifiCorp has provided instream flow releases required by USBR's annual Project Operations Plans. USBR's consultation with U.S. Fish and Wildlife Services (USFWS) and National Oceanic and Atmospheric Administration (NOAA)-Fisheries on the Plans resulted in Biological Opinions that specifically defined UKL elevations and Klamath River flows downstream of Iron Gate dam needed to protect ESA-listed species (USBR, 2002).

To comply with the NOAA Fisheries 2002 Biological Opinion (NOAA, 2002), PacifiCorp coordinates with USBR to pass through those minimum flows stated in the current biological opinion rather than those cited as the FERC minimum. During 2003 through 2005, USBR will meet or exceed the Iron Gate dam flows listed in Table B3.3-1 by water year types plus an additional volume to be provided by a water bank (USBR, 2002). Specifically, the minimum volume of additional water during water years 2003 through 2005 will be 50 TAF, 75 TAF, and 100 TAF, respectively. The amount of this additional water is to increase with each successive year as USBR continues to develop water resources to support a reliable water bank. Iron Gate Fish Hatchery return water and Bogus Creek contributions are included in this minimum flow.

To prevent potential fish stranding, USBR will operate the Klamath Irrigation Project to provide water and coordinate with PacifiCorp to achieve the following rates for ramping down of flows between monthly or biweekly timesteps below Iron Gate dam (as listed in Table B4.3-1): (1) decreases in flow of 300 cfs or less per 24-hour period and no more than 125 cfs per 4-hour period when Iron Gate dam flows are above 1750 cfs; or (2) decreases in flows of 150 cfs or less per 24-hour period and no more than 50 cfs per 2-hour period when Iron Gate dam flows are 1750 cfs or less (NOAA, 2002).

The current FERC license minimum flow requirements are 0.5 cfs at all times from the Fall Creek dam into Fall Creek, and a 15-cfs continuous flow in Fall Creek (or a quantity equal to the natural stream flow, whichever is less) downstream of the powerhouse.

Table B4.3-1. Instream flow releases as measured at Iron Gate dam in USBR's Klamath Project Operations 2002 Biological Assessment (USBR, 2002).

Time Step	Average Daily Flows at Iron Gate Dam by Water Year Type*			
	Above Normal	Below Normal	Dry	Critical Dry
October	1,345	1,345	879	920
November	1,337	1,324	873	912
December	1,387	1,621	889	929
January	1,300	1,334	888	1,101
February	1,300	1,806	747	637
March 1-15	1,953	2,190	849	607
March 16-30	2,553	1,896	993	547
April 1-15	1,863	1,742	969	874
April 16-30	2,791	1,347	922	773
May 1-15	2,204	1,021	761	633
May 16-31	1,466	1,043	979	608

Table B4.3-1. Instream flow releases as measured at Iron Gate dam in USBR's Klamath Project Operations 2002 Biological Assessment (USBR, 2002).

	<b>Average Daily Flows at Iron Gate Dam by Water Year Type*</b>			
<b>Time Step</b>	<b>Above Normal</b>	<b>Below Normal</b>	<b>Dry</b>	<b>Critical Dry</b>
June 1-15	827	959	741	591
June 16-30	934	746	612	619
July 1-15	710	736	547	501
July 16-31	710	724	542	501
August	1,039	1,000	647	517
September	1,300	1,300	749	722

\*Water Year Type is based on UKL Net Inflow (during April – September) as follows:

Above Normal	Above 500,000 acre-feet
Below Normal	500,000 to greater than 312,000 acre-feet
Dry	312,000 to greater than 185,000 acre-feet
Critical	185,000 acre-feet or less

## B5.0 HYDROLOGY—PROPOSED CONDITIONS

For the proposed Project, water will no longer be provided to the East Side and West Side developments. USBR will be responsible for maintaining appropriate instream flow and ramp rates in Link River below Link River dam. Although no longer a part of the Project, PacifiCorp intends to continue to operate Keno dam per current operations under the jurisdiction of the State of Oregon.

As a result, flows into the proposed Project at the J.C. Boyle Development and into the other Project developments are expected to be similar to existing conditions.



## B6.0 LINK RIVER DAM

### B6.1 FACILITY OVERVIEW

Link River dam, located at RM 254 in Klamath Falls, Oregon, is the point of water diversion for the East Side and West Side powerhouses. Construction of Link River dam was completed in 1921. As a federally owned dam, Link River dam is not included in the current FERC license for the Project. The current license includes the East Side and West Side diversion canals and all downstream Project facilities. Although the East Side and West Side developments are proposed for decommissioning, information regarding Link River dam is provided to describe historic operations.

### B6.2 OWNERSHIP AND CONTRACTUAL OBLIGATIONS

PacifiCorp's operational relationship with USBR dates back to 1917. On February 24, 1917, PacifiCorp's predecessor, Copco (California and Oregon Power Company), entered into an agreement with USBR to construct Link River dam for the regulation of UKL. Under this agreement, Copco constructed Link River dam at its own expense and agreed to operate it to serve the USBR Project. In exchange, Copco received significant flexibility to regulate the active water storage in UKL to maximize water availability for downstream hydroelectric generation outside the irrigation period. The term of the 1917 agreement was 50 years. To gain additional active storage, construction of the dam included notching the natural bedrock reef upstream of Link River dam in the narrow of the UKL outlet. This notching lowered the hydraulic control point 3 feet so the lake could be drawn down to an elevation of El. 4137 feet mean sea level (msl).

On January 31, 1956, the parties renewed the agreement, on essentially the same terms, for another 50 years (Appendix B-1A). Under the 1956 Contract, USBR owned Link River dam, but Copco had a broad right to regulate UKL between the elevations of El. 4137 and El. 4143.3 feet msl. In exchange, Copco agreed to provide electric power at significantly reduced rates for use by USBR Project irrigators pumping USBR Project water.

Under the 1956 Contract, USBR set operational conditions that allowed PacifiCorp sufficient flexibility (in the form of storage water) to efficiently use UKL as a reservoir for hydroelectric benefits. Since 1992, however, USBR has modified Link River dam operations to benefit the shortnose sucker and the Lost River sucker, two Klamath Basin fish listed in 1988 as endangered under the ESA (USFWS, 1992). To protect these fish, the USFWS required that water levels in UKL be managed within specific elevation limits. The impact to PacifiCorp's Project was lost flexibility in how UKL water storage could be used to optimize and shape power production. The 1992 operational directives have also increased the risk of springtime flooding. The overall impact has been higher UKL elevations during the spring run-off period with resultant increases in the amount of water spilled to the river that otherwise could have been used to generate electricity during the winter.

Compliance with more recent biological opinions for USBR's operations have resulted in further loss of seasonal generation due to additional constraints on UKL operational flexibility and higher summer flows downstream of Iron Gate dam (USFWS, 2001 and NOAA Fisheries, 2001).

Initially, PacifiCorp's flexibility was limited only by the requirement to satisfy USBR Project water requirements. But with the ESA listing of upstream suckers in 1988 and downstream coho salmon in 1997, PacifiCorp's ability to operate UKL for hydroelectric purposes was essentially eliminated. UKL elevations are driven by ESA requirements, then Tribal Trust, then irrigation needs, then hydroelectric uses. In the mid-1990s, PacifiCorp considered rescinding the 1956 Contract because its original purpose in entering the contract was no longer viable (i.e., providing storage in UKL for hydropower generation). The situation had left PacifiCorp with significant liability exposure due to potential impacts on flood control while no longer affording PacifiCorp the ability to operate UKL for the benefit of the downstream hydroelectric Project.

In 1997, in order to induce PacifiCorp not to rescind the 1956 Contract, USBR proposed a modification to the 1956 Contract (see Appendix B-1A). Under the 1997 modification, USBR assumed all discretionary responsibility for UKL levels and minimum stream flows at Iron Gate dam. This eliminated PacifiCorp's exposure to ESA liability for the consequences of operating Link River dam and water levels of UKL. Since 1997, USBR and PacifiCorp have signed annual letter of agreements to continue under the 1997 Contract modification (see Appendix B-1A).

The 1997 modification was challenged in court by some groups of USBR Project irrigators. The irrigators believed that PacifiCorp had authority under the 1956 Contract to refuse to implement USBR's annual operations plans. In *Klamath Water Users Protective Association v. Patterson* (January 28, 2000), the U.S. Ninth Circuit Court of Appeals upheld the 1997 modification and made it clear that the ESA gave USBR, not PacifiCorp, priority control over UKL levels and flows below Iron Gate dam flows.

PacifiCorp currently operates Link River dam and Iron Gate dam to meet agency target UKL levels and target minimum flows below Iron Gate dam. Lake levels and stream flows are typically presented in USBR's annual Klamath Project Operations Plans, following consultations with USFWS and NOAA Fisheries (formerly NMFS). The plans do not provide any significant operational flexibility for PacifiCorp. PacifiCorp must use its technical expertise to determine how best to meet the targets in USBR's plans, while also protecting against floods. PacifiCorp does not have any meaningful ability to alter UKL levels to increase downstream Project power generation.

The 1956 Contract will expire by its terms in 2006. At that point, the right to operate and control Link River dam will revert to USBR as its owner.

### B6.3 EXISTING OPERATIONS

As discussed above, Link River dam is operated for UKL elevations and flows downstream of Iron Gate dam at USBR's direction. With each new operating plan and consequent biological opinion, UKL elevations and minimum discharges on the Klamath River below Iron Gate dam have become more specific with more frequent targets to meet throughout the year. For example, the 1997 Operating Plan set four minimum target elevations for UKL and the 2001 Operating Plan set six target minimum elevations. With the increase in constraint frequency, the operational flexibility of using UKL as a storage reservoir has been greatly reduced and the capability of the lake to provide flood management has been reduced.

Prior to the ESA limitations, the dam was operated within a rule curve for UKL. Elevation bounds on the lake were dependent upon the then current hydrologic conditions and required some storage in the winter to handle the large runoff from storms and snowmelt. Primary operating objectives were refill of UKL irrigation water, generation, and meeting minimum flows below Iron Gate (not necessarily in that order). PacifiCorp was able to use its discretion to manage the risk of storage inflow forecasts and lake elevation. With only these constraints, PacifiCorp was able to make some planning decisions on how to best use the UKL water according to anticipated power demands and market conditions as well as forecasted inflows to the system. Operational decisions were based upon the then current and forecasted hydrology and power needs within the region.

Since the release of the USFWS biological opinion for USBR Project operations in 1992, Link River dam operations are closely monitored by USBR to ensure that the lake elevations are met for ESA compliance. From one target elevation to the next on the elevation plot, PacifiCorp is expected to maintain a steady increase or decrease to the next target elevation. The option to use water for hydroelectric production in high demand months and to store water in low demand months is not a PacifiCorp option if it would cause UKL elevations to deviate from the expected targets. The expectation that PacifiCorp follow a steady, fixed discharge schedule between elevations effectively eliminates operational flexibility.

The operational flexibility remaining for the Project rests with PacifiCorp's discretion in balancing the active storage at its own hydroelectric reservoirs downstream of Keno dam. This flexibility applies over a 7-day period, but no longer. Usable active storage (J.C. Boyle, Copco, and Iron Gate reservoirs) is limited. Controlled water flow between the reservoirs is only possible for approximately a 3-day period, after which reservoirs have to be refilled and cycled over again.

Flows at the Link River facilities and Keno dam must be continuously adjusted to balance the varied flows from the USBR Project and to meet flow requirements downstream of Iron Gate dam. This control is maintained by adjusting flows through East Side powerhouse. Flow through West Side powerhouse and Link River dam spill is kept constant. The flows through the West Side turbine cannot be varied (the plant is either on or off).

Although most flow is diverted at Link River dam for irrigation or hydropower use, there are times when water is spilled. The primary spill gates can pass up to 1,000 cfs. The stop log spill gates can pass up to 12,000 cfs when opened. These releases are based on a full reservoir level of El. 4,143 feet msl.

Current ramp rates (see Table B6.3-1) at Link River dam were put in place in the 1980s through collaboration with ODFW. These ramp rates were accepted in USFWS's 1996 biological opinion for operation of the Project. Although ramp rates at Link River dam are within the capabilities of the equipment used to control flow, the ability to control flow with a high degree of accuracy is unknown at this time.

At Link River dam, instream flow is provided to the Link River reach through spill gates and the fish ladder. Minimum flow in the Link River below the dam is 90 cfs. A requirement in the USFWS 2001 biological opinion raised that value to a minimum flow of 250 cfs to improve water quality in this reach during the late summer/early fall of 2001.

Flow through the dam is measured by a rule curve determined by the opening of the spill gates and the reservoir head.

Table B6.3-1. Link River minimum instream flow and ramp rate directives.

River Reach	Length of Reach (River Miles)	Minimum Instream Flow	Ramp Rate	
Link River	1.5	90 cfs from the dam (as per agreement with ODFW)  250 cfs during the summer when water quality is adverse as per USFWS 2001 biological opinion for suckers (USFWS 2001)	Flow Release Rate (cfs)	Ramp Rate
			0-300	(down) 20 cfs/5 min
			300-500	50 cfs/30 min
			500-1500	100 cfs/30 min (USFWS 2001)

The field personnel on site generally manage the flow major releases needed at Link River dam. Since the majority of the gates require manual operation, the plant operators make flow adjustments as needed for the East Side canal, the secondary spill section with stop logs, and the West Side canal. PacifiCorp has control of two of the six primary spillgates. As flows fluctuate and exceed the operating range of those gates, the plant operators are contacted to adjust any of the manual gates and to provide another flow range on the automated gates. Discharge flows exceeding the capacity of the primary spill section prompt the operators to begin removing stop logs in the secondary spill section. The head gates for the West Side canal throttle the flows to maintain constant flow of approximately 250 cfs for unit efficiency. When the West Side unit is not operating, the West Side canal headgates are closed and East Side canal provides the needed downstream flows. The East Side canal headgates are normally kept open and the throttling of flows is done with the East Side turbine flows.

#### B6.4 FUTURE OPERATIONS

With expiration of the 1956 contract in 2006, USBR will be responsible, as owner of the Link River dam, to operate the dam to meet ESA and other regulatory needs. These include meeting UKL elevations and Iron Gate Development instream flow releases.



## B7.0 EAST SIDE AND WEST SIDE DEVELOPMENTS

### B7.1 INTRODUCTION

The East Side and West Side developments are part of the existing Project, but will be removed from service and excluded from the proposed Project.

### B7.2 EAST SIDE DEVELOPMENT OVERVIEW

PacifiCorp owns and operates the East Side Development including the canal from Link River dam to the powerhouse. The development consists of 1,729 feet of wood-stave flowline, 1,362 feet of steel flowline, a surge tank, and a powerhouse on the east bank of Link River. Maximum diversion capacity for the East Side powerhouse is 1,200 cfs. The powerhouse consists of a single 3.2-MW unit. There are no fish screens at the East Side canal intake. A large trash rack (28 feet by 28 feet) is in place at the entrance to the wood stave flowline.

### B7.3 EAST SIDE POWERHOUSE CONTROL

The general operation of the East Side powerhouse is to operate continuously and not vary generation according to customer demand. The exception is during late July into October when the powerhouse operates in a diurnal fashion reducing flows through the facility at night to 200 cfs. This operation minimizes entrainment of federally listed fish (Lost River and shortnose suckers).

The East Side Development typically operates as a run-of-river facility. In above-average water years, more water flows into UKL than can be stored. As such, the facility operates at full hydraulic capacity and excess water is spilled. In below-average water years, spill does not occur, and all available water is used for generation and the development is operated to meet specified instream flows below Iron Gate.

Flow downstream of the East Side powerhouse is measured at USGS gauge 11507500 approximately ¼ mile downstream from the plant. This gauge measures spill from Link River dam and powerhouse flows. Powerhouse flow is determined with a rule curve based on power being produced. That is, a particular flow is known to produce a given amount of electricity based on the efficiency of the turbine unit. There are no ramp rate restrictions for changing flows through the East Side powerhouse; however, a minimum instream flow of 450 cfs is in effect below the powerhouse (Table B7.3-1).

Table B7.3-1. East Side minimum instream flow and ramp rate directives.

<b>River Reach</b>	<b>Length of Reach (River Miles)</b>	<b>Minimum Instream Flow</b>	<b>Ramp Rate</b>
Downstream of East Side powerhouse to Keno reservoir	Not Applicable	450 cfs (as per USFWS 1996 biological opinion for PacifiCorp)	None

The canal headgates are normally open, and in the event the powerhouse is not operating the elevation of the forebay mimics that of UKL. Depending on the expected length of an outage, Link River dam spillgate(s) may be opened to meet downstream flow needs.

The East Side powerhouse is operated both manually and automatically. Manual operation includes manual watering up or de-watering of the water conveyance system before and after planned, extended outages. PacifiCorp personnel are present for normal unit startup and shutdown. Project flows and generation are monitored continuously. Unit loading can be remotely adjusted to meet downstream flow requirements until additional manual changes are needed. Local personnel are able to operate the plant or shut the unit down until problems are corrected.

#### B7.3.1 Annual Plant Factor

The average annual energy production for the East Side Development is 15,400 MWh (30-year long-term average, May 2003).

With an installed capacity of 3.2 MW, this yields an annual plant factor of 55 percent.

#### B7.3.2 Period of Critical Stream Flow, Average Annual Energy Production, and Dependable Capacity

The period of critical stream flow used to determine the dependable capacity is water year 1981. However, the East Side Development is typically operated based on UKL releases to meet Iron Gate dam downstream flow requirements. The dependable capacity is approximately the same as the installed capacity of 3.2 MW. The average annual energy production for the East Side development is 15,400 MWh (30-year long-term average, May 2003).

Monthly flow-duration curve for flows at Link River dam are presented in Figure B7.3-1.

#### B7.3.3 Area-Capacity Curve and Rule Curve

No active storage is available in UKL for use by the East Side Development given USBR's current directive operations. Therefore, no area-capacity curves showing gross storage capacity and usable storage capacity are presented.

#### B7.3.4 Hydraulic Capacity

The estimated hydraulic capacity of the East Side powerhouse is approximately 975 cfs at a net rated head of 47 feet. The minimum flow necessary for operation is 200 cfs.

#### B7.3.5 Tailwater Rating Curve

The tailwater rating curve is shown in Figure B7.3-2.

#### B7.3.6 Power Plant Capacity Versus Head Curve

The power plant capacity versus head curve is shown in Figure B7.3-3.

### B7.4 WEST SIDE FACILITY OVERVIEW

The West Side facilities consist of a 5,575-foot-long flume below Link River dam, a spillway and discharge structure, an intake, 140 feet of steel penstock, and a powerhouse located on the right bank of the Link River. Maximum diversion capacity for the West Side canal is 250 cfs.

The West Side powerhouse contains a single 0.6-MW unit. There are no fish screens at the West Side canal intakes; however, there is a 5-foot-wide by 16-foot-high trash rack ahead of each headgate. A second trash rack, 12 feet high by 18 feet wide, is located at the penstock entrance.

The West Side powerhouse contains a single 0.6-MW unit. There are no fish screens at the West Side canal intakes; however, there is a trash rack (5 feet wide by 16 feet high) ahead of each headgate. A second trash rack (18 feet wide by 12 feet high) is located at the penstock entrance.

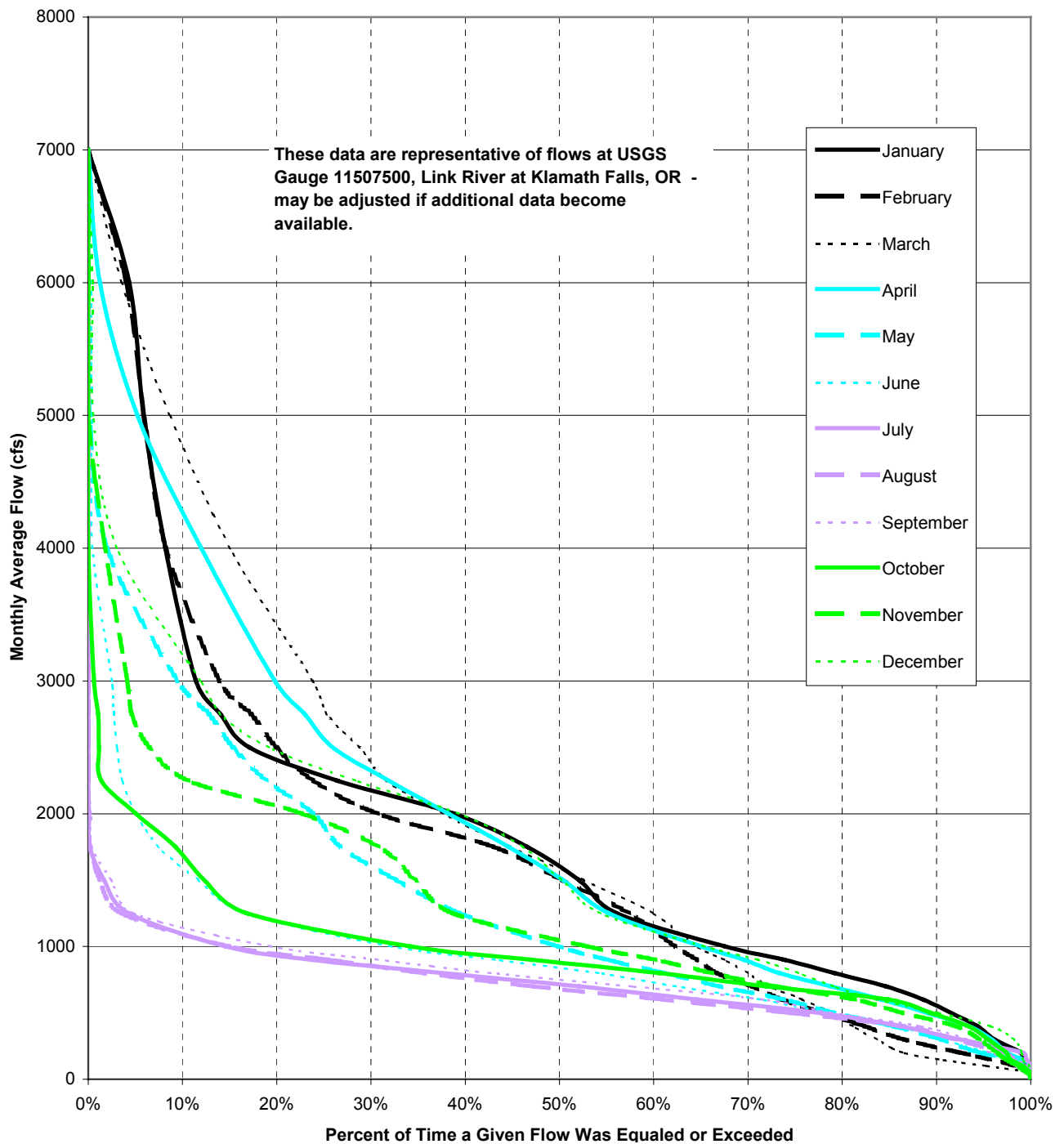
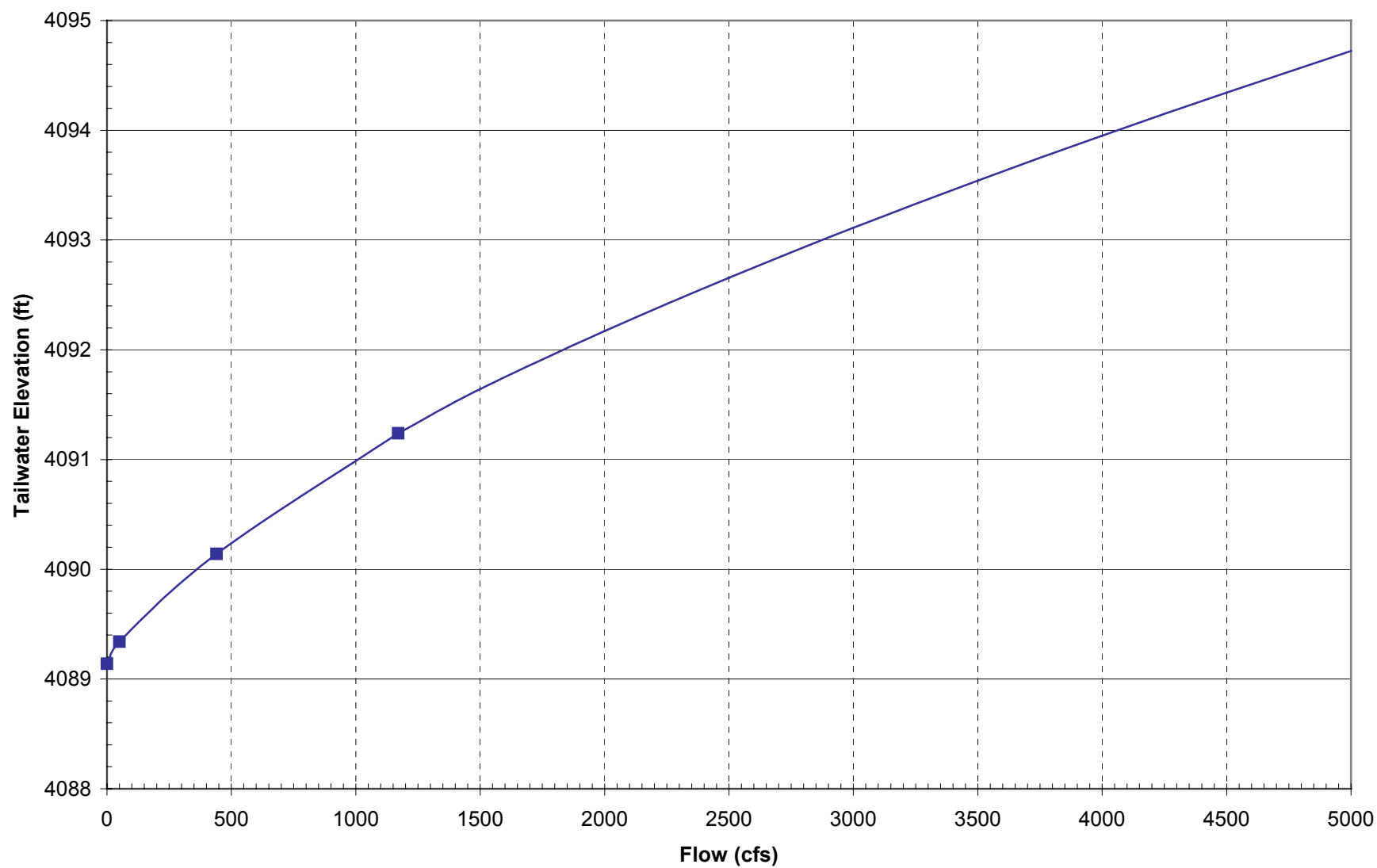


Figure B7.3-1. Flow-duration curve of monthly flows at the East Side Development.



Normal Tailwater Elevation = 4090 ft

Figure B7.3-2. Tailwater rating curve, East Side Development.

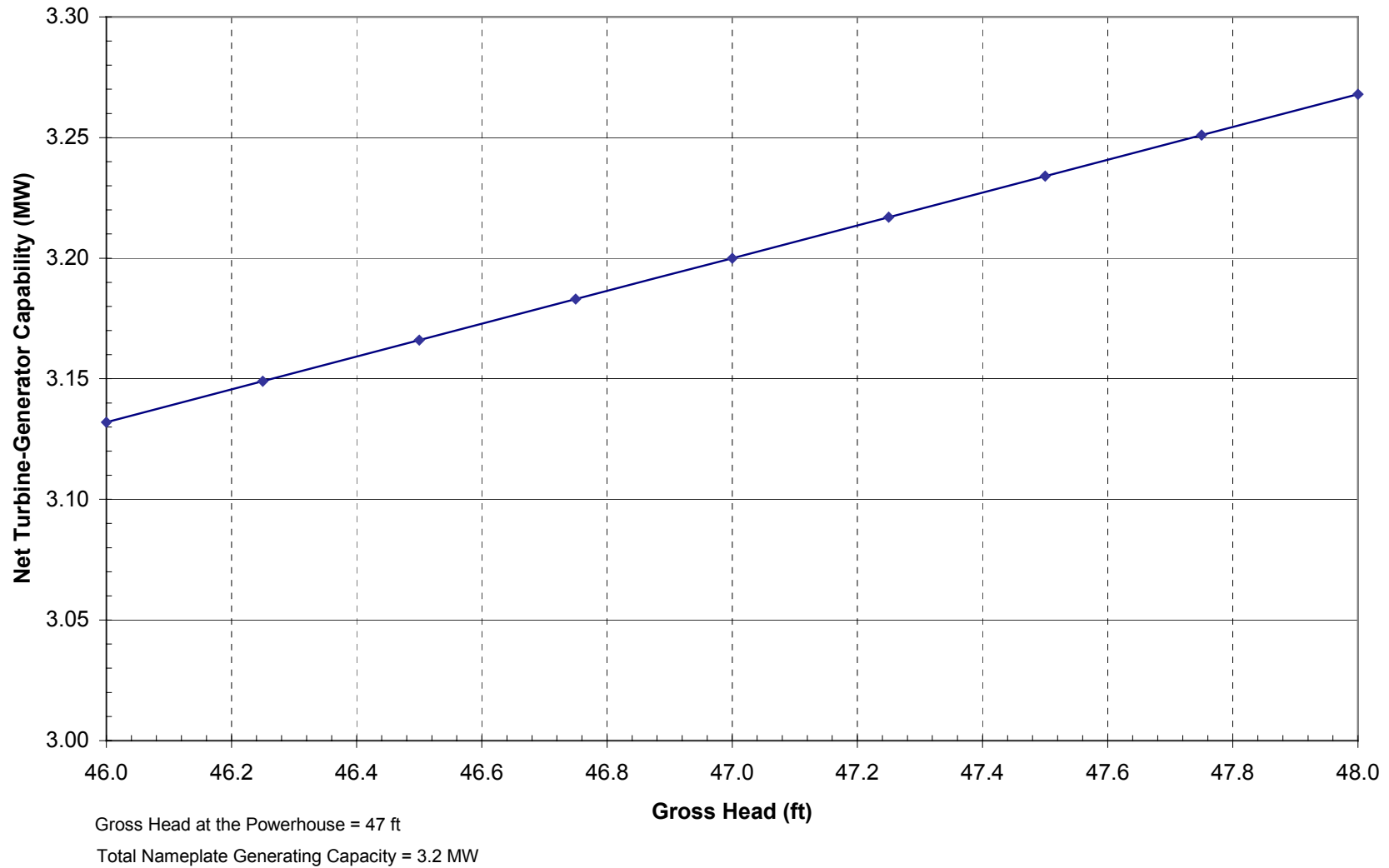


Figure B7.3-3. Turbine generator capability vs. head, East Side Development.

#### B7.4.1 West Side Powerhouse Control

The West Side powerhouse can only operate near full flow 230–250 cfs. Generation at the West Side plant is possible when downstream flow needs at Iron Gate dam exceed the sum of the East Side powerhouse hydraulic capability (975 cfs) and the minimum instream flow in the Klamath River below the Link River dam (90 or 250 cfs, depending on the time of year), or when there is spill available from UKL. When the powerhouse is not in operation, the canal is kept full, in part to meet small irrigation diversions to surrounding properties and in part to maintain the canal integrity.

In the event of an unplanned powerhouse shutdown, water flowing in the West Side canal backs up from the powerhouse raising the water elevation in the canal. Once the elevation is high enough, water flows over the ungated spillway down a short chute to Link River. This spill continues until the powerhouse is back in operation or the West Side canal headgates can be manually closed.

The West Side powerhouse operates in a manual mode that includes manual watering up and dewatering of the conveyance system for planned extended outages or emergencies and all normal unit startup and shutdowns. The West Side generating unit is “block loaded” by setting the control on “head-level” indication, setting inlet canal flows at the dam, and allowing the unit to produce at its capacity only. There is remote monitoring and remote unit tripping, but no control of the canal flow and unit generation. Local operators are notified of any needed changes to the plant’s operation.

#### B7.4.2 Annual Plant Factor

The average annual energy production for the West Side powerhouse is 3,420 MWh (30-year, long-term average, May 2003). With an installed capacity of 0.6 MW the annual plant factor for West Side is 65 percent.

#### B7.4.3 Period of Critical Stream Flow, Average Annual Energy Production, and Dependable Capacity

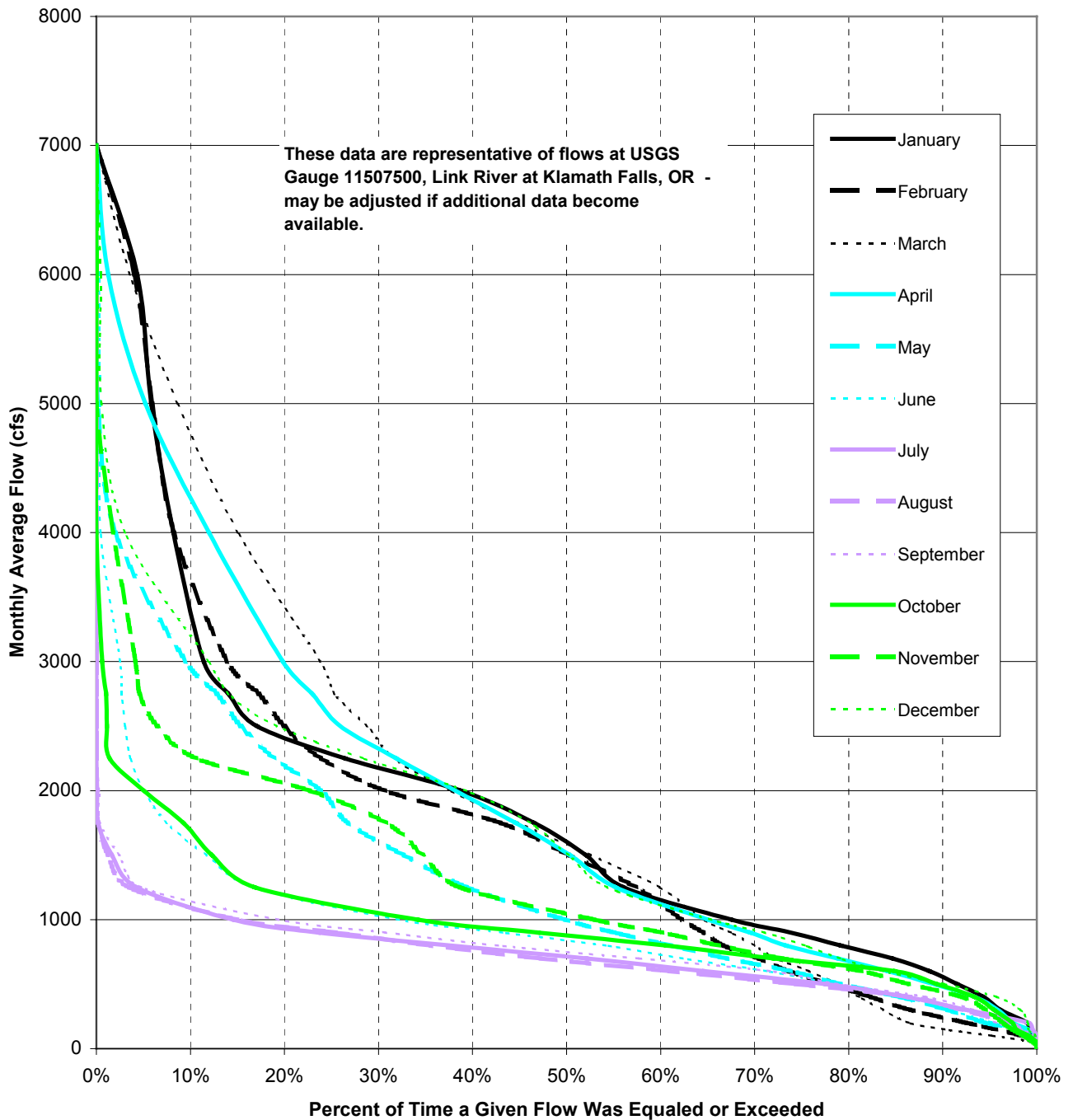
The period of critical streamflow used to determine the dependable capacity is water year 1981. However, the West Side Development is typically only operated when water availability exceeds the capacity of the East Side Development. Therefore, during a dry year, the dependable capacity is effectively zero.

The average annual energy production for the West Side Development is 3,420 MWh (30-year, long-term average, May 2003).

In Figure B7.4-1, the monthly flow-duration curves at Link River dam, also apply to the West Side Development.

#### B7.4.4 Area-Capacity Curve and Rule Curve

No active storage is available in UKL for hydroelectric purposes given USBR's current directive operations. Therefore, no area-capacity curves showing gross storage capacity and usable storage capacity are presented.



Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1966, 1967 and 1989)

Figure B7.4-1. Flow-duration curve of monthly flows at the West Side Development.



#### B7.4.5 Hydraulic Capacity

The estimated hydraulic capacity of the West Side powerhouse is approximately 250 cfs at a rated net head of 47 feet.

#### B7.4.6 Tailwater Rating Curve

The tailwater rating curve is shown in Figure B7.4-2.

#### B7.4.7 Power Plant Capacity Versus Head Curve

The power plant capacity versus head curve is shown in Figure B7.4-3.

### B7.5 EAST SIDE AND WEST SIDE DECOMMISSIONING

As described in Sections A3.6, Proposed Minor Modifications, and C2.5, Proposed Changes, the East Side and West Side developments are planned to be decommissioned. It is expected that upon removal of the East Side and West Side developments, the USBR will release flows through the spillgates and fish ladders at Link River dam in a pattern very similar to the existing conditions. The decommissioning will result in the lost of 3.8 MW of capacity and 18,800 MWhs of annual energy.

Decommissioning of the East Side and West Side Developments will have negligible effect on operation of the downstream developments. The USBR will be responsible for the downstream releases at Link River dam in conformance to the requirements of the Klamath Project Annual Operations Plan. These releases, based on the USBR's water year type determination as discussed in Section B2.1, will be utilized by the downstream developments.

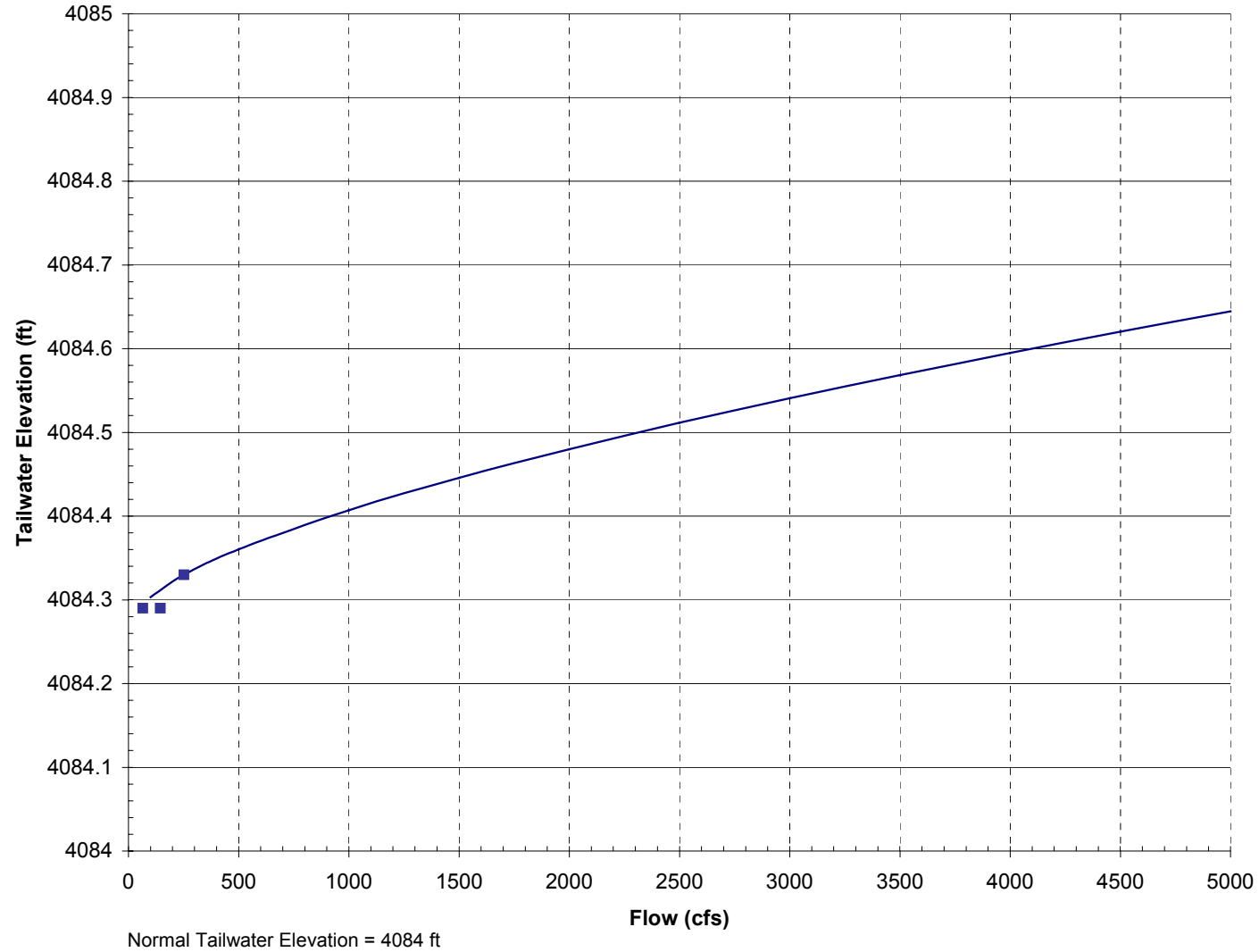


Figure B7.4-2. Tailwater rating curve, West Side Development.

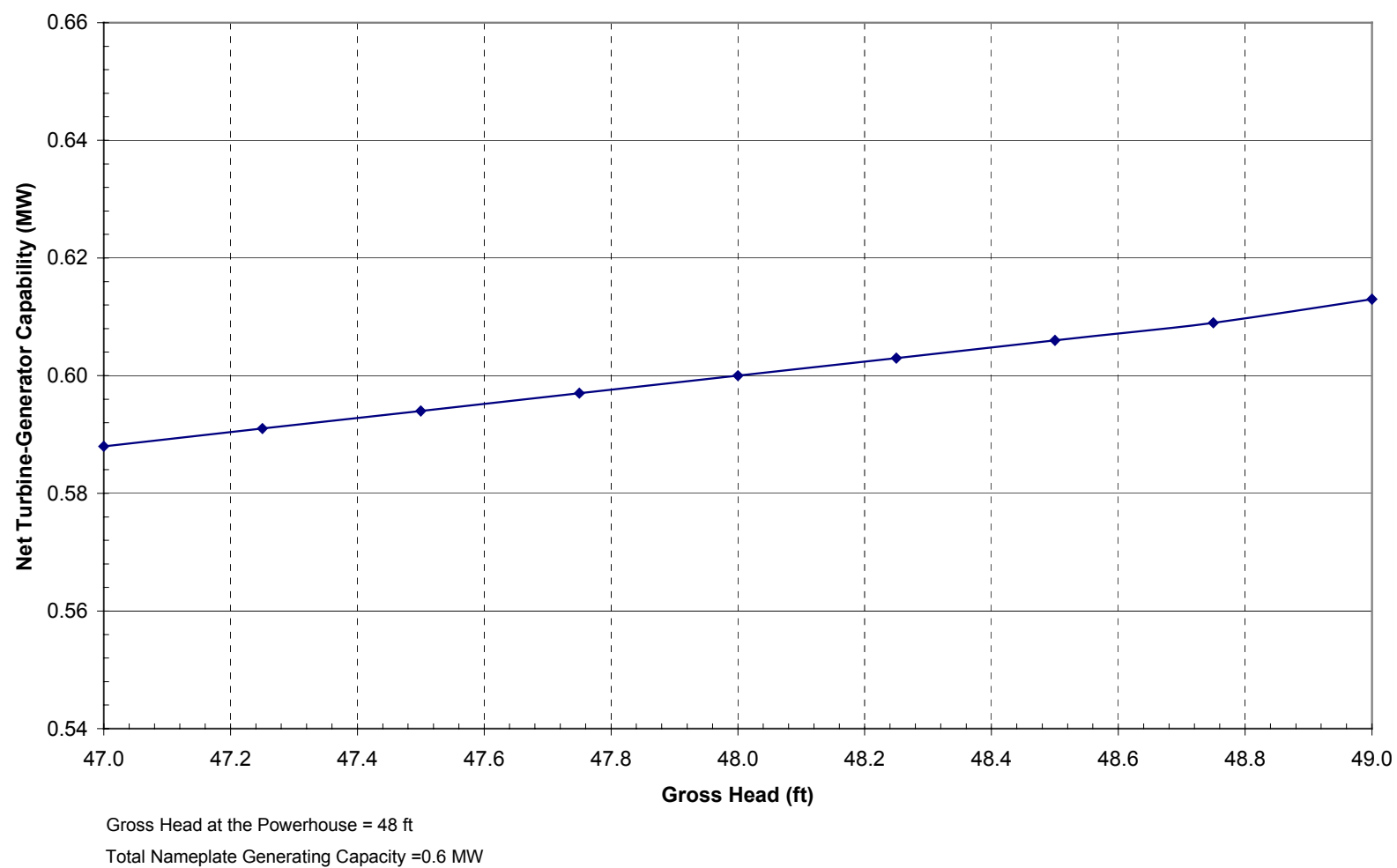


Figure B7.4-3. Turbine generator capability vs. head, West Side Development



## B8.0 KENO DEVELOPMENT

### B8.1 INTRODUCTION

For the existing Project, PacifiCorp operates Keno dam in accordance to contracts with USBR and local irrigators. The Project does not receive substantial benefit from Keno dam. As such, Keno dam will not be included in the proposed Project. Future operations will be consistent with current operations.

### B8.2 DEVELOPMENT OVERVIEW

Keno dam is a re-regulating facility located at approximately RM 233, which is approximately 21 miles downstream of Link River dam (Figure B1.1-1). There is no power generating capability at this facility. The concrete dam has a height of 25 feet and a spillway section consisting of six 40-foot-wide spill gates. The impoundment upstream of the dam has a surface area of 2,475 acres and a total storage capacity of 18,500 acre-feet. There is a weir and orifice-type fish ladder at the Keno dam.

### B8.3 OWNERSHIP AND CONTRACTUAL OBLIGATIONS

On January 3, 1968, Pacific Power & Light Company (formerly Copco, now PacifiCorp) and USBR entered into a contract to operate Keno dam (Appendix B-8A). This contract was in response to the FERC license article No. 55 “The licensee shall enter into formal agreement with the United States Bureau of Reclamation for the purpose of regulating the level of Lake Ewauna and the Klamath River between Keno dam and Lake Ewauna, and in the event that the Licensee and the Bureau fail to reach an agreement, the Commission will prescribe the terms of such regulation after notice and opportunity for hearing” (FPC 1956).

The 1968 contract requires PacifiCorp to maintain Keno reservoir at elevations between 4085.0 and 4086.5 feet whenever USBR is diverting water to the USBR Project. From the upper bounds to the lower bounds of these elevations is the equivalent of 18,500 acre-feet. The 1968 contract also requires PacifiCorp to take certain steps to facilitate the return of used irrigation water into the river at the Klamath Straits Drain (up to 300 cfs) and the Lost River diversion channel (up to 3,000 cfs).

Operation in this manner requires close coordination between USBR and PacifiCorp on any issues where one party’s operation of its project facilities might impact the other party. This coordination is particularly difficult and important in the spring when run-off can be naturally high and irrigators are pumping a large volume of water from their fields into Keno reservoir in preparation for the growing season. The 1968 Keno contract expires in 2006 coincidentally with PacifiCorp’s current FERC license. Aside from the contract with USBR and at the request of irrigators with pumps on Keno reservoir, PacifiCorp maintains Keno reservoir at elevation  $4085.4 \pm 0.1$  feet from October 1 to May 15 and  $4085.5 \pm 0.1$  feet from May 16 to September 30 so that lake elevations are suited to irrigation pump depths. These elevations also allow for gravity flow from Keno reservoir onto the ODFW Miller Island Wildlife Refuge.

## B8.4 OPERATIONS

Keno dam is a re-regulating facility for the varying flows in and out of the Klamath River between Link River and Keno dam. In as much as possible, Keno dam is operated to maintain a steady reservoir elevation through all river flows and water year types, while continuing to provide enough water to meet flow requirements at Iron Gate dam. The steady reservoir elevation allows both the USBR and local irrigators to manage irrigation water. In operating Keno dam, PacifiCorp can more effectively schedule and plan load following operations at the J.C. Boyle powerhouse. Operating the reservoir in a re-regulating mode can result in river fluctuations below the dam, especially during high flow conditions.

Flows from the USBR Project enter PacifiCorp's Project in Keno reservoir via the Klamath Straits Drain and Lost River diversion channel. These return flows can be highly variable and can be somewhat problematic for stable reservoir elevations. Flows from the USBR Project can vary approximately 775 cfs, each 200 cfs has the ability to affect the reservoir elevation approximately 0.2 feet in a 24-hour period. Hence, control of flows from the East Side Development and flow through Keno dam are crucial to maintain a constant elevation in Keno reservoir. In order to achieve a reservoir fluctuation within  $\pm 0.1$  feet, PacifiCorp and USBR coordinate and/or communicate their operations on a daily basis during periods of high flow fluctuation.

Given the need to maintain a fixed Keno reservoir water surface elevation, inflows must be matched by the outflows. It follows that flows through Keno dam largely mimic those into Keno reservoir, namely releases from UKL plus the net USBR canal flows into Keno reservoir. The spill gates at Link River dam are operated to assure tight control on minimum flow but not all gates can be remotely controlled to respond to flow changes. Similarly, the West Side powerhouse is manually placed on- or off-line and thus cannot easily respond to change. Finally, the hydraulic capacity at the East Side powerhouse limits river flow adjustments to 1,200 cfs until gate positions at the dam can be reconfigured by field personnel. For example, if flow releases exceed the East Side turbine flow capacity, operators manually open the spillgates to provide a range of operating levels that allow further adjustment to the plant's power generation. Along with operations at the Link River facilities, spill gate adjustments at Keno dam can be used to help maintain a constant elevation in Keno reservoir. A result of such operations is that the river below Keno may fluctuate to keep Keno reservoir elevation constant. (See the next paragraph and Table B8.3-1 for a further description of the magnitude and frequency of these changes.) Minimum flow below Keno dam is 200 cfs, although flows rarely, if ever, get this low except in drought years (e.g., flows approached 150 cfs in 1992, a drought year). If flow is expected to be less than 250 cfs, PacifiCorp must contact ODFW.

There is no required FERC ramp rate below Keno dam. However, consistent with flow management at J.C. Boyle, PacifiCorp manages flow changes to no more than a 500 cfs per hour ramp rate or 9 inches per hour when not in high flow situations. Table B8.3-1 is a summary of hourly flows at Keno dam and the frequency of hourly changes for various change amounts. Average flow ranges from 700 cfs in July up to 3,600 cfs in March. Large hourly flow changes mostly occur in January through May. The effects of these hourly changes on river stage are summarized in the second column.

Table B8.3-1. Flows below Keno dam and frequency/magnitude of flow changes; WY 1995-2001 (through September 30, 2001) (USGS Gauge No.11509500).

Month	Average Hourly Stage Change (ft)	Average Hourly Flow (cfs)	Average Hourly Change (cfs)	Avg. # of Hourly Changes per Month (100-150 cfs)	Avg. # of Hourly Changes per Month (151-250 cfs)	Avg. # of Hourly Changes per Month (251-350 cfs)	Avg. # of Hourly Changes per Month (351-500 cfs)	Avg. # of > 500 cfs Hourly Changes per Month
January	0.016	2,935	27	17	15	7	6	6
February	0.013	3,586	29	17	16	5	7	5
March	0.045	3,606	24	12	12	5	7	5
April	0.017	2,791	22	8	10	6	5	6
May	0.014	2,570	17	9	11	7	5	2
June	0.007	1,370	8	3	5	2	1	0
July	0.022	705	5	7	3	4	1	1
August	0.008	788	5	5	6	2	1	0
September	0.011	984	6	7	4	1	1	0
October	0.013	1,076	6	3	3	2	2	1
November	0.024	1,165	5	4	4	1	2	1
December	0.008	1,533	9	8	7	4	1	1
Total Average	0.02	1,976	14	93	94	45	38	28

The elevation of Keno reservoir is tightly constrained between  $4085.4 \pm 0.1$  feet October 1 through May 15 and  $4085.4 \pm 0.1$  feet from May 16 through September 30. Diversions from the USBR Project can vary by greater than 1,000 cfs over a 24-hour period. Spill changes at Link River dam and/or generation adjustments at the East Side powerhouse must balance these changes. Tables B8.3-2 and B8.3-3 summarize the absolute value of average and maximum daily changes at the USBR diversions by month.

Table B8.3-2. Average 24-hour Klamath Straights Drain change (cfs) for 1995-2001 (through September 30, 2001).

Month	1995	1996	1997	1998	1999	2000	2001*
January	173	75	263	176	93	128	50
February	112	314	189	87	156	84	42
March	290	99	38	165	256	81	56
April	70	53	47	207	149	82	34
May	59	72	74	204	61	88	12
June	73	58	67	193	113	74	0
July	62	56	58	87	105	78	0
August	44	63	105	75	92	67	23
September	38	65	62	63	58	132	14
October	62	57	46	49	64	49	NA

Table B8.3-2. Average 24-hour Klamath Straights Drain change (cfs) for 1995-2001 (through September 30, 2001).

Month	1995	1996	1997	1998	1999	2000	2001*
November	37	55	78	87	40	44	NA
December	93	81	56	109	50	52	NA

\*2001 was a drought year and irrigation supplies via the A-Canal were terminated through the summer.  
NA = Not available at the time this table was prepared.

Table B8.3-3. Maximum 24-hour Klamath Straights Drain change (cfs) for 1995-2001 (through September 30, 2001).

Month	1995	1996	1997	1998	1999	2000	2001*
January	1,106	463	1,079	1,049	349	799	137
February	681	1,273	1,051	407	483	330	123
March	1,756	495	114	619	924	512	158
April	298	176	149	851	660	277	121
May	261	288	254	765	253	263	29
June	224	158	193	1,132	557	169	0
July	231	216	261	265	568	281	0
August	127	178	280	264	228	169	104
September	91	192	188	281	165	688	67
October	296	335	129	153	178	376	NA
November	165	184	353	374	100	141	NA
December	492	458	226	447	225	222	NA

\*2001 was a drought year and irrigation supplies via the A-Canal were terminated through the summer.  
NA = Not available at the time this table was prepared.

Without Keno dam, the flows in this reach of the Klamath River would fluctuate in direct proportion to the current USBR diversions in and out of the reservoir.

Flows are released at Keno dam via three routes: the fish ladder, a 36-inch-diameter sluice conduit, and the six spill gates. With the exception of critically dry periods, flow is typically released from all three points. During times when the release flow approaches 200 cfs, the spill gates are closed and flow releases are via the sluice conduit (130 cfs capacity) and the fish ladder (70 cfs capacity). A USGS gauge (No. 11509500) approximately one mile downstream of the Keno dam monitors river flows every few minutes. Table B8.3-4 identifies flow and ramp rate guidelines for releases at Keno.

Table B8.3-4. Keno minimum instream flow and ramp rate directives.

River Reach	Length of Reach (River Miles)	Minimum Instream Flow	Ramp Rate
Below Keno dam	5	200 cfs (as per agreement with ODFW, notify when flow will be less than 250 cfs)	500 cfs or 9 inches per hour during summer (self, imposed, nonregulatory ramp rate)



#### B8.4.1 Description of Plant Control

Keno dam is automated to provide flow regulation facility. It maintains a relatively constant reservoir level (within a 0.5-foot range). The gate opening, gate closing, control and monitoring can be provided remotely without local personnel present or involved. This is provided 24 hours per day, seven days a week. Local crews provide checks of the facilities and manually adjust gate position to coincide with telemetry values on an as-needed basis. During high runoff periods when spill releases exceed the capacity of the controlled gates, the field crew adjusts the locally controlled gates and provides a new operating range for the auto-remote controlled gates.

#### B8.4.2 Keno Drawdown

At the request of USBR and irrigators with pumps located around Keno reservoir, PacifiCorp voluntarily draws down the reservoir approximately 2 feet every 1 or 2 years in the early spring (April or May) for 2 to 3 days. This is done to let irrigators clean out their water intakes and maintain the pumps before the irrigation season begins. The drawdown affects Project operations for approximately a week.



## B9.0 J.C. BOYLE DEVELOPMENT

### B9.1 DEVELOPMENT OVERVIEW

The J.C. Boyle Development consists of a reservoir, dam, power canal, and powerhouse on the Klamath River between approximately RM 228 and 220 (Figure B1.1-1). The dam is an earth-filled dam 68 feet tall impounding a narrow reservoir of 420 surface acres (J.C. Boyle reservoir). The impoundment formed upstream of the dam contains approximately 3,495 acre-feet of total storage capacity and 1,724 acre-feet of active storage capacity.

The dam has a spillway with three spill gates and can divert up to 14,850 cfs at El. 3,792 feet msl. The rated hydraulic capacity of the powerhouse is 2,850 cfs. The intake from the dam to the power canal is screened. A fish ladder at the dam provides for upstream fish passage.

Water diverted at the dam enters a 617-foot-long steel flowline that empties into a canal. Flow into the canal can be controlled by an automated headgate. The canal extends just over 2 miles along the river canyon. At the downstream end of the canal is a small forebay where two automated spillgates direct overflows to a short spillway and into the bypass reach. Water flowing to the powerhouse goes through a trash rack before entering a tunnel. The water then flows into two steel penstocks, each serving a separate 40-MW unit. The powerhouse is located approximately 4.3 RM downstream of the dam.

### B9.2 OWNERSHIP AND CONTRACTUAL OBLIGATION

PacifiCorp owns and operates the J.C. Boyle Development and has no direct contractual obligations with USBR regarding its operation. The J.C. Boyle facility, however, is operated in a manner to assure conformity with NOAA Fisheries 2002 BO flows downstream of Iron Gate dam.

### B9.3 OPERATIONS

The J.C. Boyle powerhouse is typically operated as a power peaking facility, especially when river flows are less than maximum turbine hydraulic capacity 3,000 cfs. Due to turbine efficiencies, the preferred flow is 2,500 cfs and is typically the maximum used at the plant. Power generation (and hence flow through the powerhouse) is shaped to coincide with peak customer electricity demand. During the summer months, peak demand typically occurs on weekdays in the afternoons and early evenings. In general, on a daily basis, water storage occurs in the J.C. Boyle reservoir at night when generation is not occurring. Given the required up-ramp rate for the J.C. Boyle powerhouse (9 inches per hour), generation must begin well in advance of peak electric load requirements so that the units are at full generation capacity for the peak demand period. The reservoir usually begins to fill sometime after dark, is full by early morning, and begins to be drawn down again during the daylight hours. Specific periods of releases may vary widely depending on the anticipated time of peak demand, downstream flow requirements, and climatic conditions.

The J.C. Boyle bypass reach (i.e., the reach immediately downstream of the dam and upstream of the powerhouse) has a current FERC minimum flow requirement of 100 cfs (Table B9.3-1). This flow is comprised of approximately (a) 80 cfs from the fish ladder, (b) 20 cfs from the juvenile bypass system, and (c) any seepage from the dam. Flow through the fish ladder is regulated by a

float attached to a head gate that moves up and down to open/close the head gate, as necessary, to maintain a constant flow through the ladder. Opening a valve manually regulates flow into the juvenile bypass system. The valve remains fully open at all times.

Table B9.3-1. J.C. Boyle minimum instream flow and ramp rate directives.

<b>River Reach</b>	<b>Length of Reach (River Miles)</b>	<b>Minimum Instream Flow</b>	<b>Ramp Rate</b>
J.C. Boyle Bypass (dam to powerhouse)	5	100 cfs (FERC license)	9 inches per hour (up and down rate)
J.C. Boyle Reach Downstream of powerhouse	22	100 cfs into bypass reach from dam. Additional natural flow from Big Springs of approximately 220 cfs	9 inches per hour (up and down rate) (FERC license)

Large springs that begin approximately half way down the bypass reach contribute approximately 220<sup>2</sup> cfs to the reach (Figure B9.3-1). Hence, flow at the downstream end of the bypass reach is a minimum of approximately 320 cfs when the dam is not spilling and there is no power generation. The bypass reach has no USGS gauge; however, a USGS gauge (No. 11510700) is located 1/4 mile downstream of the powerhouse and records flow levels every few minutes.

The J.C. Boyle powerhouse generally operates as a peaking facility when flow is not adequate to allow continuous operations. Such operating conditions can result in a fluctuation of approximately 3.5 feet maximum between minimum and full pool elevations in the J.C. Boyle reservoir, but the average daily fluctuation is approximately 1–2 feet. This type of operation can also result in powerhouse flows that vary according to power demand. As a result, flows downstream from the powerhouse may fluctuate on a daily basis, based on the amount of water available to the plant.

Operating in a peaking mode allows commercial and recreational rafting opportunities from the powerhouse to Copco reservoir (approximately 15 miles) from May to mid-October. During that period and dependent on power demand conditions, PacifiCorp may consider the timing needs of commercial rafters when it is scheduling the flow release.

In view of the annual hydrology, the J.C. Boyle Development typically operates as a run-of-river facility; that is, in above-average water years, more water flows into the reservoir than can be stored. As such, the facility operates at full hydraulic capacity and excess water is spilled. In below-average water years, spill does not occur, and all available water is used for generation and the development is operated to meet specified instream flows below Iron Gate.

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<sup>2</sup> This flow was calculated by identifying those days when the dam was not spilling and flow through the powerhouse equaled zero. On those days, the minimum FERC flow of 100 cfs was subtracted from the USGS gauge data flow located approximately ¼ mile below the powerhouse.

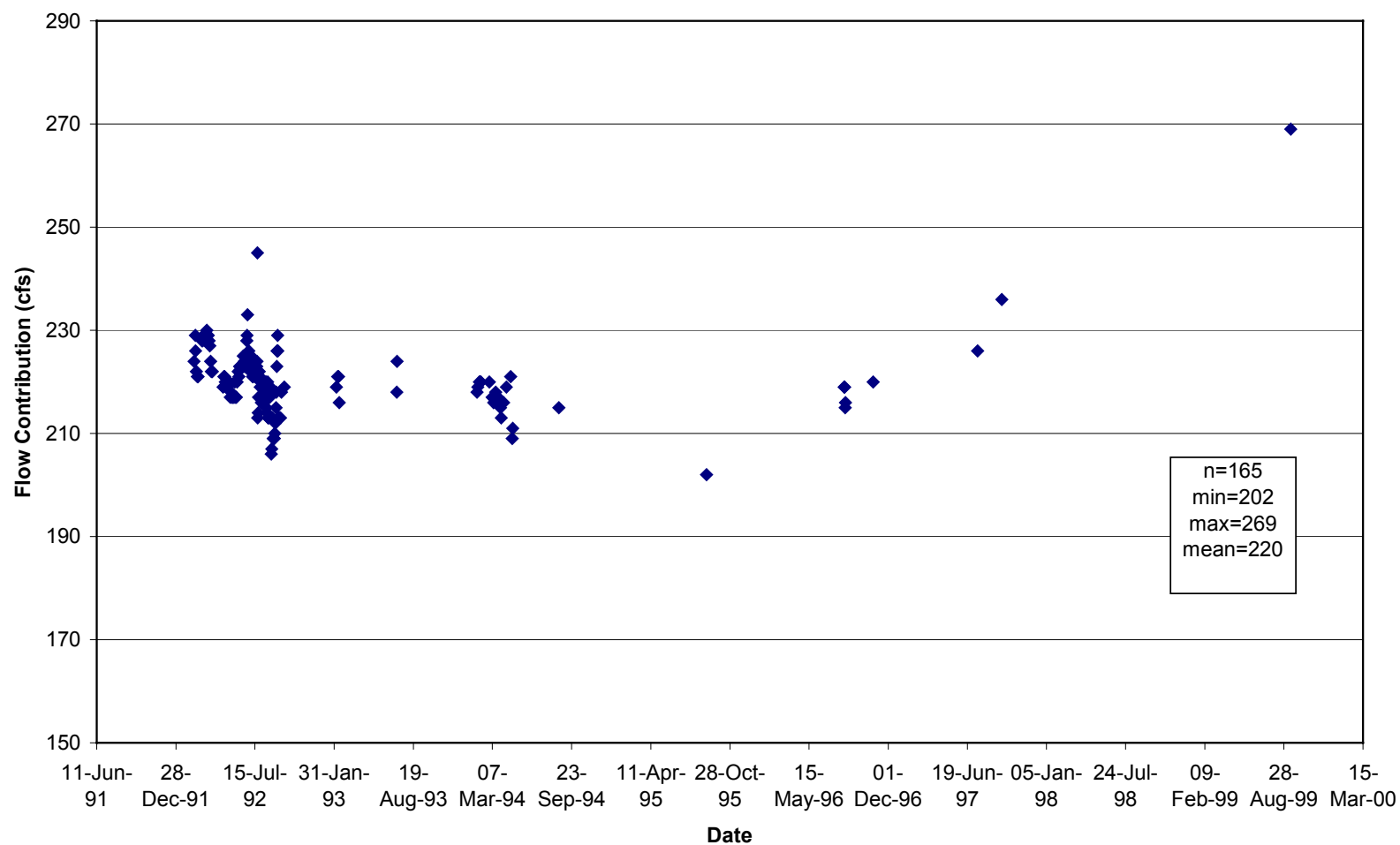


Figure B9.3-1. J.C. Boyle spring accretion contribution.

In the event of an unscheduled powerhouse shutdown, the J.C. Boyle canal headgate automatically closes to prevent additional flow from entering the power canal. At the downstream end of the canal is a forebay with a float that triggers the operation of the canal spill gates. When water in the canal rises to a predetermined elevation, the spill gates open. Spill continues until the float drops down below the critical canal elevation. If only one generating unit is in operation (1,500 cfs or less) and it shuts down, the canal may be able to capture the water without opening the spill gates. With both units in operation, it is most likely that spill will occur. Should the shutdown be lengthy and adversely effect water supply needs downstream, PacifiCorp may elect to open spill gates at J.C. Boyle dam.

The operation of the J. C. Boyle Development is automated. The operation of the two turbine-generator units is prescribed from a daily generation schedule established to meet the power demands of the PacifiCorp system while passing required flows through the Project facilities. Upon a unit's startup, generation is set and automatically held until it is reset or the unit is shut down. Local operators can control the operation manually from the powerhouse.

#### B9.4 ANNUAL PLANT FACTOR

The average annual energy production for the J.C. Boyle powerhouse is 329,000 MWh (30-year long-term average, May 2003). With a nameplate capacity of 80 MW, the annual plant factor for J.C. Boyle is 47 percent.

#### B9.5 PERIOD OF CRITICAL STREAM FLOW, AVERAGE ANNUAL ENERGY PRODUCTION, AND DEPENDABLE CAPACITY

The period of critical streamflow used to determine the dependable capacity is water year 1981. The dependable capacity is 15,300 kW.

The average annual energy production for the J.C. Boyle powerhouse is 329,000 MWh (30-year long-term average, May 2003).

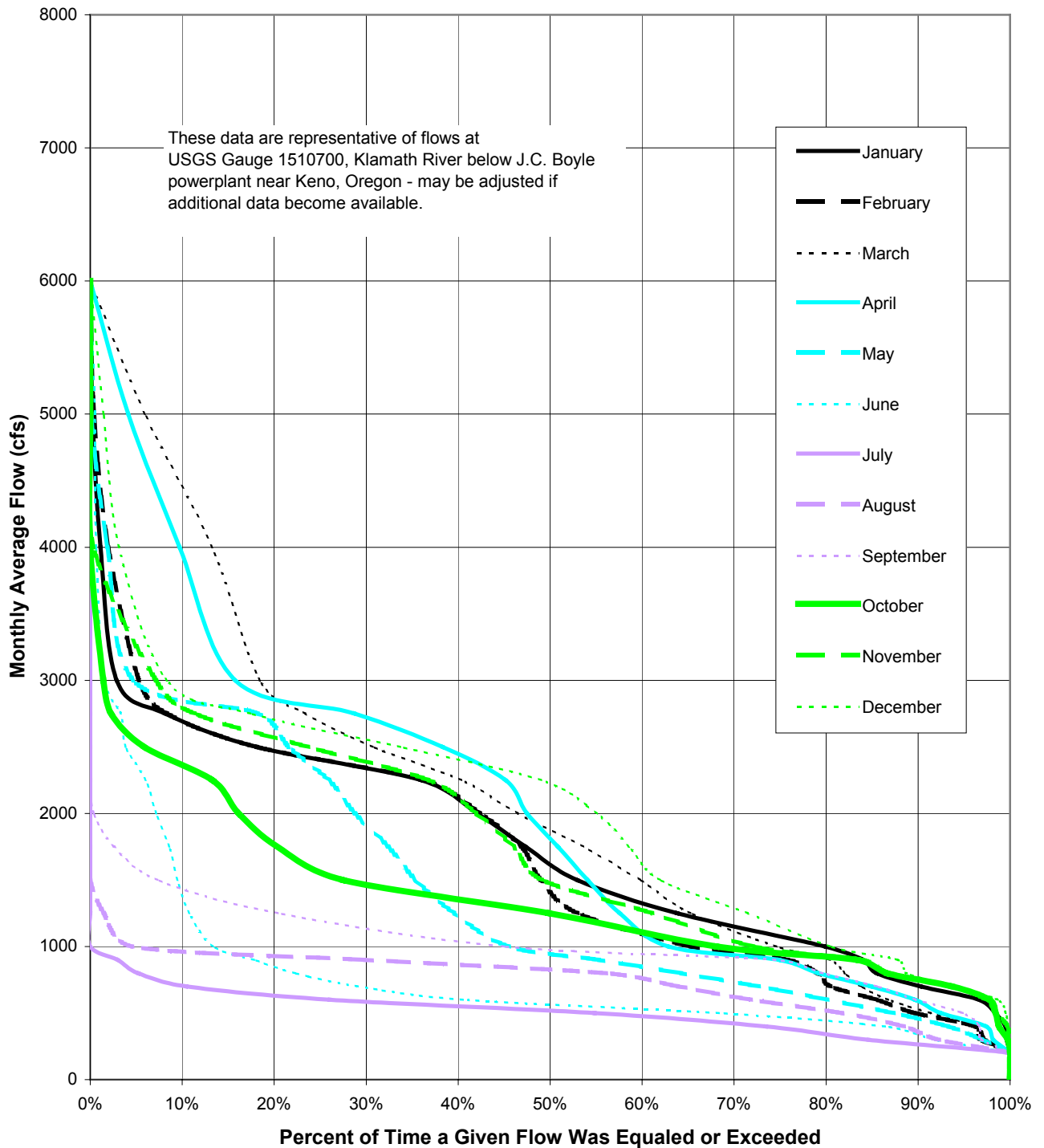
Monthly flow-duration curves are presented in Figure B9.5-1. Figure B9.5-2 shows the maximum, mean, and minimum historical monthly flows for the development.

#### B9.6 AREA-CAPACITY CURVE AND RULE CURVE

An area-capacity curve showing gross and usable storage capacity of the reservoir is shown in Figure B9.6-1. A typical reservoir operating curve is shown in Figure B9.6-2. Because of limited reservoir storage, the reservoir is operated on a daily cycle over a limited elevation range of 1 to 2 feet.

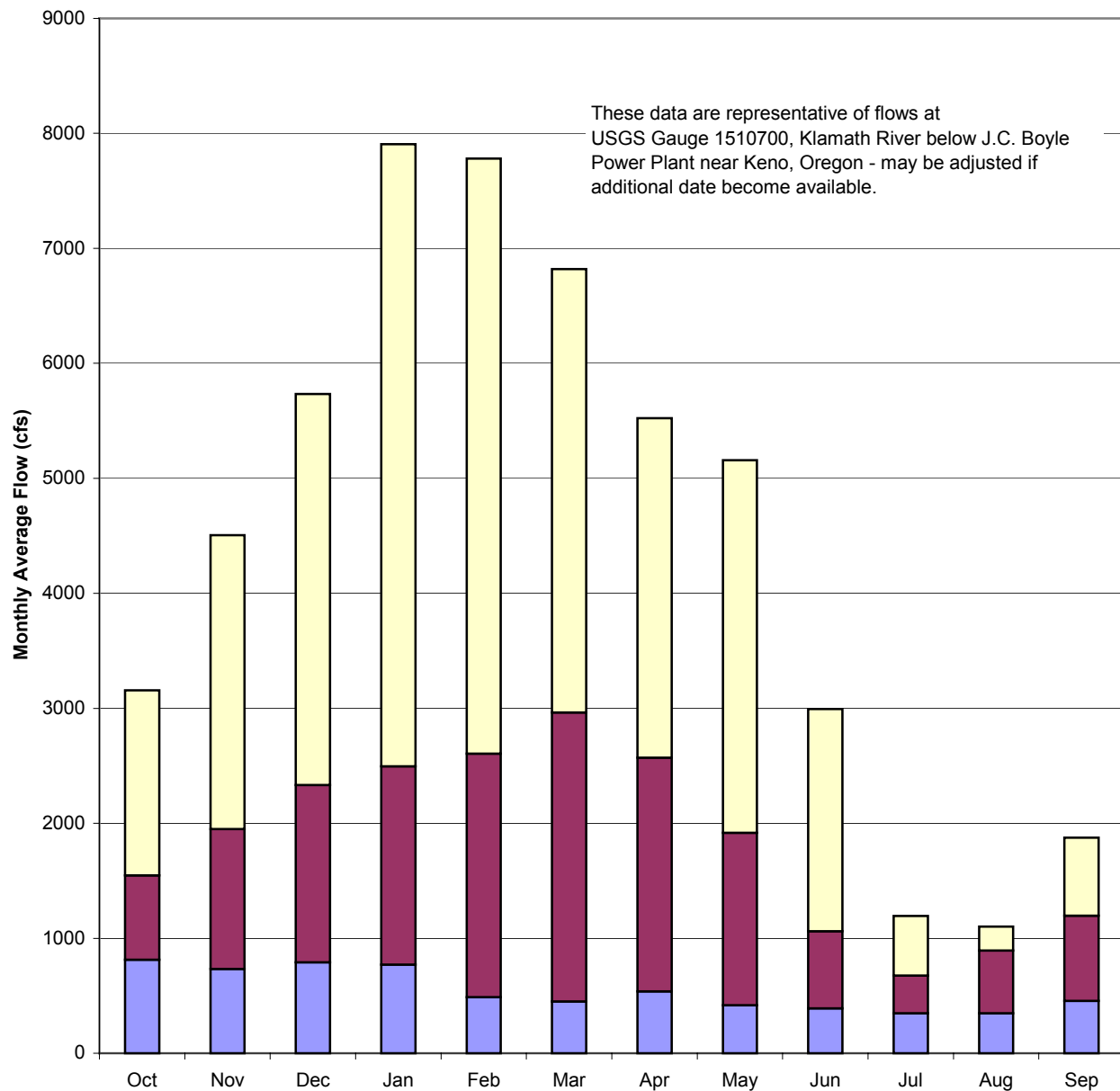
#### B9.7 HYDRAULIC CAPACITY

The estimated hydraulic capacity of the J.C. Boyle powerhouse is approximately 3,000 cfs at a rated net head of 450 feet. In 1996, testing of Unit No. 1 efficiency showed that at a gate position of 20 percent (smallest gate position tested) and a gross head of 446.7 feet, the resulting flow is 344 cfs, which produces approximately 8 MW. Similarly, for Unit No. 2, testing showed that at a gate position of 20 percent (smallest gate position tested) and a gross head of 447 feet, the resulting flow is approximately 407 cfs, which produces 10.2 MW.



Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1972, 1973, 1974, 1980, 1981, and 1982)

Figure B9.5-1. Flow-duration curves of monthly flows J.C. Boyle Development.



Maximum Monthly Average Flow = 7905 cfs  
Mean Monthly Average Flow = 1851 cfs  
Minimum Average Monthly Flow = 349 cfs

Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1972, 1973, 1974, 1980, 1981, and 1982)

Figure B9.5-2. Maximum, mean and minimum historical monthly flows at the J.C. Boyle Development.



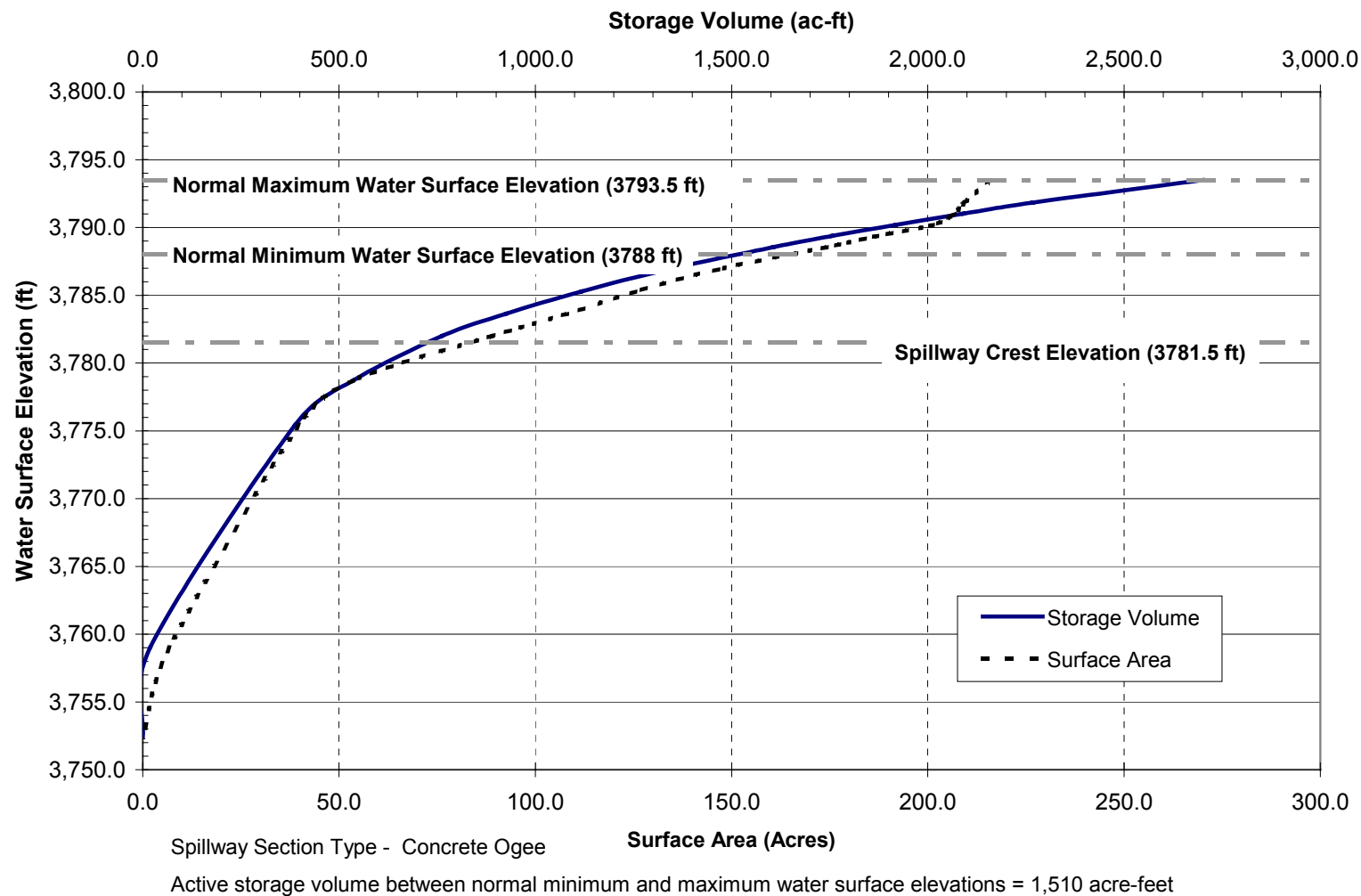
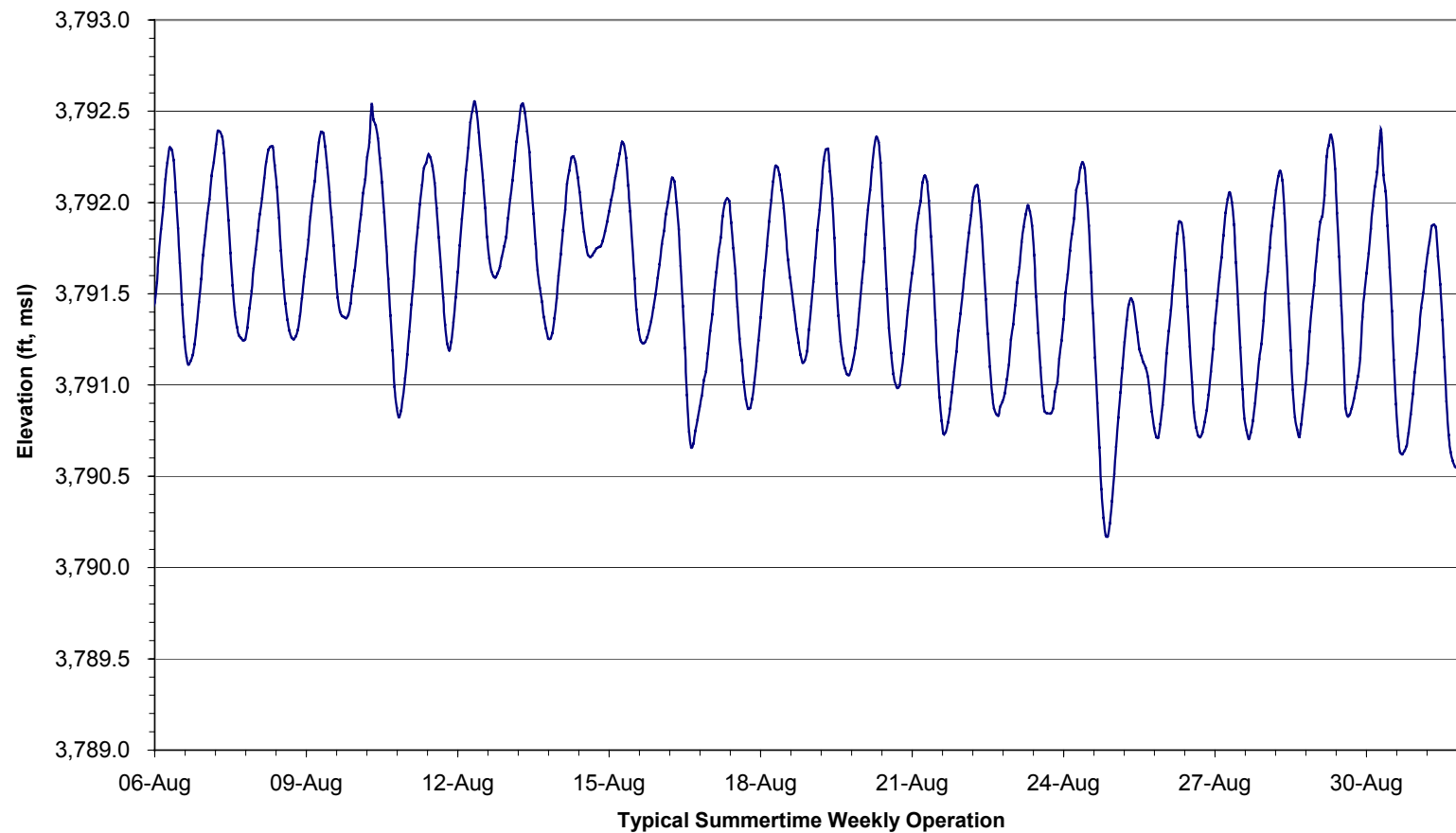


Figure B9.6-1. Area-capacity curve, J.C. Boyle reservoir.



Note: Summertime headwater variability will be greater than in the winter, particularly when spilling.

Figure B9.6-2. J.C. Boyle reservoir typical hourly reservoir elevations.

#### B9.8 TAILWATER RATING CURVE

The tailwater rating curve for the J.C. Boyle tailrace is shown in Figure B9.8-1.

#### B9.9 POWERPLANT CAPACITY VERSUS HEAD CURVE

The power plant capacity versus head curve is shown in Figure B9.9-1.

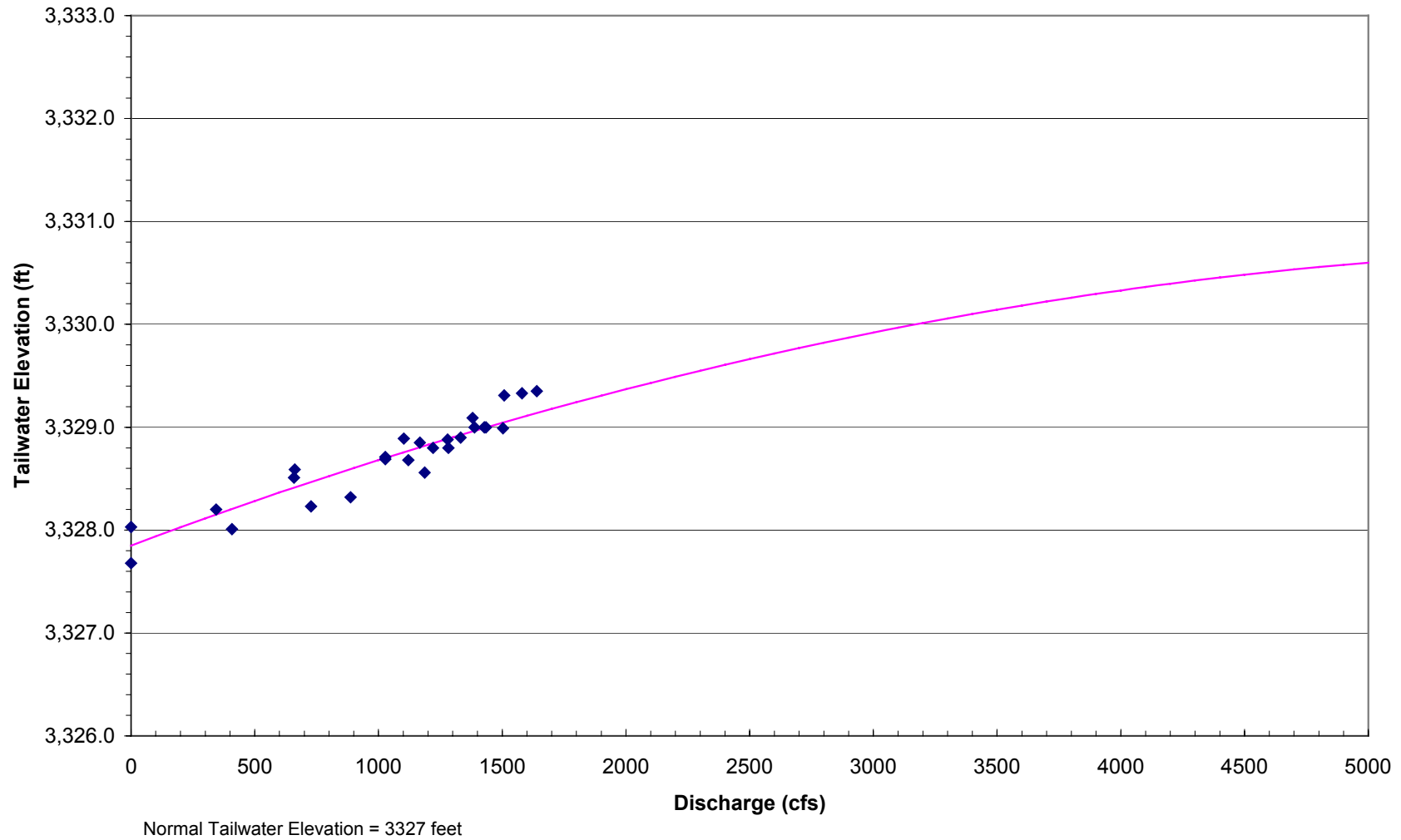


Figure B9.8-1. Tailwater rating curve, J.C. Boyle Development.

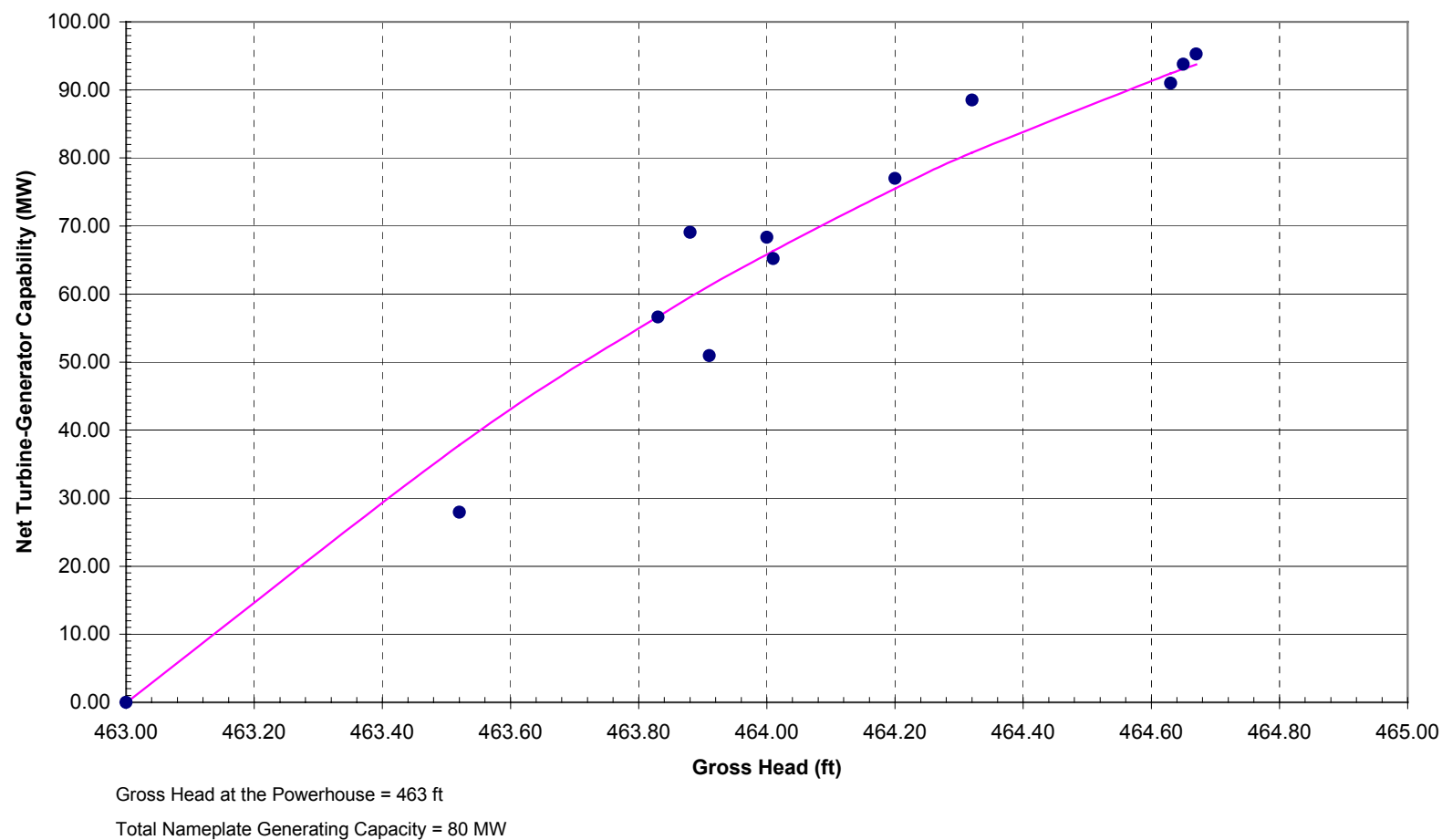


Figure B9.9-1. Turbine generator capability vs. head, J.C. Boyle Development.



## B10.0 COPCO NO. 1 DEVELOPMENT

### B10.1 DEVELOPMENT OVERVIEW

The Copco No. 1 Development consists of a reservoir, dam, and powerhouse located on the Klamath River between approximately RM 204 and RM 199 just south of the Oregon-California border (Figures B1.1-1). Copco No. 1 dam is a concrete arch dam 126 feet high, with 13 radial gates. The impoundment formed upstream of the dam is approximately 1,000 acres in extent with approximately 46,900 acre-feet of total storage capacity and 6,235 acre-feet of active storage capacity. The Copco No. 1 powerhouse is located immediately below the Copco No. 1 dam. Water diverted for power use flows through several trash racks into three short penstocks that supply the two turbines, each 10 MW in size. Combined hydraulic capacity of the turbines is 3,200 cfs. Copco No. 1 powerhouse flow is directed to the Copco No. 2 powerhouse intake through the small, 1/4-mile-long Copco No. 2 reservoir.

### B10.2 OWNERSHIP AND CONTRACTUAL OBLIGATION

PacifiCorp owns and operates the Copco No. 1 development and has no direct contractual obligations with the USBR regarding its operation. The Copco No. 1 facility, however, is operated in a manner to assure conformity with NOAA Fisheries 2002 BO flows downstream of Iron Gate dam.

### B10.3 OPERATIONS

Copco dam is operated for power generation, some very minor flood control and control of the Copco reservoir water surface elevation. The Copco No. 1 powerhouse is usually operated to generate during the day when energy demands are highest, and to store water during the non-peak times (weeknights and weekends power). When river flows are near or in excess of turbine hydraulic capacity, the powerhouse generates continuously and excess water is spilled through the spill gates. Copco reservoir can fluctuate 5.0 feet between normal minimum and full pool elevations, but the average daily fluctuation is approximately 0.5 feet.

Copco No. 1 and No. 2 operate together. Since flows through the system must be closely coordinated due to lack of significant storage and mandatory downstream flow requirements, flow through the Copco plants typically mimics flow (with a time lag) through J.C. Boyle on a daily average basis. Copco No. 2 has virtually no storage reservoir so is essentially “a slave” to Copco No. 1. That is, Copco No. 2 generation and hydraulic discharge follow Copco No. 1 generation and hydraulic discharge.

Copco No. 1 Development has no bypass reach. The powerhouse is located immediately below the dam. The Copco No. 1 powerhouse tailwater is the small Copco No. 2 reservoir. There are no minimum instream flow or ramp rate requirements for the Copco No. 1 Development.

The spill gates at Copco No. 1 dam may be opened if an unscheduled turbine shutdown results in a lengthy outage that adversely affects downstream water flow requirements.

The Copco No. 1 Development has been automated for remote control of unit start, stop, and loading. Copco No. 1 generation is scheduled to meet the power demands of the system while passing required flows. The development operation is monitored and controlled twenty-four

hours a day, seven days per week. Upon unit startup, generation loads are set and the unit will automatically reach and hold that requirement until reset or the unit shuts down. Project operators can control the operation manually from the powerhouse.

#### B10.4 ANNUAL PLANT FACTOR

The average annual energy production for the Copco No. 1 powerhouse is 106,000 MWh (30-year, long-term average, May 2003). With a nameplate capacity of 20 MW, the annual plant factor for Copco No. 1 is 60 percent.

#### B10.5 PERIOD OF CRITICAL STREAM FLOW, AVERAGE ANNUAL ENERGY PRODUCTION, AND DEPENDABLE CAPACITY

The period of critical streamflow used to determine the dependable capacity is water year 1981. The dependable capacity is 6,000 kW.

The average annual energy production for the Copco No. 1 powerhouse is 106,000 MWh.

Monthly flow-duration curves are presented in Figure B10.5-1. Figure B10.5-2 shows the maximum, mean, and minimum historical monthly flows for Copco No. 1.

#### B10.6 AREA-CAPACITY CURVE AND OPERATING CURVE

An area-capacity curve showing gross and usable storage capacity of the reservoir is shown in Figure B10.6-1. A typical reservoir operating curve is shown in Figure B10.6-2. Because of limited reservoir storage, the reservoir is operated on a daily basis over a limited range of approximately 1 foot.

#### B10.7 HYDRAULIC CAPACITY

The estimated hydraulic capacity of the Copco No. 1 powerhouse is approximately 3,200 cfs at a rated net head of 118 feet. In 1997, testing of Unit No. 1 efficiency showed that at a gate position of approximately 18 percent (smallest gate position tested) and a gross head of approximately 118 feet, the resulting flow is approximately 258 cfs, which produces 0.33 MW. Similarly, testing of Unit No. 2 efficiency showed that at a gate position of 15 percent (smallest gate position tested) and a net head of approximately 117 feet, the resulting flow is 305 cfs, which produces approximately 1.5 MW.

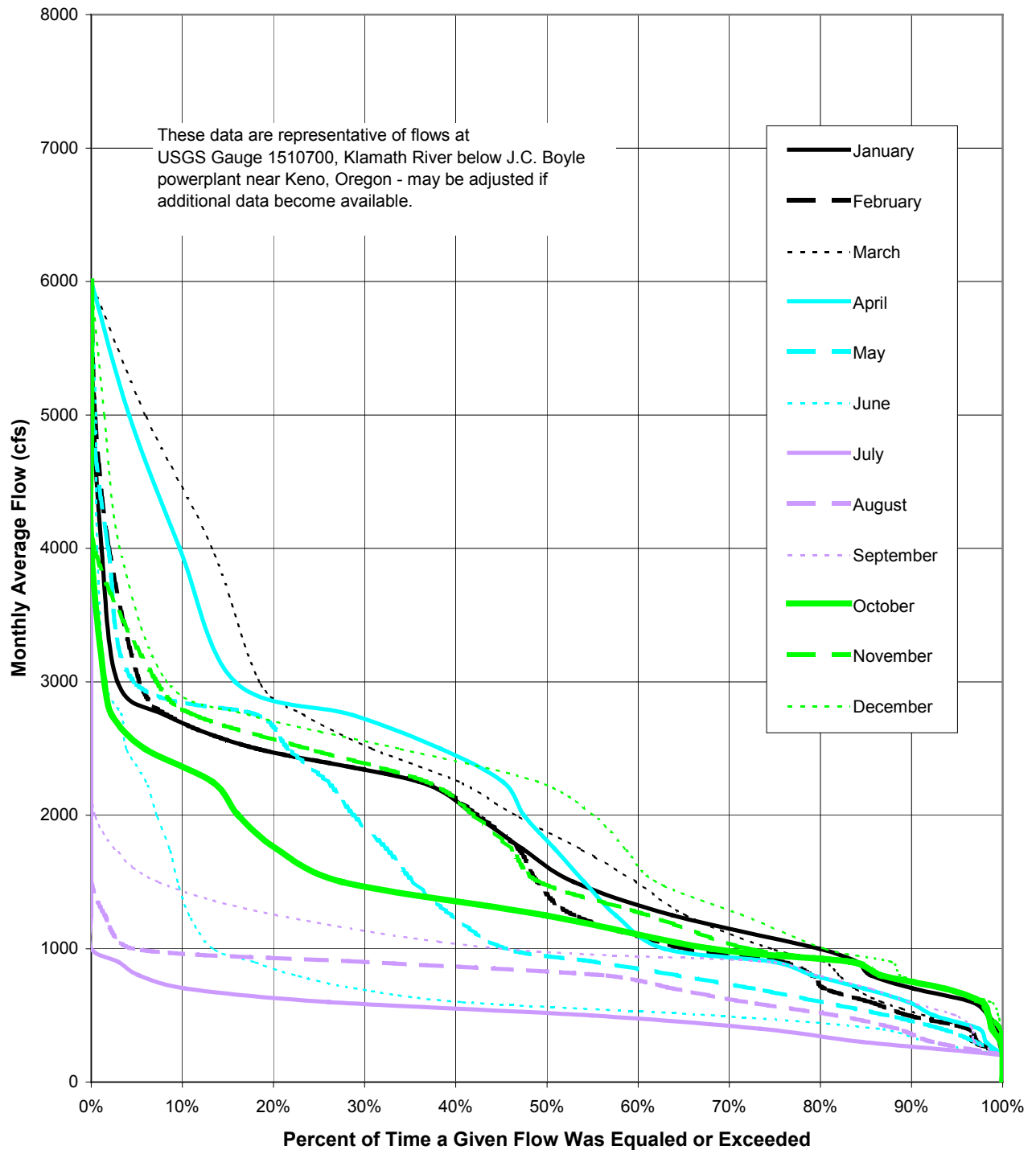
#### B10.8 TAILWATER RATING CURVE

The tailwater rating curve is shown in Figure B10.8-1.

#### B10.9 POWERPLANT CAPACITY VERSUS HEAD CURVE

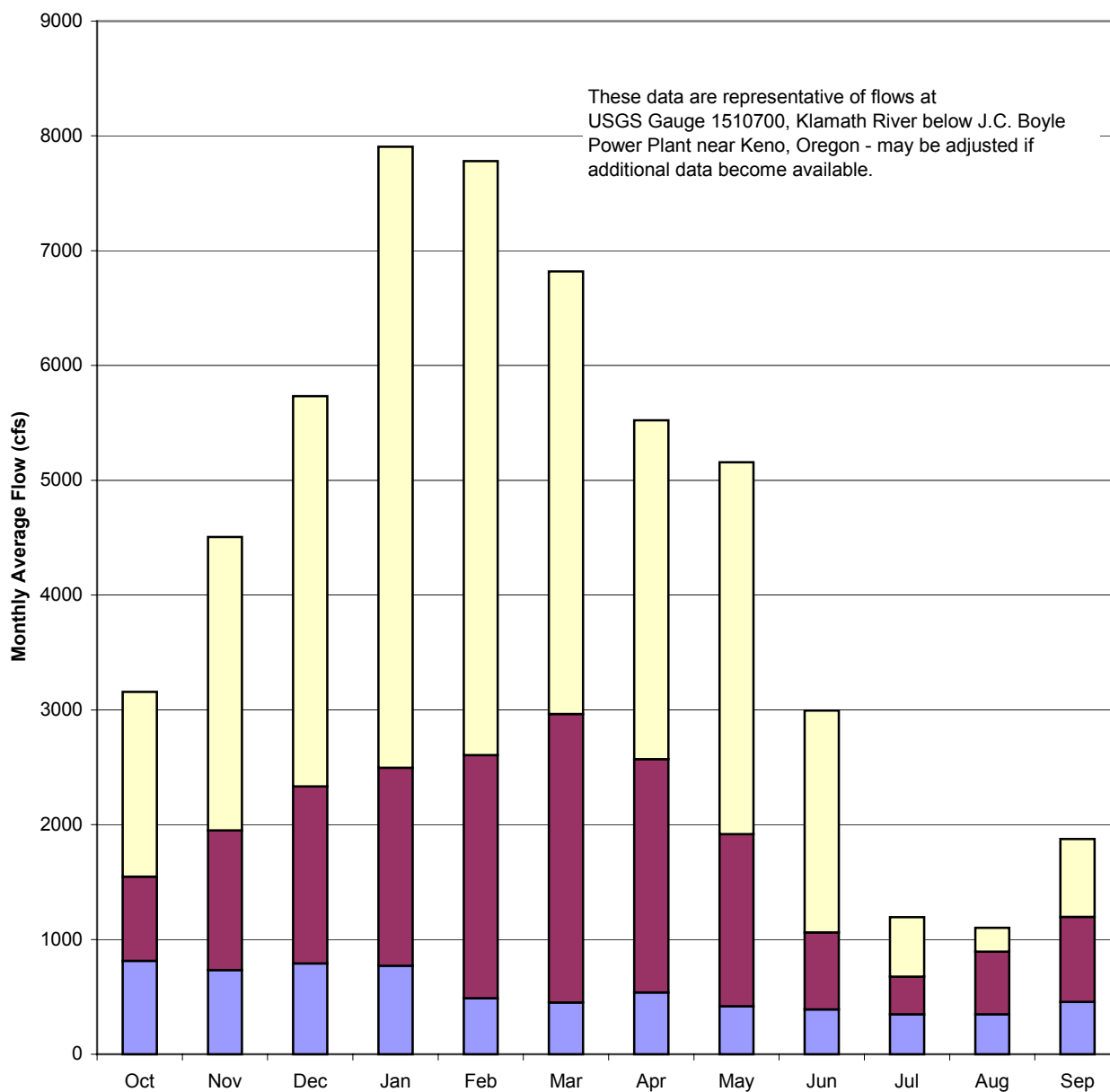
The power plant capacity versus head curve is shown in Figure B10.9-1.





Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1972, 1973, 1974, 1980, 1981, and 1982)

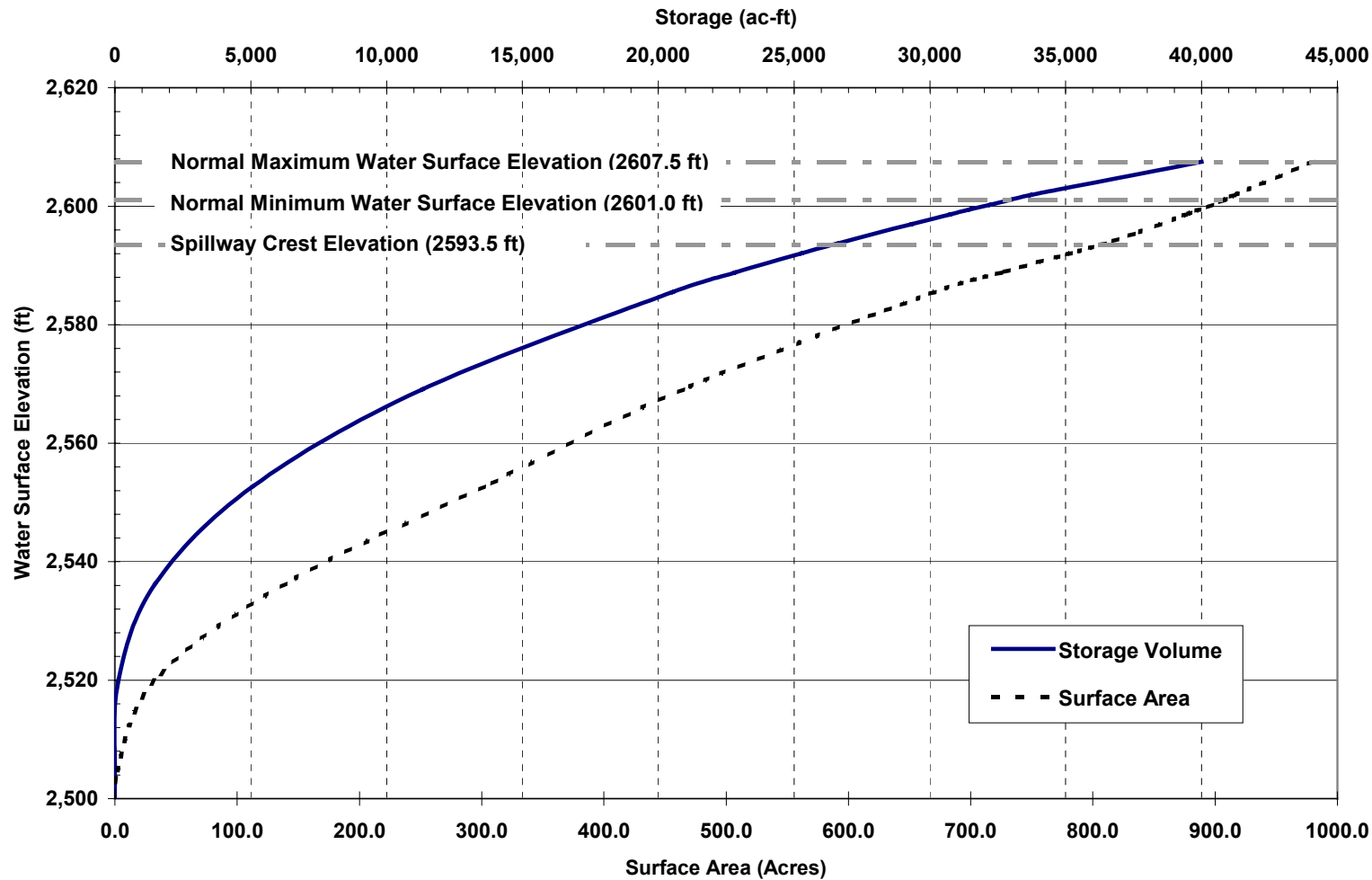
Figure B10.5-1. Flow-duration curves of monthly flows at the Copco No. 1 Development.



Maximum Monthly Average Flow = 7905 cfs  
Mean Monthly Average Flow = 1851 cfs  
Minimum Average Monthly Flow = 349 cfs

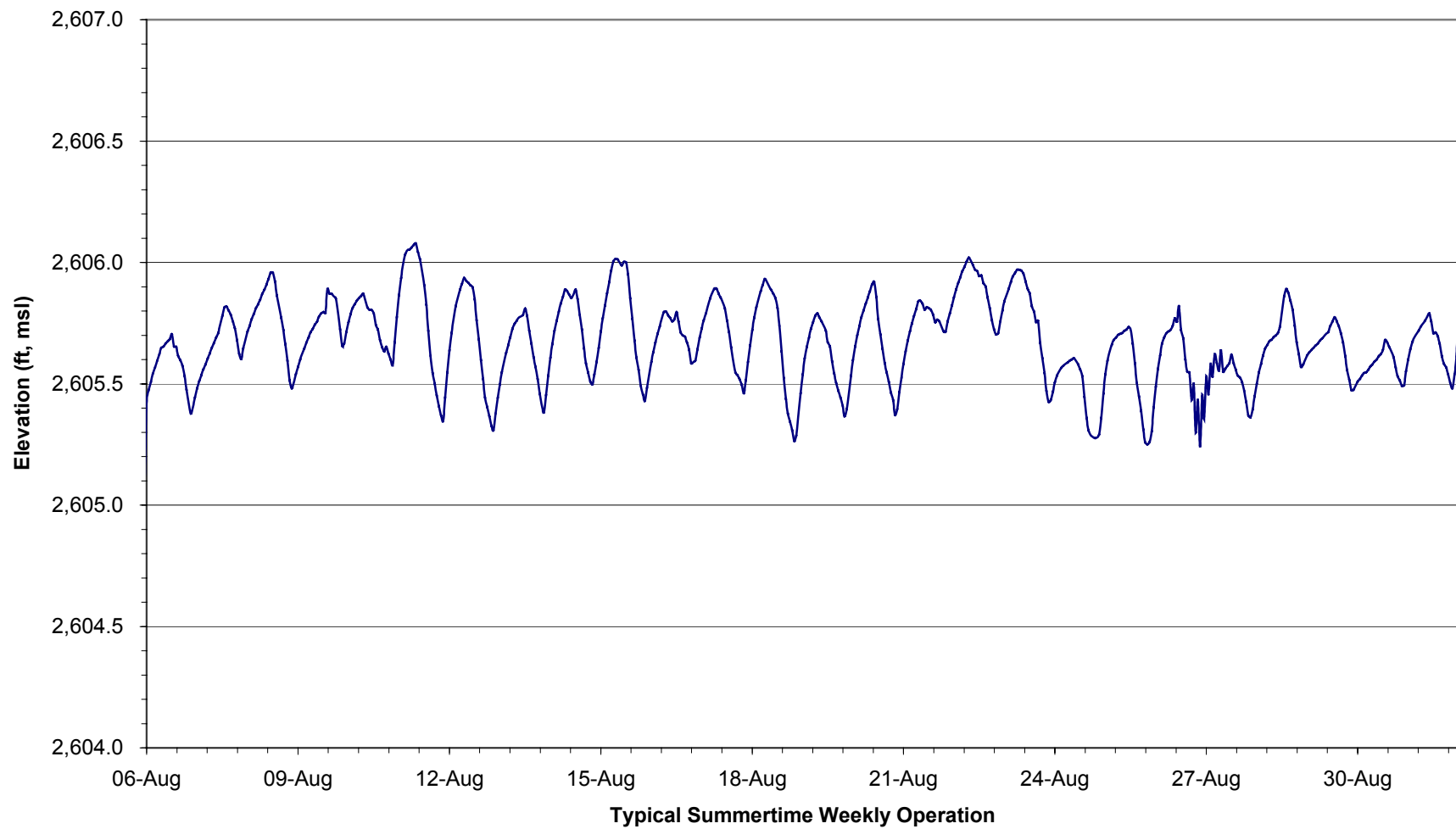
Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1972, 1973, 1974, 1980, 1981, and 1982)

Figure B10.5-2. Maximum, mean, and minimum historical monthly flows at the Copco No. 1 Development.



Spillway Section Type - Tainter Gated Concrete  
Active storage volume between normal minimum and maximum water surface elevations = 2,927.6 acre-feet

Figure B10.6-1. Area-capacity curve, Copco Lake.



Note: Summertime headwater variability will be greater than in the winter, particularly when spilling.

Figure B10.6-2. Copco No. 1 typical hourly reservoir elevations.

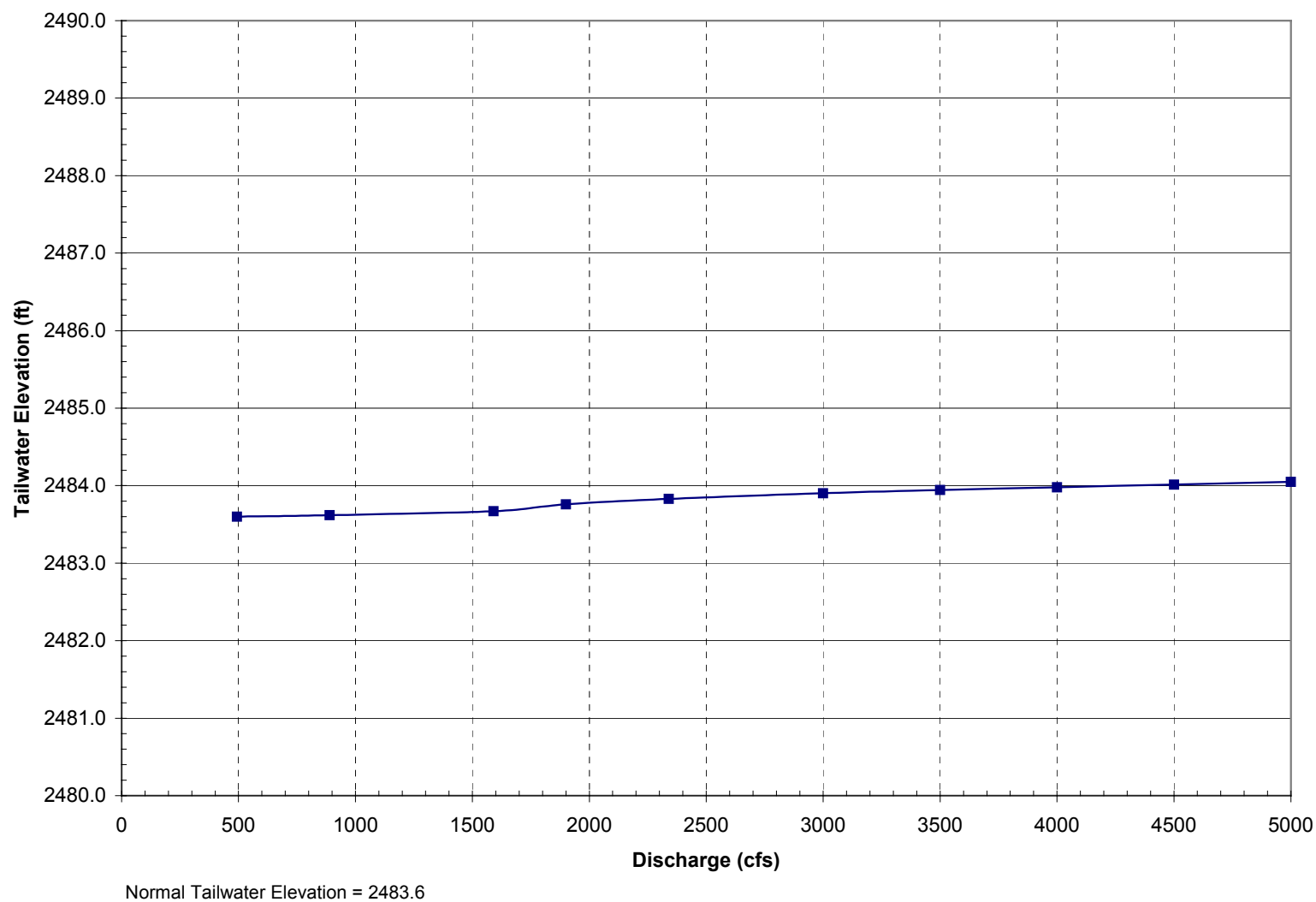
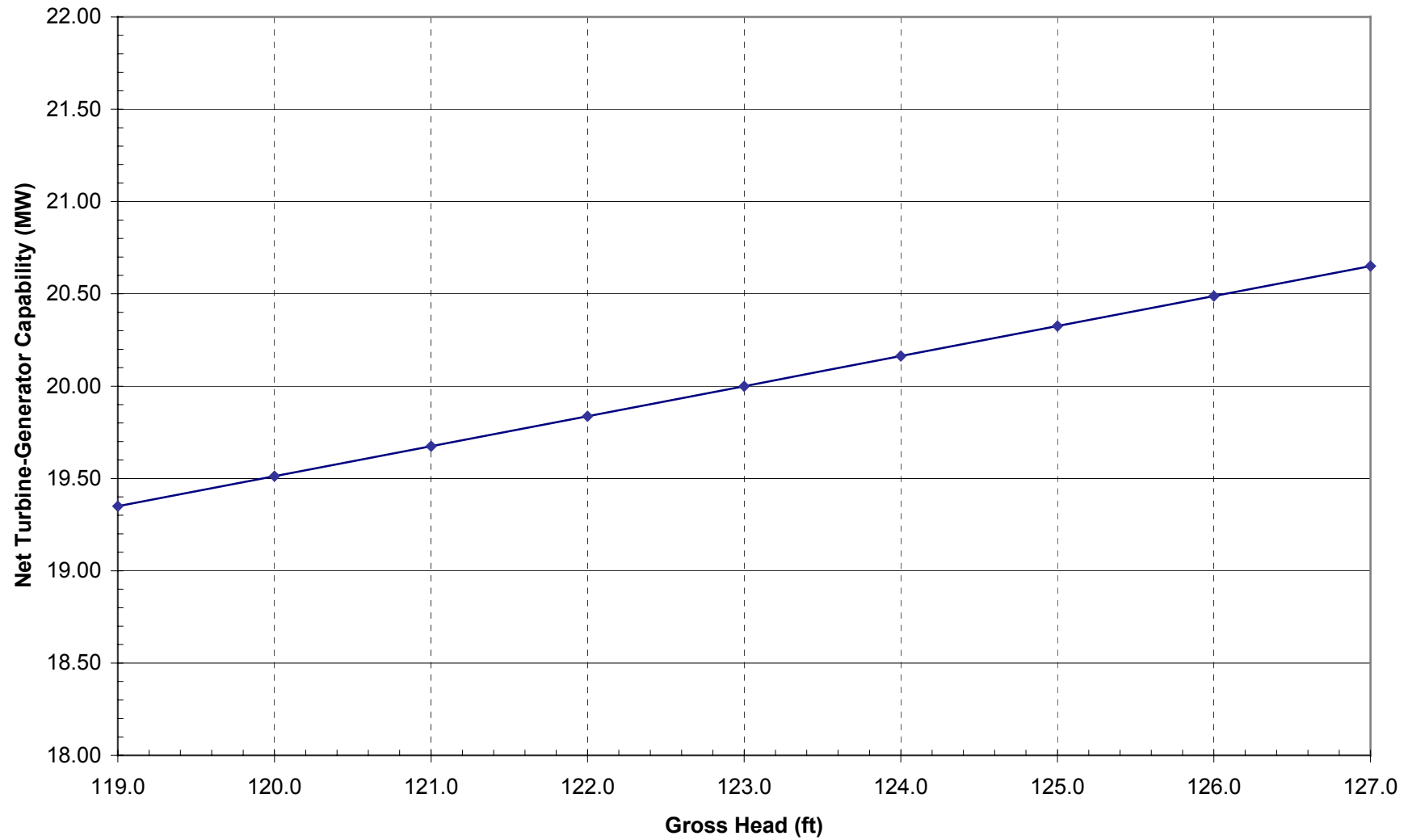


Figure B10.8-1. Tailwater rating curve, Copco No. 1 Development.



Gross Head at the Powerhouse = 123 ft  
Total Nameplate Generating Capacity = 20 MW

Figure B10.9-1. Turbine generator capability vs. head, Copco No. 1 Development.

## B11.0 COPCO NO. 2 DEVELOPMENT

### B11.1 DEVELOPMENT OVERVIEW

The Copco No. 2 Development consists of a diversion dam, a small impoundment, and powerhouse located just downstream of Copco No. 1 dam between approximately RM 198.3 and RM 196.8 (Figure B1.1-1). The reservoir created by the 38-foot-high dam has minimal storage capacity (73 acre-feet). Copco No. 2 is entirely dependent upon Copco No. 1 releases for water and as a result functions as a “slave” to the Copco No. 1.

Copco No. 2 dam has five spill gates and a manual gate valve that can control a small amount of water into the bypass reach. The flowline to the powerhouse consists of portions of wood-stave pipe, rock tunnel, and steel penstock. At the entrance to the flowline is a 36.5-foot by 48-foot trash rack. There are two 13.5 MW units with a combined hydraulic capacity of 3,200 cfs in the powerhouse.

### B11.2 OWNERSHIP AND CONTRACTUAL OBLIGATION

PacifiCorp owns and operates the Copco No. 2 development and has no direct contractual obligations with USBR regarding its operation. The Copco No. 2 facility, however, is operated in a manner to assure conformity with NOAA Fisheries 2002 BO flows downstream of Iron Gate dam.

### B11.3 OPERATIONS

Copco No. 2 reservoir has virtually no active storage, and relies on Copco No. 1 releases for operating flows. Copco No. 2 generation and hydraulic discharge follow Copco No. 1 generation and hydraulic discharge. With this type of operation, water surface elevations of the Copco No. 2 reservoir rarely fluctuate more than several inches.

There are no ramp rate requirements for the 1.5 mile long bypass reach between Copco No. 2 dam and Copco No. 2 powerhouse, but PacifiCorp currently releases a minimum flow of 5 to 10 cfs as standard operation practice (Table B11.3-1). No natural springs are known to contribute flow to this reach.

Table B11.3-1. Copco No. 2 minimum instream flow and ramp rate directives.

<b>River Reach</b>	<b>Length of Reach (River Miles)</b>	<b>Minimum Instream Flow</b>	<b>Ramp Rate</b>
Copco No. 2 Bypass (dam to powerhouse)	1.5	10 cfs (nonregulatory release; PacifiCorp standard practice)	None.
Klamath River (Copco No. 2 tailrace to Iron Gate reservoir)	0	None	None

In the event of an unscheduled shutdown at the Copco No. 2 powerhouse, the Copco No. 1 powerhouse is consequently shutdown. If flow in the Copco No. 2 waterway is at full capacity at time of shutdown, some water may be spilled into the lower Copco No. 2 bypass reach via an overflow waterway at the surge tank. If flows are near the capacity of a single unit (approx-

mately 1,600 cfs), a surge chamber in the tunnel can accommodate the excess water. If the outage at Copco No. 2 powerhouse will be lengthy, Copco No. 1 powerhouse may be operated and water spilled at Copco No. 2 dam.

Since the Copco No. 2 Development is located immediately downstream of Copco No. 1 powerhouse, the Copco No. 2 generation is scheduled simultaneously with the generation at Copco No. 1. The Copco No. 2 units are automated. The daily generation schedule is established to meet the power demands of the system while passing required flows through the various Project facilities. The operation is monitored and controlled 24 hours a day, 7 days per week. Upon unit startup, generation loads are set and the unit will automatically reach and hold that requirement until reset or the unit shuts down. The local operators to control the operation manually from the powerhouse.

#### B11.4 ANNUAL PLANT FACTOR

The average annual energy production for the Copco No. 2 powerhouse is 135,000 MWh (30-year, long-term average, May 2003). With a nameplate capacity of 27 MW, the annual plant factor for Copco No. 2 is 57 percent.

#### B11.5 PERIOD OF CRITICAL STREAM FLOW, AVERAGE ANNUAL ENERGY PRODUCTION, AND DEPENDABLE CAPACITY

The period of critical streamflow used to determine the dependable capacity is water year 1981. The dependable capacity is 7,700 kW.

The average annual energy production for the Copco No. 2 powerhouse is 135,000 MWh.

Monthly flow-duration curves are presented in Figure B11.5-1. Figure B11.5-2 shows the maximum, mean, and minimum historical monthly flows for Copco No. 2.

#### B11.6 AREA-CAPACITY CURVE AND RULE CURVE

In view of the annual hydrology of inflow, the Copco No. 2 Development is considered a run-of-river plant. As such, there is no usable storage and the forebay is kept at a constant water surface elevation. Because there is minimal storage, area-capacity and rule curves are not applicable.

#### B11.7 HYDRAULIC CAPACITY

The estimated hydraulic capacity of the Copco No. 2 powerhouse is approximately 3,200 cfs at a rated net head of 148 feet. In 2000, testing of Unit No. 1 efficiency showed that at a gate position of approximately 15 percent (smallest gate position tested) and a gross head of approximately 154 feet, the resulting flow is approximately 241 cfs, which produces approximately 1 MW. Similarly, testing of Unit No. 2 efficiency showed that at a gate position of approximately 20 percent (smallest gate position tested) and a net head of 150 feet, the resulting flow is 467 cfs, which produces approximately 3.8 MW.

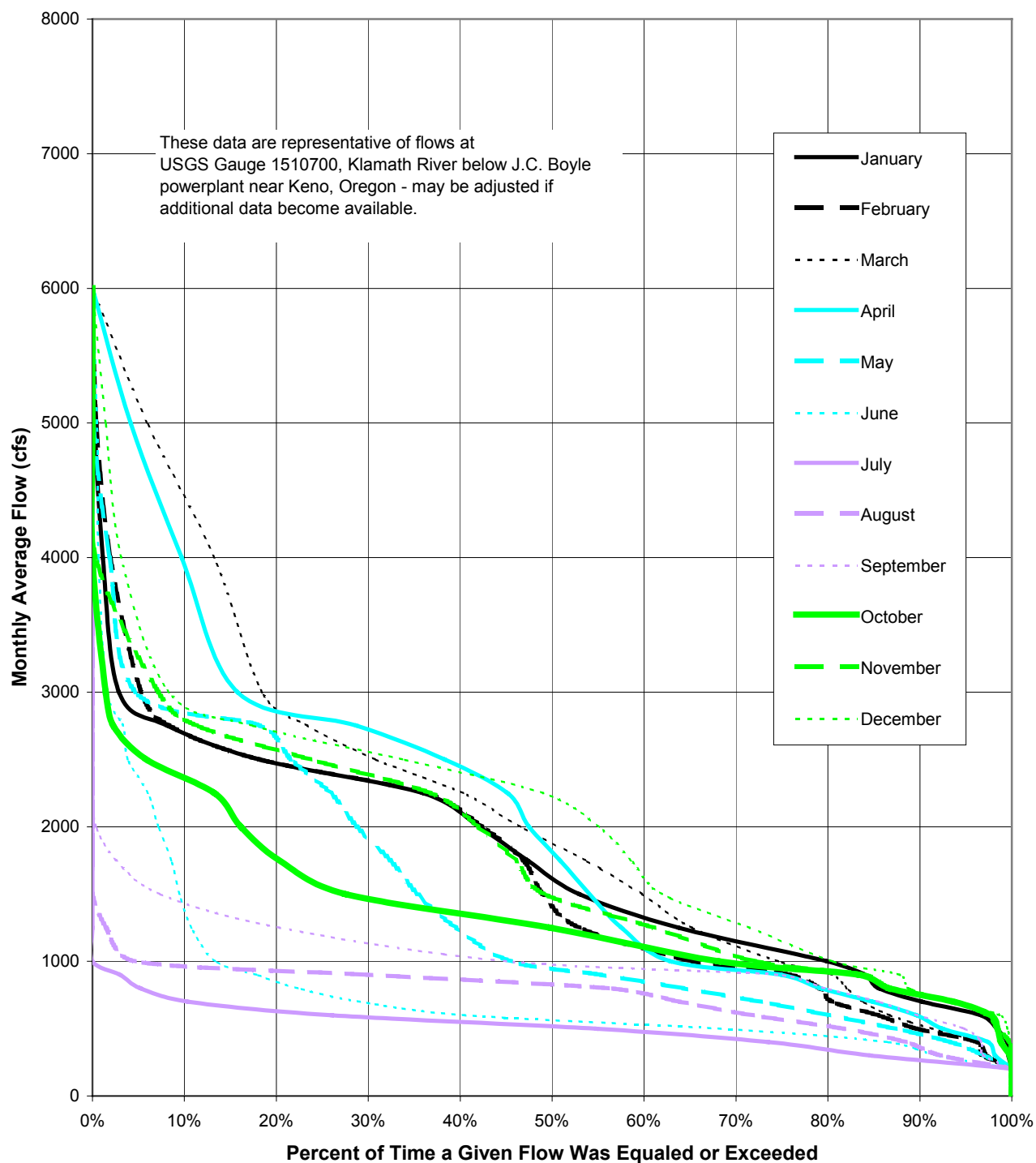


#### B11.8 TAILWATER RATING CURVE

The tailwater rating curve is shown in Figure B11.8-1.

#### B11.9 POWERPLANT CAPACITY VERSUS HEAD CURVE

The power plant capacity versus head curve is shown in Figure B11.9-1.



Period of Record: Water Years 1962 - 2001 (incomplete flow data WY 1972, 1973, 1974, 1980, 1981, and

Figure B11.5-1. Flow duration curve of monthly flows at the Copco No. 2 Development.

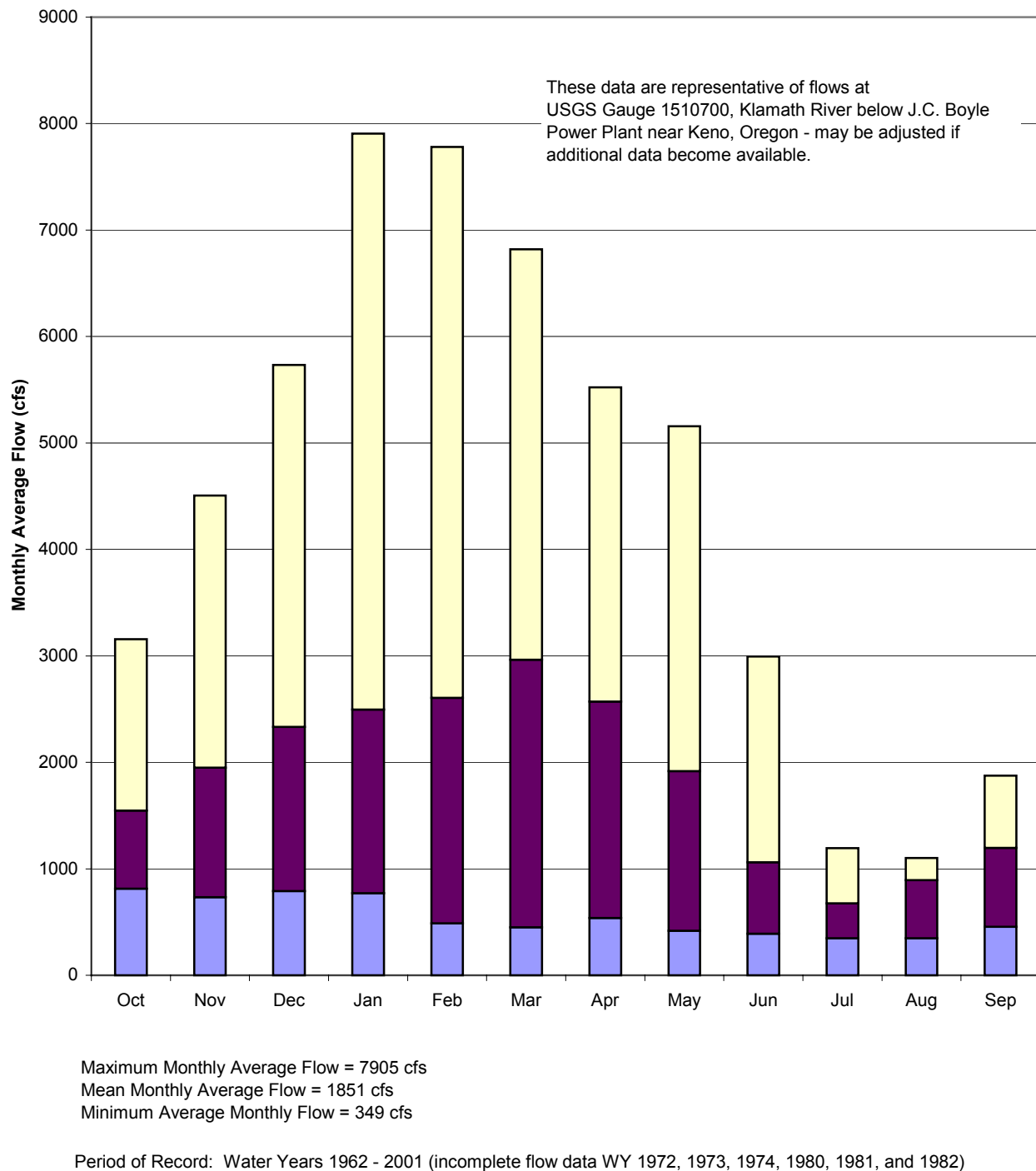


Figure B11.5-2. Maximum, mean, and minimum historical monthly flows at the Copco No. 2 Development.

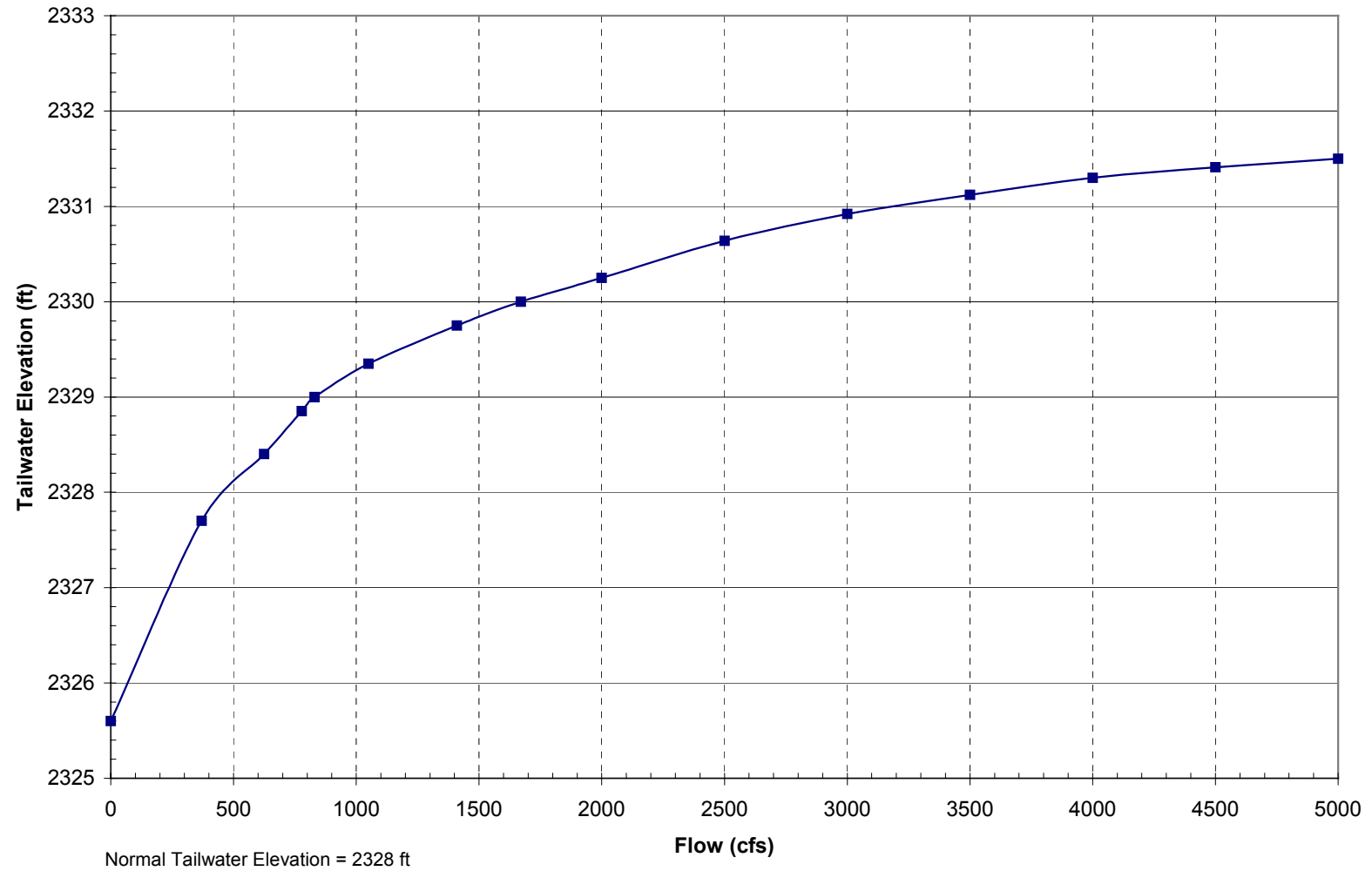


Figure B11.8-1. Tailwater rating curve, Copco No. 2 Development.

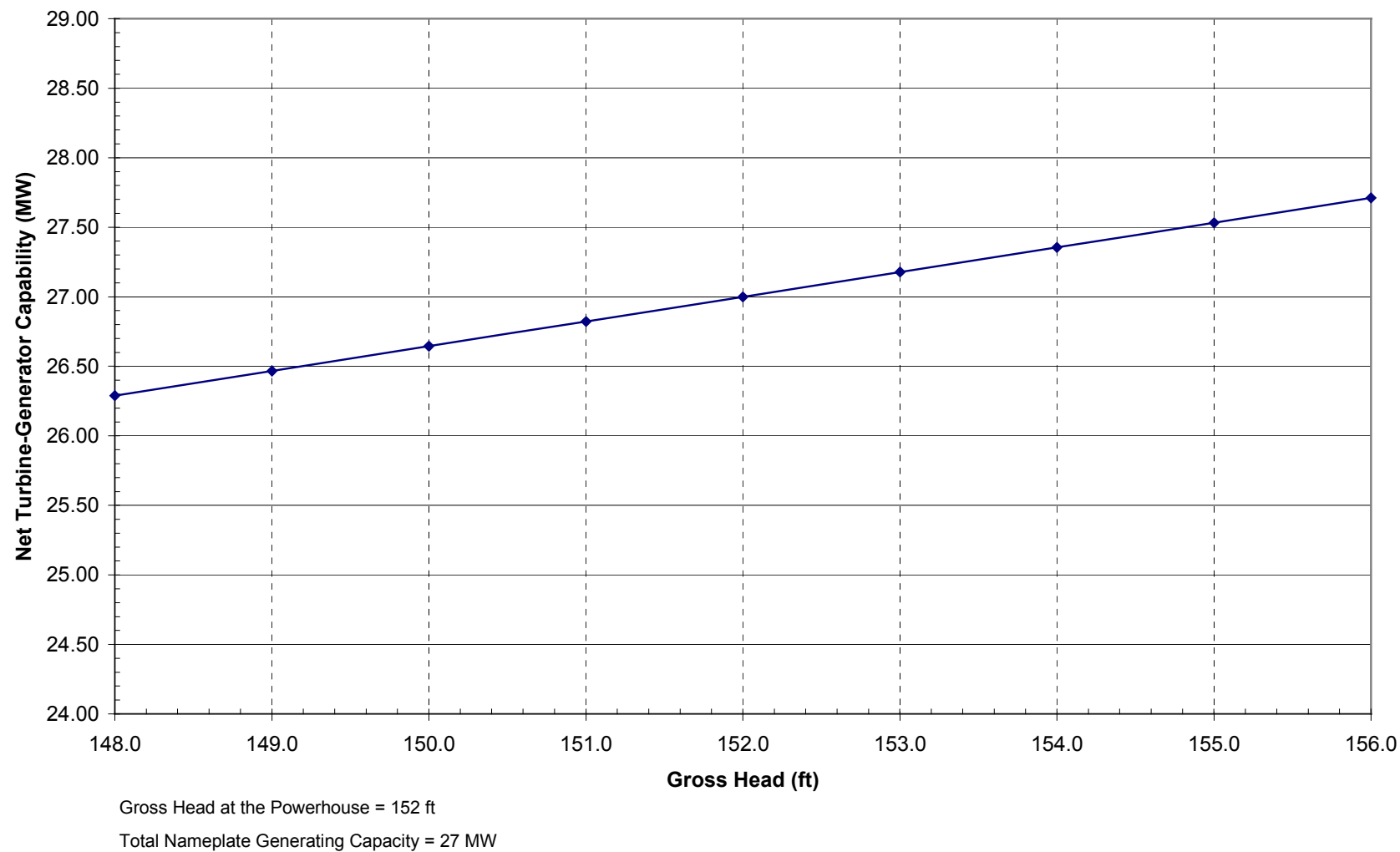


Figure B11.9-1. Turbine generator capability vs. head Copco No. 2 Development.



## B12.0 FALL CREEK DEVELOPMENT

### B12.1 DEVELOPMENT OVERVIEW

The Fall Creek Development is a run-of-river facility located on Fall Creek, which is a tributary of the Iron Gate reservoir. The Fall Creek Development consists of two small diversion dams, an earthen ditch, a penstock, and a powerhouse. The upper-most diversion is located on Spring Creek. When in use, it diverts up to 16.5 cfs of water to Fall Creek. The diversion dam on Fall Creek then diverts up to 50 cfs into the power canal and penstock that supplies the powerhouse.

The diversion dam on Fall Creek is an earth- and rock-filled berm. The spillway structure is constructed of timber flashboards and concrete. The length of the power canal from the dam to the penstock intake is approximately 4,560 feet. At the entrance to the penstock is a trash rack. The penstock drops over the hillside, providing a 730-foot head to the three Pelton turbines in the powerhouse. Generation capacity is 0.5 MW for Unit No. 1, 0.45 MW for Unit No. 2, and 1.25 MW for Unit No. 3. The total hydraulic capacity of the turbines is 50 cfs.

### B12.2 OWNERSHIP AND CONTRACTUAL OBLIGATION

The Fall Creek hydroelectric facilities are owned and operated by PacifiCorp.

### B12.3 OPERATION

The water supply for the Fall Creek powerhouse is predominantly spring fed and is fairly consistent. Because of this, the facility was designed without a storage reservoir and is operated as a run-of-the-river facility under all river flows and water year types. Generation is dependent on flow.

To provide the minimum instream flow, a notch in the lower stop logs at the Fall Creek diversion dam ensures that 0.5 cfs is continually released into the bypass reach. Continuous operation at the powerhouse (including turbine bypass) or flow through the bypass channel during maintenance ensures that the 15 cfs minimum instream flow downstream of the powerhouse is met (Table B12.3-1). A gauge (USGS No. 11512000) was previously operated downstream of the powerhouse, and has recently been reactivated (spring 2003). It is unknown how long this gauge will be in operation. Flow released at the powerhouse can be estimated through a flow-generation relationship.

Table B12.3-1. Fall Creek minimum instream flow and ramp rate directives.

<b>River Reach</b>	<b>Length of Reach (River Miles)</b>	<b>Minimum Instream Flow</b>	<b>Ramp Rate</b>
Fall Creek Bypass	1.2	0.5 cfs into bypass plus a 15 cfs continuous flow downstream of the powerhouse tailrace (FPC 1956)	None.

The Fall Creek development is operated manually, due primarily to its run of river operation, smaller generation potential, and the consistency of the stream flow at the diversion point. The facility is operated at a constant discharge equal to the diversion dam inflow minus the 0.5 cfs instream release. The flashboards at the diversion dam are maintained at a constant elevation, and during periods of higher flow, the water in excess of the diversion capacity (50 cfs) passes

over the diversion dam. The three units are manually operated as flows become available or diminish seasonally. After normal business hours, the units are monitored. The Fall Creek generation is monitored 24 hours per day, 7 days per week from a continuous total generation readout and through limited critical alarming. Should a critical alarm occur, the local operator is contacted to respond on site. Since the units are impulse runners, normal unit shutdowns will deflect flows from the runners and not change flow releases until the operator elects to do so.

#### B12.4 SPRING CREEK FACILITY

Spring Creek is a tributary to Jenny Creek that in turn flows into the Iron Gate reservoir. Spring Creek water can be diverted out of the Jenny Creek basin into the Fall Creek basin for use at the Fall Creek powerhouse (Figure B12.4-1).

The Spring Creek dam is a small earthen embankment approximately 6.3 feet high, spanning the entire stream width (approximately 66 feet). The water from Spring Creek may be diverted through an earthen canal approximately 6,850 feet long that empties into the Fall Creek drainage. The Spring Creek facilities are not currently part of the current FERC License No. 2082.

For at least a decade, PacifiCorp has been denied the opportunity to use Spring Creek water for hydroelectric production due a water rights dispute with an adjacent landowner. PacifiCorp and the landowner filed their respective claims with the Oregon Water Resources Department, and a pre-adjudication ruling was made in favor of PacifiCorp. PacifiCorp's water rights claim is for a diversion of 16.5 cfs from Spring Creek into Fall Creek for hydroelectric production at the Fall Creek Development.

#### B12.5 ANNUAL PLANT FACTOR

The average annual energy production for the Fall Creek powerhouse is 12,000 MWh. With a nameplate capacity of 2.2 MW, the annual plant factor for Fall Creek is 62 percent.

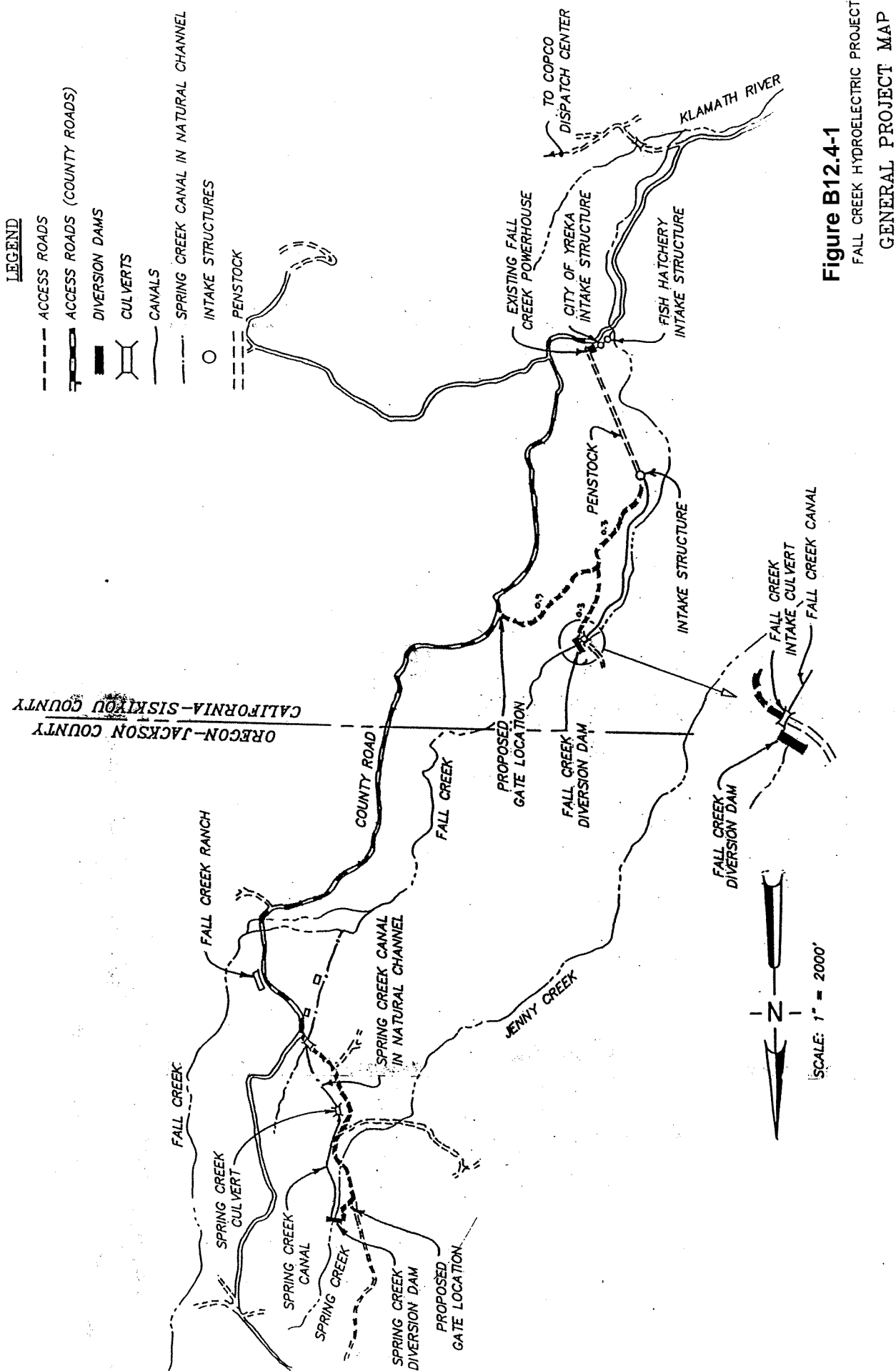
#### B12.6 PERIOD OF CRITICAL STREAM FLOW, AVERAGE ANNUAL ENERGY PRODUCTION, AND DEPENDABLE CAPACITY

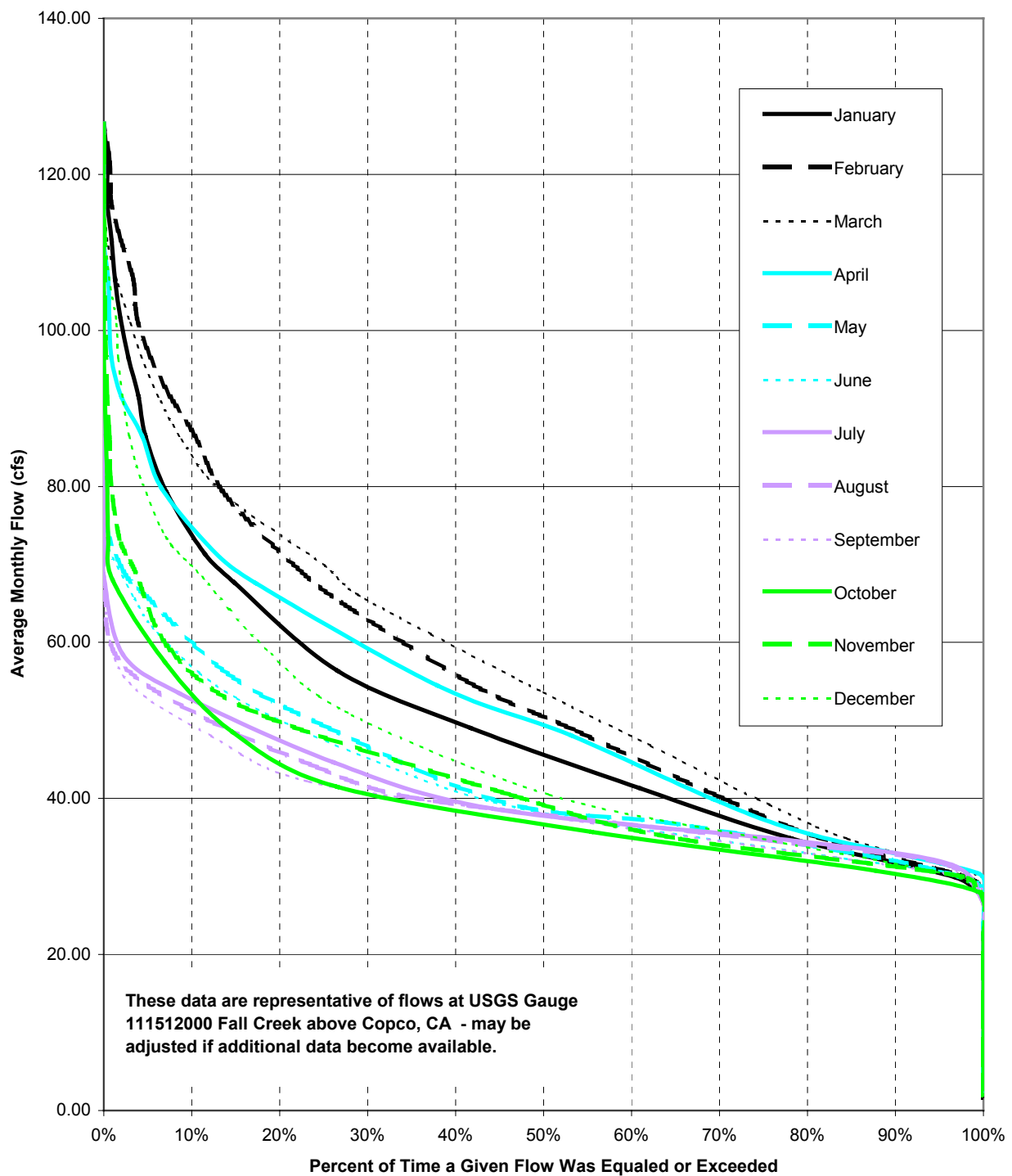
The period of critical streamflow used to determine the dependable capacity is water year 1981. The dependable capacity is approximately 1.6 MW.

The average annual energy production is for the Fall Creek powerhouse is 12,000 MWh, without the Spring Creek flows. With the Spring Creek flows, the estimated average annual energy production is 16,000 MWh.

Monthly flow-duration curves are presented in Figure B12.6-1.







Period of Record: Water Years 1933 - 1959 (incomplete flow data WY October 1932 - March 1933)  
Spring Creek Diversion Flow Estimated

Figure B12.6-1. Flow duration curve of monthly flows at the Fall Creek Development.

#### B12.7 AREA-CAPACITY CURVE AND RULE CURVE

The Fall Creek Development is a run-of-river plant. As such, there is no usable storage, and the forebay is kept at a constant level. There is no area-capacity curve or rule curve.

#### B12.8 HYDRAULIC CAPACITY

The estimated hydraulic capacity of the Fall Creek powerhouse is approximately 50 cfs at a rated net head of 720 feet.

#### B12.9 TAILWATER RATING CURVE

The Fall Creek powerhouse utilizes Pelton-type impulse turbines, which discharge to an open channel at atmospheric pressure. As a result, the turbine capacity is generally unaffected by the tailwater elevation.

#### B12.10 POWERPLANT CAPACITY VERSUS HEAD CURVE

The run-of-river Fall Creek Development operates at a fairly constant head. As such, generating capacity is only influenced by variations in flow rate.



## B13.0 IRON GATE DEVELOPMENT

### B13.1 DEVELOPMENT OVERVIEW

The Iron Gate Development consists of a reservoir, dam, and powerhouse located on the Klamath River between approximately RM 196.8 and RM 190, which is approximately 20 miles northeast of Yreka, California. It is the most downstream hydroelectric facility of the Project (Figure B1.1-1). The rock fill Iron Gate dam is 173 feet high. The impoundment formed upstream of the dam is approximately 944 surface acres and contains approximately 58,794 acre-feet of total storage capacity and 3,790 acre-feet of active storage capacity. An ungated spillway 730 feet long leads to a large spill canal, allowing transport of high flows past the structure. The powerhouse is located at the base of the dam. Trash is prevented from entering the penstock by a 17.5-foot by 45-foot trash rack.

In 2003, modifications were made to Iron Gate dam to raise the dam crest elevation from El. 2343 feet msl to El. 2348 feet msl. The modifications included construction of a concrete wall extension along the dam crest, anchored into the existing dam structure. Additional riprap materials were placed on the upstream face of the dam to protect those areas inundated by the higher reservoir elevations. This work included shotcrete protection at the top of the spillway and spillway chute.

The Iron Gate powerhouse consists of a single 18 MW unit with a hydraulic capacity of 1,735 cfs. In the event of a turbine shutdown, a synchronized bypass valve located immediately upstream of the turbine diverts water around the turbine to maintain flows downstream of the dam.

The original construction diversion tunnel is still in place. Operation of the gate controlling the flow through the tunnel is limited to emergency use during high flow events. If needed for such purposes, the tunnel can pass up to approximately 5,000 cfs.

### B13.2 OWNERSHIP AND CONTRACTUAL OBLIGATION

PacifiCorp owns and operates the Iron Gate Development. Although it is not covered by the 1956 Contract with USBR, most of the discussion relating to Link River dam and UKL nonetheless applies to Iron Gate dam as well because average daily flows below Iron Gate dam are a direct function of flows released at Link River dam.

In 1992, USBR operational control required only specific UKL elevations, but now USBR also requires specific flow releases at Iron Gate dam. In 1997, National Marine Fisheries Service (NOAA Fisheries) listed coastal coho salmon below Iron Gate dam as federally threatened under the ESA. In compliance with ESA, for the period 1997-2003, USBR defined its own Project operations through annual operation plans. Each annual plan defined how UKL and flows downstream of Iron Gate dam could be regulated for that year, based on hydrological and environmental (e.g., water quality, fishery) conditions. USBR's consultation with USFWS and NOAA Fisheries on the plans resulted in Biological Opinions that specifically defined UKL elevations and Klamath River flows downstream of Iron Gate dam needed to protect listed species. PacifiCorp has continued to assist USBR in achieving its UKL elevation and the river flow in compliance with the ESA. This commitment is expressed via annual agreements that

PacifiCorp has signed with USBR stating its cooperation to operate the Hydroelectric Project in accordance with USBR's annual Operating Plans (see Appendix B-1A).

Since coho salmon are listed under the ESA downstream of Iron Gate dam and flows below Iron Gate are closely correlated to releases at Link River and Keno Dams, the 1997 modification of the 1956 Contract covers Iron Gate dam as well. Specifically, the modification states that USBR will assume all discretionary responsibility for setting minimum river flows below Iron Gate dam. USBR does this through consultation with NOAA Fisheries. PacifiCorp implements the minimum flows pursuant to the 1997 modification and annual agreements with USBR. In summary, under the 1997 modification and because there is minimal in-Project storage, USBR, not PacifiCorp, controls the amount of water released at Iron Gate dam to meet instream flow conditions of NOAA Fisheries Biological Opinions (most recently the 2002 BO).

### B13.3 OPERATIONS

The Iron Gate powerhouse is located at the base of the dam and has no bypass reach. The facility operates as a regulating dam to dampen the effects of fluctuating river levels from the Copco Nos. 1 and 2 peaking operations. Releases through the turbine can be as much as 1,735 cfs. When flows are higher, or higher flows are needed to meet regulatory conditions downstream, additional water is passed over the ungated spillway. The amount of spill is controlled to the extent possible through Copco Nos. 1 and 2 operations. If a consistent spill is needed at Iron Gate dam, Copco Nos. 1 and 2 cannot operate in a peaking operation, but must provide a constant flow to maintain Iron Gate reservoir elevations. Due to the 800-foot length of the spillway, and the variable inflows from reservoir tributaries (Fall Creek, Jenny Creek, and Camp Creek), operating to meet less than a 500 cfs spill amount over the ungated spillway at Iron Gate dam is very difficult.

The current FERC license stipulated minimum flow requirements below Iron Gate dam are 1,300 cfs from September through April, 1,000 cfs in May and August, and 710 cfs in June and July. However, and as mentioned above, since 1997 PacifiCorp has operated to provide instream flow releases dictated by USBR's annual Project Operations Plans.

PacifiCorp coordinates with USBR to pass those minimum flows stated in the current biological opinion rather than those cited as the FERC minimum. During 2003 through 2005, USBR will meet or exceed the Iron Gate dam flows listed in Table B10.3-1 by water year types plus an additional volume to be provided by a water bank (NOAA Fisheries, 2002). Specifically, the minimum volume of additional water during water years 2003 through 2005 will be 50 total acre-feet (TAF), 75 TAF, and 100 TAF, respectively. The amount of this additional water is to increase with each successive year as USBR continues to develop water resources to support a reliable water bank. By March 31 of each year, NOAA Fisheries and USBR will determine how this additional water will be distributed for release. Iron Gate Hatchery return water and Bogus Creek contributions are included in this minimum flow.

Table B13.3-1. Instream flow releases as measured at Iron Gate dam in the U.S. Bureau of Reclamation's Klamath Project Operations 2002 Biological Assessment (USBR, 2002).

<b>Flows at Iron Gate Dam (Average Daily Flow) by Water Year Type*</b>				
<b>Time Step</b>	<b>Above Average</b>	<b>Below Average</b>	<b>Dry</b>	<b>Critical Dry</b>
October	1,345	1,345	879	920
November	1,337	1,324	873	912
December	1,387	1,621	889	929
January	1,300	1,334	888	1,101
February	1,300	1,806	747	637
March 1-15	1,953	2,190	849	607
March 16-30	2,553	1,896	993	547
April 1-15	1,863	1,742	969	874
April 16-30	2,791	1,347	922	773
May 1-15	2,204	1,021	761	633
May 16-31	1,466	1,043	979	608
June 1-15	827	959	741	591
June 16-30	934	746	612	619
July 1-15	710	736	547	501
July 16-31	710	724	542	501
August	1,039	1,000	647	517
September	1,300	1,300	749	722

\*Water Year Type is based on Upper Klamath Lake Net Inflow (during April – September) as follows:

Above Normal	Above 500,000 acre-feet
Below Normal	500,000 to greater than 312,000 acre-feet
Dry	312,000 to greater than 185,000 acre-feet
Critical	185,000 acre feet or less

In addition, in order to prevent potential coho salmon stranding, USBR will operate the Klamath Irrigation Project to provide water and coordinate with PacifiCorp to achieve the following rates for ramping down of flows between monthly or biweekly timesteps below Iron Gate dam as listed in Table B13.3-1.

The 2001 biological opinion issued by NOAA Fisheries for USBR contained limits on PacifiCorp's ramp rates at Iron Gate. The 2001 and the subsequent 2002 biological opinions specified a ramp rate of 50 cfs per 2-hour period at the Iron Gate powerhouse at those times when flows are within the hydraulic capacity of the plant (Table B13.3-2). The biological opinions also set a limit for flow reduction to 150 cfs per day (NOAA Fisheries, 2001). This limit is five times more restrictive than the current FERC license ramp rate of 250 cfs per hour. PacifiCorp has found that the equipment in the powerhouse can achieve this lower ramp rate. However, coordination between USBR and PacifiCorp is necessary to make sure enough water is available for release over the long ramp-down periods. This operational change relies on semi-automated control subject to occasional inaccuracies. PacifiCorp has committed to implement those ramp rates to the extent possible based on the physical limitations of the hydroelectric Project facilities. These limitations include the absence of spill gates at Iron Gate dam.

Flow below Iron Gate dam is measured every 15 minutes at a USGS gauging station (No. 11516530) located approximately 0.6 mile downstream. The gauge is also downstream of

Bogus Creek, a tributary to the Klamath River; hence, instream flow at the gauge is a measure of flow from the powerhouse, Iron Gate fish hatchery return water, and the ungauged Bogus Creek.

Table B13.3-2. Iron Gate minimum instream flow and ramp rate directives.

<b>River Reach</b>	<b>Length of Reach (River Miles)</b>	<b>Minimum Instream Flow</b>	<b>Ramp Rate</b>
Iron Gate Dam	Not Applicable	Specified in PacifiCorp license (FPC 1956) and in NOAA Fisheries 2001 and 2002 biological opinions for Coho (NOAA Fisheries, 2001 and 2002)	<ol style="list-style-type: none"> <li>1. 250 cfs or 3 inches per hour, whichever is less (FPC 1956).</li> <li>2. Decreases not more than 125 cfs per hour not exceeding 300 cfs per 24 hour period when flows are above 1,750 cfs and no more than 50 cfs per 2-hour period not exceeding 150 cfs per 24 hour period when flows are 1,750 cfs or less (NOAA Fisheries 2001 and 2002).</li> </ol>

The Iron Gate Development is primarily operated manually with minor control provided remotely to serve as the Project's regulating facility. Generation schedules reflect the instream flow requirements and ramp rates PacifiCorp is obligated to provide. The exception to this may occur seasonally when high river flows result in spills. The single Iron Gate unit is scheduled to maintain those regulated flows as well as provide minimal adjustments for seasonal peaks within its range limits. This schedule is given daily. Monitoring and control is provided 24 hours a day, 7 days per week. Local operators start and stop the unit. Unit control is done automatically on a defined (pre-programmed) ramp rate. The unit can be tripped remotely.

#### B13.4 ANNUAL PLANT FACTOR

The average annual energy production for the Iron Gate powerhouse is 116,000 MWh (30-year, long-term average, May 2003). With a nameplate capacity of 18MW, the annual plant factor for Iron Gate is 73 percent.

#### B13.5 PERIOD OF CRITICAL STREAM FLOW, AVERAGE ANNUAL ENERGY PRODUCTION, AND DEPENDABLE CAPACITY

The period of critical streamflow used to determine the dependable capacity is water year 1981. The dependable capacity is 8,900 kW.

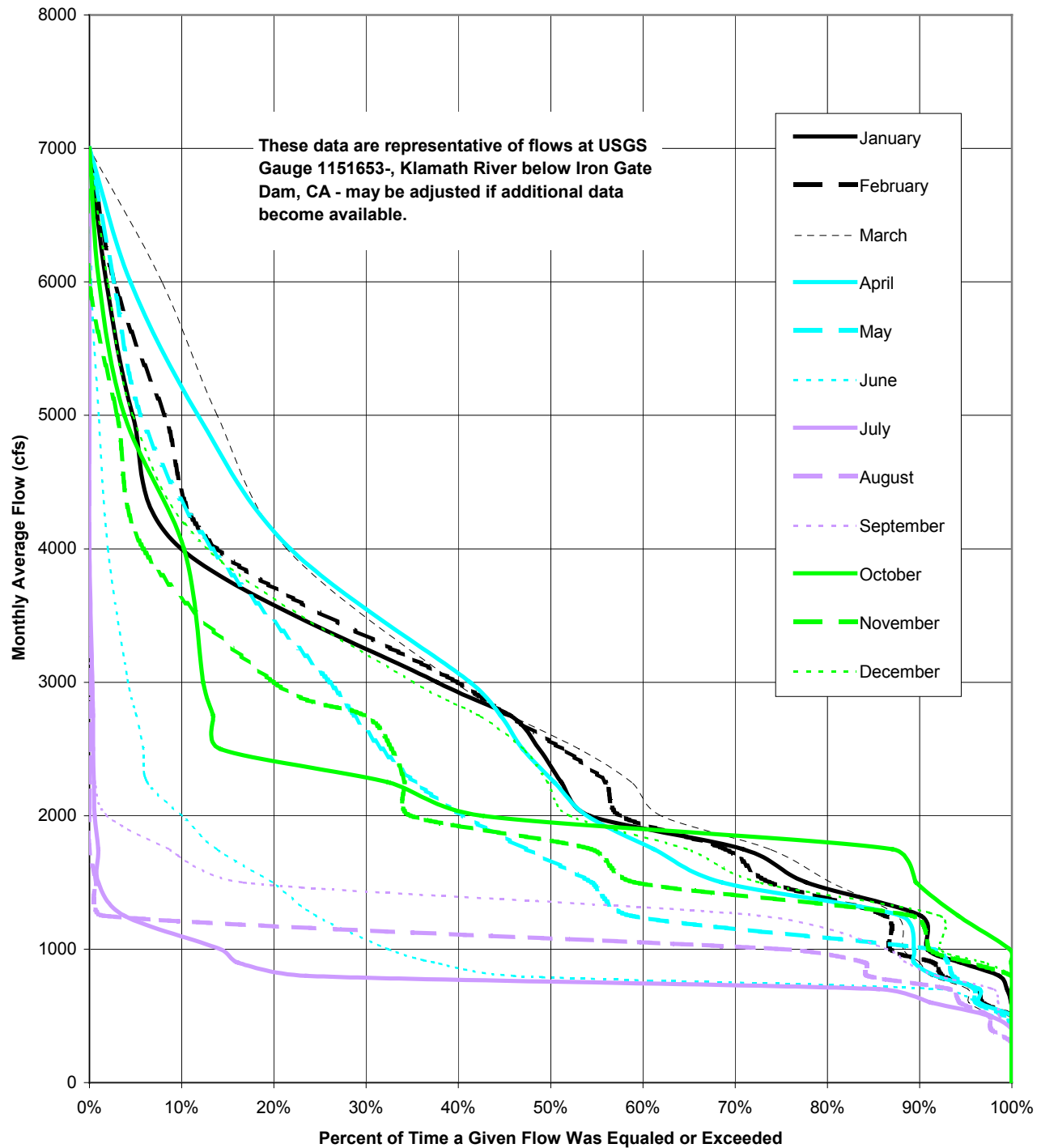
The average annual energy production for the Iron Gate powerhouse is 116,000 MWh.

Monthly flow-duration curves are presented in Figure B13.5-1.

#### B13.6 AREA-CAPACITY CURVE AND OPERATING CURVE

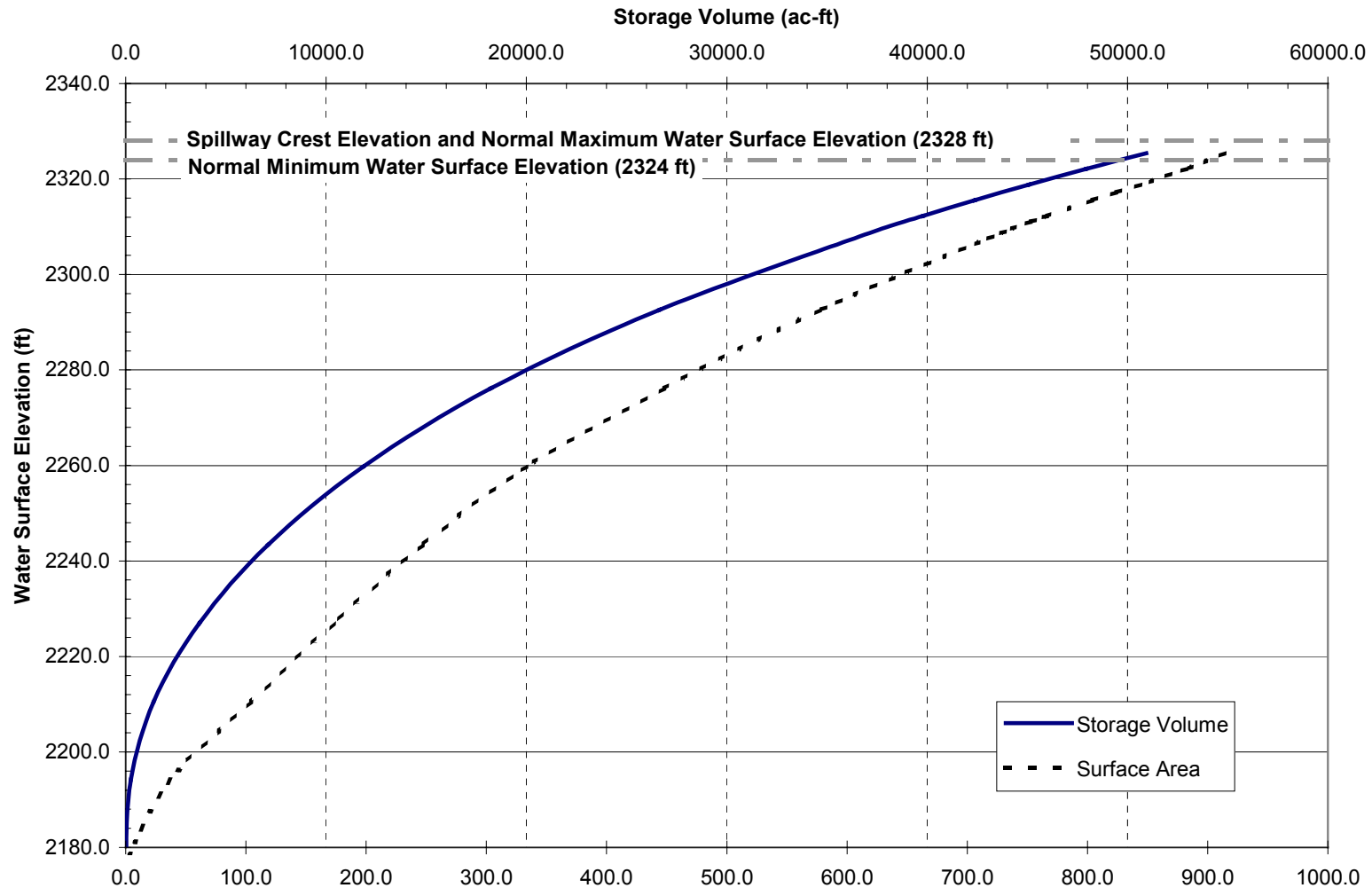
An area-capacity curve showing gross and usable storage capacity of the reservoir is shown in Figure B13.6-1. A typical reservoir operating is shown in Figure B13.6-2. Because of limited reservoir storage, the reservoir is operated on a daily basis over a limited range of approximately 1.5 feet.





Period of Record: Water Years 1962 - 2001

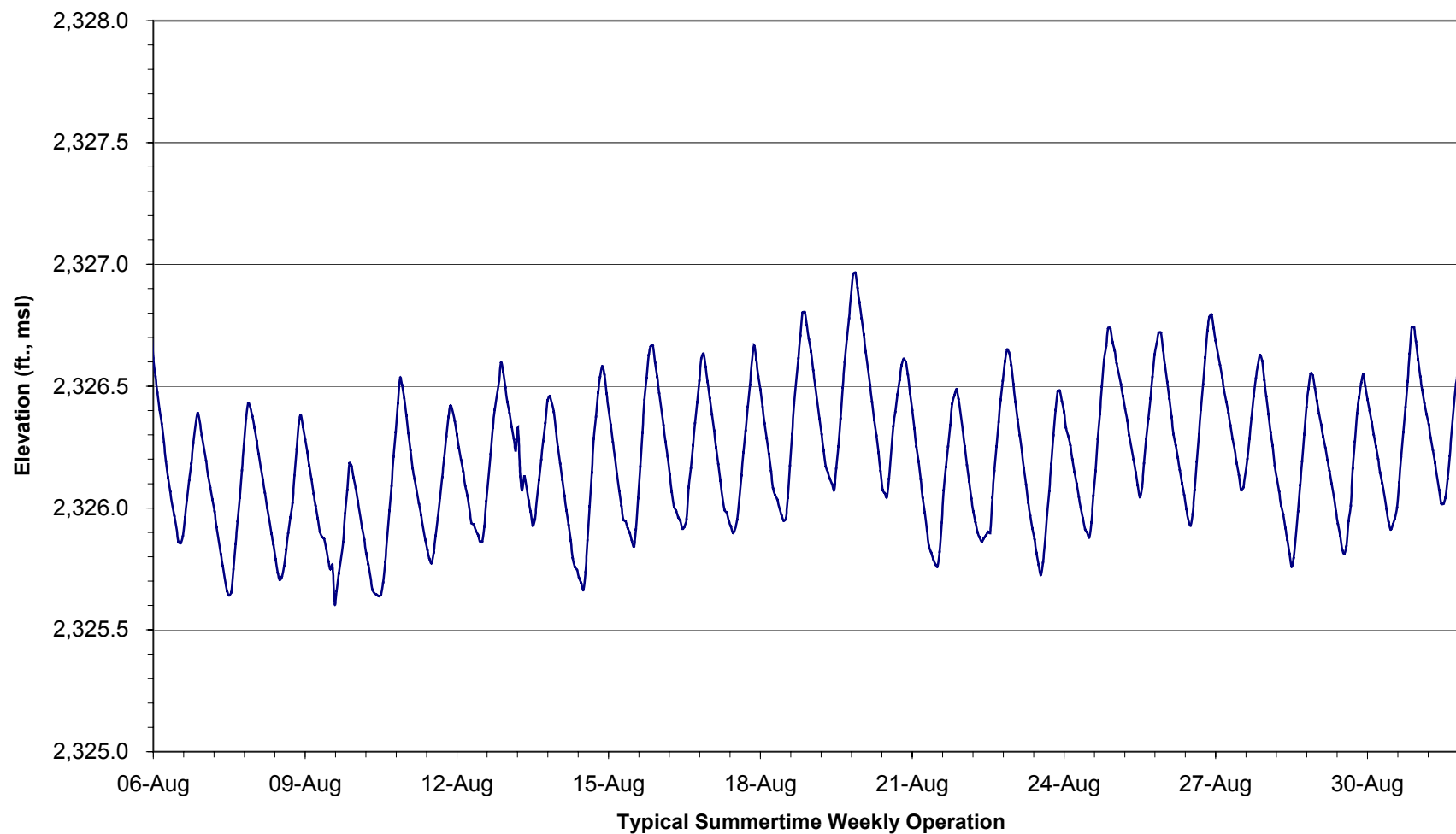
Figure B13.5-1. Flow duration curve of monthly flows at the Iron Gate Development.



Spillway Section Type - Ungated Concrete Ogee with Sluice

Active storage volume between normal minimum and maximum water surface elevations = 3,800.3 acre-feet

Figure B13.6-1. Area-capacity curve, Iron Gate reservoir.



Note: Summertime headwater variability will be greater than in the winter, particularly when spilling.

Figure B13.6-2. Iron Gate typical hourly reservoir elevations.

### B13.7 HYDRAULIC CAPACITY

The estimated hydraulic capacity of the Iron Gate powerhouse is approximately 1,735 cfs at a rated net head of 153 feet.

### B13.8 TAILWATER RATING CURVE

The tailwater rating curve is shown in Figure B13.8-1.

### B13.9 POWERPLANT CAPACITY VERSUS HEAD CURVE

The power plant capacity versus head curve is shown in Figure B13.9-1.

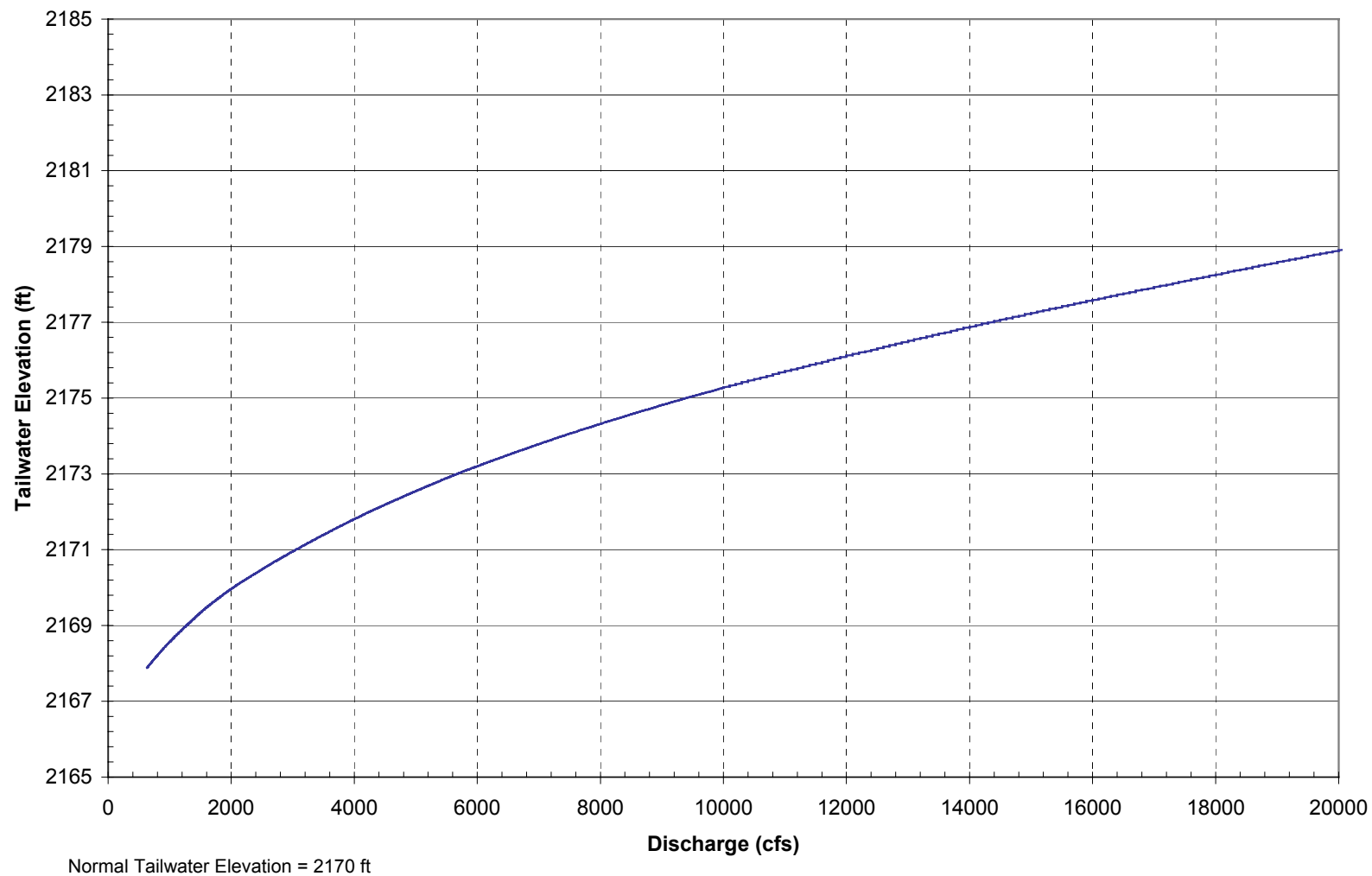


Figure B13.8-1. Tailwater rating curve, Iron Gate Development.

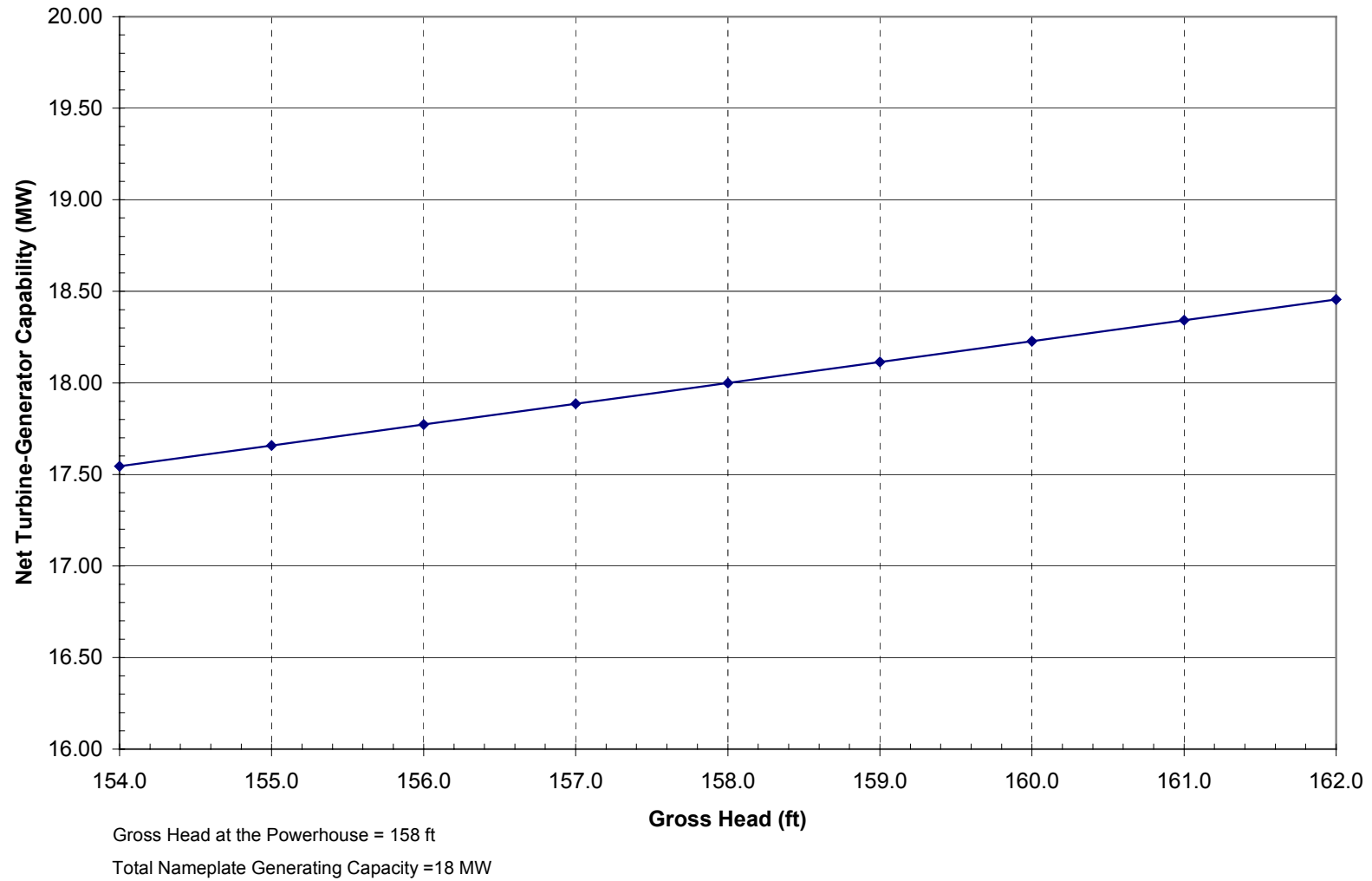


Figure B13.9-1. Turbine generator capability vs. head, Iron Gate Development.

## B14.0 POWER UTILIZATION

Power generated at the Project is and will be used to meet the applicant's system loads. The applicant is an operating public utility, subject to regulation by the Public Utilities Commissioner of Oregon, the Washington Public Service Commission, the Idaho Public Utilities Commission, Utah Public Service Commission, the Public Service Commission of Wyoming, and the Public Utilities Commission, State of California, engaged primarily in the business of generating, purchasing, transmitting, distributing, and selling electric power and energy to domestic, commercial, and industrial customers in its service areas in the States of Oregon, Washington, Idaho, Utah, Wyoming, and California.

The applicant's transmission facilities are interconnected with those of other utilities constituting the Northwest Power Pool. The Project is connected to this transmission grid and is operated in coordination with the Northwest Power Pool under the provisions of the Pacific Northwest Coordination Agreement.





## B15.0 PROPOSED PROJECT

The proposed Project will include the removal of three developments (East Side, West Side, and Keno) from the existing Project and the inclusion of new instream flow requirements at two developments (J.C. Boyle and Fall Creek). PacifiCorp does not plan to make any substantial Project generation capacity additions in the foreseeable future. As described in Exhibit A, PacifiCorp will monitor the condition of powerhouse runners and generators and make repairs in a timely manner to extend the life of the equipment or replace as needed. These generation enhancements will result in slight improvements in capacity and energy at the Project developments.

As previously stated, the decommissioning of the East Side and West Side developments will result in the loss of 3.8 MW of capacity and 18,800 MWh of annual energy.

The proposed additional 100 cfs of instream flow released at the J. C. Boyle powerhouse will result in an estimated annual energy reduction at that development of 1,500 MWh. The increase of the instream flow at the Fall Creek Development from 0.5 cfs to 5.0 cfs will reduce the annual energy production by 1,300 MWh.



## B16.0 INFORMATION SOURCES

- Ayers Associates. 1999. Geomorphic and Sediment Evaluation of the Klamath River, California, Below Iron Gate Dam. Fort Collins, Colorado.
- Balance Hydrologics, Inc. (BHI). 1996. Initial Assessment of Pre- and Post-Klamath Project Hydrology on the Klamath River and Impacts on Instream Flows and Fishery Habitat. Report prepared by BHI for the Yurok Tribe. Berkeley, California.
- Federal Energy Regulatory Commission (FERC). 1990. Final Environmental Impact Statement: Salt Caves Hydroelectric Project (FERC 10199-0000). Federal Energy Regulatory Commission, Office of Hydropower Relicensing, Washington, D.C.
- Federal Power Commission. 1956. The California-Oregon Power Company Project No. 2082. License (Major). Issued March 1, 1956, by Federal Power Commission, Washington D.C.
- National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries). 2001. Biological Opinion – Ongoing Klamath Project Operation.
- National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries). 2002. Biological Opinion – Ongoing Klamath Project Operation.
- PacifiCorp. 2000. Klamath Hydroelectric Project FERC No. 2082 First Stage Consultation Document. Portland, Oregon.
- U. S. Bureau of Reclamation (USBR). 1998. Klamath Project 1998 Operations Plan Environmental Assessment. Klamath Falls, Oregon.
- U. S. Bureau of Reclamation (USBR). 2002. Final Biological Assessment. The Effects of Proposed Actions Related to Klamath Project Operation (April 1, 2002–March 31, 2012) on Federally-Listed Threatened and Endangered Species. Partially incorporating January 22, 2001, Biological Assessment submitted to the U.S. Fish and Wildlife Service. Prepared by the U.S. Department of Interior Bureau of Reclamation, Mid-Pacific Region, Klamath Basin Area Office. February 25, 2002.
- U.S. Fish and Wildlife Service (USFWS). 1992. Biological Opinion on Effects of Long-term Operation of the Klamath Project. Klamath Falls, OR.
- U.S. Fish and Wildlife Service (USFWS). 1996. Formal Consultation on PacifiCorp and The New Earth Corporation Operations, as Permitted by the Bureau of Reclamation, for the Lost River and Shortnose Sucker. Klamath Falls, Oregon.
- U.S. Fish and Wildlife Service (USFWS). 2001. Biological / conference opinion regarding the effects of operation of the Bureau of Reclamation's Klamath Project on endangered Lost River (*Deltistes luxatus*), endangered shortnose sucker (*Chasmistes brevirostris*), threaten bald eagle (*Haliaeetus leucocephalus*) and proposed critical habitat for the Lost River / shortnose suckers. California/Nevada Operations Office, Sacramento, California.



## **APPENDIX B-1A**

### **1956 Contract with USBR for the Operation of Link River Dam and Associated Letters of Contract Amendments**



APPENDIX A - 1956 Contract with  
Reclamation for the Operation of  
Link River Dam and Associated  
Letters of Amendment

Contract No.  
14-06-200-5075

UNITED STATES  
DEPARTMENT OF THE INTERIOR

CONTRACT WITH THE CALIFORNIA OREGON POWER COMPANY

THIS CONTRACT, made this 31<sup>st</sup> day of January, 1956,  
in pursuance of the Act of Congress of June 17, 1902 (32 Stat. 388),  
and acts amendatory thereof or supplementary thereto, hereinafter  
referred to as "the Federal reclamation laws", and acts of Congress re-  
lating to the preservation and development of fish and wildlife resources,  
between THE UNITED STATES OF AMERICA, hereinafter called "the United  
States", represented by the officer executing this contract, his duly  
appointed successor, or his duly authorized representative, hereinafter  
called "the Contracting Officer", and THE CALIFORNIA OREGON POWER COMPANY,  
a California corporation, its successors or assigns, hereinafter called  
"Copco";

WITNESSETH:

WHEREAS, the United States, pursuant to the Federal reclamation  
laws, is now engaged in the reclamation and irrigation of lands lying in  
the State of Oregon and in the State of California in the vicinity of  
Klamath Falls, Oregon, known as the Klamath Project; and

WHEREAS, the United States has investigated and is further  
investigating and preparing plans for the development of water and related  
resources of the Upper Klamath River Basin, including the area in  
California known as Butte Valley; and

000001

1956

WHEREAS, on February 24, 1917, an agreement was made for the term of fifty (50) years between the United States and a predecessor of Copco, which agreement was thereafter assigned to Copco, providing, among other things, for the construction of Link River Dam, Klamath County, Oregon, for the purpose of regulating the level of Upper Klamath Lake, and said agreement has been amended and supplemented from time to time; and

WHEREAS, the parties deem it to their advantage and to the best interest of the users of the water in the Upper Klamath River Basin that a new agreement be entered into for a period of fifty (50) years, upon the terms and conditions hereinafter expressed;

NOW, THEREFORE, in consideration of the premises and the mutual covenants hereinafter contained, the parties hereto agree as follows:

1. Whenever used in this contract, the following terms shall have the respective meanings set opposite thereto:

(a) Upper Klamath River Basin -- The area so designated and delineated on the map annexed hereto and made a part hereof, marked Exhibit "A".

(b) Klamath Water -- The water lying or flowing in or which has been diverted from Upper Klamath Lake, Link River, Lake Ewauna, Lost River, Klamath River, or their tributaries, or water that is pumped from underground sources for use on Project Land as part of a plan for maximum water resource development.



(c) Project Land -- All land of the United States lying in the Upper Klamath River Basin, and all land in the Upper Klamath River Basin lying within any public district or within the service area of any association which has contracted or may hereafter contract and any land of individuals or corporations in the Upper Klamath River Basin which have contracted or may hereafter contract with the United States, pursuant to the Federal reclamation laws, for water service or for the construction of irrigation, drainage, or other reclamation works.

2. Copco shall operate and maintain for a period of fifty (50) years from the effective date hereof, subject to the conditions herein-after provided, Link River Dam, located in Klamath County, Oregon, heretofore constructed by Copco and transferred to the United States pursuant to the agreement of February 24, 1917. Copco may regulate the water level of Upper Klamath Lake between the elevations 4143.3 and 4137, (Reclamation Service Datum), but the water level shall not be raised above elevation 4143.3 and shall not be lowered below elevation 4137, except at such times, and on such conditions, as may be satisfactory to the Contracting Officer: Provided, That the Contracting Officer from time to time may specify a higher minimum elevation than 4137 if in his opinion such must be maintained in order to protect the irrigation and reclamation requirements of Project Land. Whenever the elevation of the

lake drops to a point two-tenths of a foot above the applicable minimum elevation, the Contracting Officer may assume control of the Link River Dam and its outlets and continue in control so long as the lake level remains at or below that elevation.

All elevations stated in this article, or specified by the Contracting Officer pursuant to this article, shall mean elevations in a state of calm.

3. Copco shall at its own expense maintain the approach channel to the "A" Canal of the Klamath Project to the satisfaction of the Contracting Officer so far as may be necessary to carry a flow of not less than 1200 c.f.s. into the "A" Canal with the water of Upper Klamath Lake at an elevation of 4137.

4. Copco assumes any and all liability for damages resulting from operation of the Link River Dam by Copco or resulting from its regulation and control of the water levels of Upper Klamath Lake. Copco hereby undertakes to hold the United States harmless from any and all liability for damage arising out of the operation by Copco of Link River Dam and the regulation and control by Copco of Upper Klamath Lake herein provided for.

5. For the period of this contract Copco agrees to furnish electric power for the purposes and for the rates set forth in Exhibit "B", attached hereto and hereby made a part of this contract.

6. Nothing in this agreement shall curtail or in anywise be construed

as curtailing the rights of the United States to Klamath Water or to the lands along or under the margin of Upper Klamath Lake. No Klamath Water shall be used by Copco when it may be needed or required by the United States or any irrigation or drainage district, person, or association obtaining water from the United States for use for domestic, municipal, and irrigation purposes on Project Land: Provided, That nothing in this agreement shall curtail or interfere with the water rights of Copco having a priority earlier than May 19, 1905, and: Provided further, That no water originating in the Upper Klamath River Basin shall be transported beyond the Upper Klamath River Basin except under the provisions of Article 7 of this contract and except for that water which originates within the drainage area of Fournmile Lake.

7. If there shall be authorized for construction pursuant to the Federal reclamation laws projects or units of projects including lands lying within Butte Valley, all drainage water shall be returned to the Klamath River at a point above the town of Keno, Oregon, unless the Secretary of the Interior shall determine that this would render the irrigation and reclamation of lands within Butte Valley economically less feasible than under an alternate plan of development, in which event, upon construction of such projects or units of projects, the drainage water from Project Land lying within Butte Valley shall be returned to the Klamath River at such point upstream from Copco Lake as shall be determined by the Secretary of the Interior: Provided, That

if Copco makes economic benefits available to such projects or units of projects by means of power rates lower than those specified in Exhibit "B", or otherwise, that will make it equally feasible, to the satisfaction of the Secretary of the Interior, to return the drainage water to a point in the Klamath River above Keno, then the drainage water shall be returned to the Klamath River above Keno. Copco shall have the first right to develop, for power purposes, drainage water removed by the United States from Project Land lying within Butte Valley, subject to establishment by Copco of its rights under the applicable state law.

8. Nothing in this agreement shall be deemed to confer on the United States or upon any of its successors any right to the use of Klamath Water for the purpose of generating electric power.

9. Except for the water rights of Copco having a priority earlier than May 19, 1905, no Klamath Water shall be used by Copco when it may be needed or required by the United States for waterfowl conservation in the Upper Klamath River Basin in the quantities in which it is being used for that purpose as of the effective date of this contract.

10. The failure of Copco to comply in the true intent and meaning with any of the provisions of this agreement in regard to the operation and use of Link River Dam during the fifty (50) year period shall render this contract in regard to said dam subject to cancellation by the Secretary of the Interior upon sixty (60) days' written notice to Copco stating the cause for such proposed cancellation and in case of failure

or refusal of Copco to comply with the provisions of this contract within the period allowed by the Secretary of the Interior he may cancel this contract. After such cancellation, or at the expiration of the fifty (50) year period of this contract, Copco shall have no further rights in regard to the use of Link River Dam and its appurtenances, the operation and control of which shall immediately pass to the United States, but such cancellation shall in nowise curtail or affect the rights which Copco now has in the waters of Link River and Klamath River.

11. This contract shall become effective on the date of its approval by the Public Utility Commissioner of the State of Oregon or the Public Utilities Commission of the State of California, whichever shall occur later, and shall not be effective in any way until approved by both regulatory authorities. Within thirty (30) days after the execution of this contract Copco shall file applications with both regulatory authorities for orders authorizing Copco to carry out the terms thereof and shall prosecute the applications and any proceedings on them diligently. If such orders are not issued and effective within nine (9) months after execution of this contract, the United States may, within sixty (60) days, terminate this contract on thirty (30) days' notice to Copco.

12. This contract shall supersede and cancel the contract, including all amendments thereto, entered into under date of February 24, 1917, by Copco and its predecessor company, California-Oregon Power Company, and the United States, upon the effective date hereof.

13. In connection with the performance of work under this contract, the contractor agrees not to discriminate against any employee or applicant for employment because of race, religion, color, or national origin. The aforesaid provision shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of the non-discrimination clause. The contractor further agrees to insert the foregoing provision in all subcontracts hereunder, except subcontracts for standard commercial supplies or raw materials.

14. No Member of or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

15. This contract binds and inures to the benefit of the parties hereto, their successors and assigns, including without limitation any water users' organization or similar group which may succeed either by assignment or by operation of law to the rights of the United States hereunder.

16. Copco warrants that it has not employed any person to solicit or

secure this contract upon any agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the United States the right to annul the contract or, in its discretion, to deduct from the contract price or consideration the amount of such commission, percentage, brokerage, or contingent fee. This warranty shall not apply to commissions payable by contractors upon contracts or sales secured or made through bona fide established commercial or selling agencies maintained by Copco for the purpose of securing business.

17. This contract shall be in effect for a period of fifty (50) years from the effective date determined pursuant to article 11.

IN WITNESS WHEREOF, the parties hereto set their hands and the seal of Copco is hereto affixed.

APPROVED AS TO LEGAL  
FORM AND SUFFICIENCY  
*Kent Schuyler*  
ACTING REGIONAL SOLICITOR  
DEPARTMENT OF THE INTERIOR

THE UNITED STATES OF AMERICA

By *John H. Spencer*

Title Regional Director, Region 2

Bureau of Reclamation,

U. S. Department of the Interior

Address P. O. Box 2511

Sacramento 11, California

THE CALIFORNIA OREGON POWER COMPANY

By *A. S. Cummins*  
A. S. CUMMINS

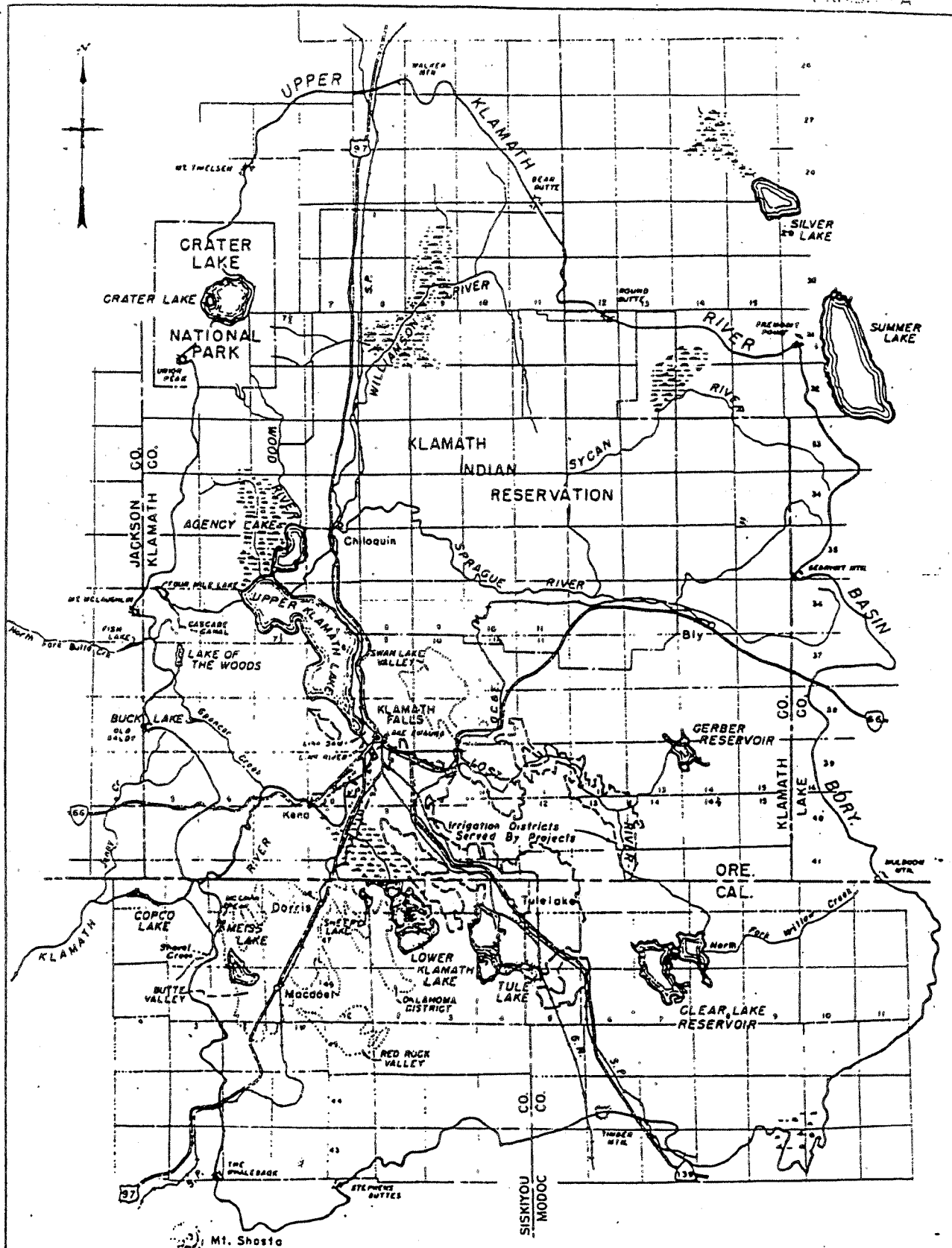
Title President

Address 216 West Main Street

Medford, Oregon

Attest:

*E. L. Lenox*  
E. L. LENOX  
Title Secretary



UPPER KLAMATH RIVER BASIN  
OREGON - CALIFORNIA



STATES OF CALIFORNIA AND OREGON  
SPECIAL GOVERNMENT POWER RATE UNDER CONTRACT DATED January 31, 1956  
BETWEEN UNITED STATES OF AMERICA AND THE CALIFORNIA OREGON POWER COMPANY  
AGRICULTURAL POWER SERVICE: --RATE SCHEDULE "A".

This rate schedule shall be applicable only to pumping Klamath  
Water for use on Project Land and for drainage of Project Land.

Territory:

Applicable to the Upper Klamath River Basin.

Rate:

0.6¢ per kwh

Annual Minimum Charge:

The annual minimum charge is based on the name plate rating in  
horsepower of the maximum connected motor load at each instal-  
lation during a calendar year.

100 H.P. or over:

for first two years of service

\$10.45 per H.P. per calendar year

after two years of service

No Charge

99 H.P. or less:

for first five years of service

first 25 H.P.

\$6.00 per H.P. per calendar year

next 74 H.P.

\$5.25 " " " " "

after five years of service

first 25 H.P.

\$3.00 per H.P. per calendar year

next 74 H.P.

\$2.625 " " " " "

Special Conditions:

- (1) Where 3-phase service is required for installation under 7-1/2 H.P., the annual minimum charge will be based on 7-1/2 H.P.
- (2) Installations in service prior to the effective date of this contract shall receive credit for the time service has been rendered under special power contracts entered into pursuant to the contract between the United States and Copco dated February 24, 1917, in meeting the time requirements used in determining annual minimum charges.
- (3) Energy will be supplied either single-phase or 3-phase at nominal voltages consistent with those in effect elsewhere in the territory served by Copco.
- (4) Special contracts shall be executed for all installations under this rate and all contracts shall have attached thereto a letter from the Contracting Officer stating the proposed consumer is entitled to this rate.
- (5) For installations of more than 7-1/2 H.P., Copco shall make all necessary line extensions at its own expense.
- (6) For installations of 7-1/2 H.P., or less, Copco shall make necessary line extensions in accordance with its established line extension policies as filed with the State regulatory authorities having jurisdiction.
- (7) The annual minimum charge is payable in consecutive monthly installments of 1/6 (one-sixth) of the annual minimum charge, beginning the first month of operation until such time as the accumulated energy charges equal the annual minimum charge.

DRAINAGE PUMPING: --RATE SCHEDULE "B"

This rate schedule shall be applicable only to the pumps operated by the United States, or its successors in interest, for the removal of water from Tule Lake Sumps and Lower Klamath Lake Sumps and any drains leading thereto or therefrom and for power used to pump such drainage water for the irrigation of the areas lying within the beds of Tule Lake and Lower Klamath Lake, all as shown on the map marked Exhibit "A".

Rate:

On-peak pumping--eight (8:00) A.M. to eight (8:00) P.M. of each day except Saturdays, Sundays and legal holidays--five (5) mills per kwh

Off-peak pumping--eight (8:00) P.M. to eight (8:00) A.M. of each day and during the 24-hour period of Saturdays, Sundays and legal holidays--three (3) mills per kwh

If at any time Copco's commercial rates for like service are lower than the rates specified in Schedules "A" and "B" herein, the commercial rates shall prevail during such time.



IN REPLY  
REFER TO:

# United States Department of the Interior

## BUREAU OF RECLAMATION

Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

JUN - 4 1997

HYDRO RESOURC

JUN 3 1997

MP-440  
PRJ-13.00

Randy Landolt, Director Hydro Resources  
PacifiCorp  
920 SW 6th Street  
Portland, Oregon 97204-1256

Subject: Temporary Modification of Contract No. 14-06-200-5075

Dear Mr. Landolt:

Under Contract No. 14-06-200-5075 dated January 31, 1956 (1956 Contract), PacifiCorp's predecessor, Copco, and the United States Department of the Interior acting through its Bureau of Reclamation (Reclamation) agreed that for a period of 50 years PacifiCorp would operate and maintain Reclamation's Link River Dam and, under section 5 of the 1956 Contract, sell power and energy to designated irrigation loads in the Klamath Basin at a reduced rate. In return for these efforts and concessions, Reclamation granted Copco some discretion in setting and maintaining the level of Upper Klamath Lake in order to enhance downstream power benefits at Copco (now PacifiCorp) hydroelectric developments.

In recent years, however, it has become evident that the water supply in the Klamath Basin cannot always meet the needs of the species listed pursuant to the Endangered Species Act (ESA), Tribal trust resources, irrigated agriculture, and wildlife refuges. As a result, PacifiCorp's ability to exercise its discretion in operating Link River Dam for power purposes has been restricted. In addition, the most recent listing of the Coho salmon under the ESA by the National Marine Fisheries Service has caused Reclamation to review its Klamath Project operations. The Klamath Project 1997 Annual Operations Plan, dated May 1, 1997, reflects this review by including certain minimum flows at Iron Gate Dam and elevations in Upper Klamath Lake that vary from the operation that PacifiCorp would prefer for this year.

PacifiCorp has expressed concern over the 1997 Plan and the loss of the benefits the parties expected PacifiCorp to obtain from its operation of Link River Dam. PacifiCorp has requested a modification to the 1956 Contract lest PacifiCorp assert its right to rescind the 1956 Contract on the grounds of frustration of purpose. Reclamation does not acknowledge PacifiCorp's right to rescind the 1956 Contract; Reclamation is, however, willing to negotiate a permanent modification to the 1956 Contract. Such a modification would potentially require a significant period of time to complete. Therefore, Reclamation

proposes a temporary modification for the remainder of calendar year 1997. Reclamation understands that PacifiCorp does not intend to enter into any subsequent temporary modifications to the 1956 Contract.

Reclamation desires PacifiCorp to continue to operate and maintain Link River Dam and to continue to provide low-cost electric power and energy for irrigation purposes under section 5 of the 1956 Contract, but wishes to specify that operations of Link River Dam meet the river flows and lake elevations contained in the 1997 Plan. In light of these positions and assuming that the Federal Energy Regulatory Commission does not object to these arrangements, Reclamation proposes that PacifiCorp until January 1, 1998, forbear from seeking to rescind the 1956 Contract and thus continue to be responsible for the daily operation and maintenance procedures at Link River Dam, in return for which Reclamation would take over discretionary responsibility for specifying Klamath River flows and Upper Klamath Lake elevations as contained in the 1997 Plan.

If the foregoing reflects your understanding and if PacifiCorp is willing to modify the 1956 Contract for the remainder of calendar year 1997 by turning over discretionary responsibility for specifying Klamath River flows and Upper Klamath Lake elevations as contained in the 1997 Plan while continuing to perform the ministerial functions associated with operation and maintenance of Link River Dam and continuing to provide power to the irrigation loads designated in the 1956 Contract at reduced prices, please sign both counterparts of this letter agreement and return one original to me.

We understand that this letter agreement shall expire at midnight on December 31, 1997, without action by either party. Thank you for your attention and assistance.

Sincerely,




Roger K. Patterson  
Regional Director

In Duplicate

PacifiCorp

By



Director

Attest



Date

June 5, 1997



IN REPLY  
REFER TO:

KO-400  
PRJ-13.00

## United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

RECEIVED

JUN - 8 1998

HYDRO RESOURCES

4 H 3

Mr. Randy Landolt  
Director Hydro Resources  
PacifiCorp  
920 SW 6th Street  
Portland, Oregon 97204-1256

Subject: Continuation of the Temporary Modification of Contract No. 14-06-200-5075  
Dated June 5, 1997

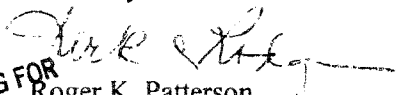
Dear Mr. Landolt:

On April 24, 1998, Reclamation adopted the 1998 Operations Plan Environmental Assessment (EA) and Finding of No Significant Impact. Alternative 1 (minimums) and 2 (targets) of the EA were adopted as the 1998 Operations Plan (1998 Plan). Reclamation and PacifiCorp agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (1956 Contract). Reclamation proposes that this renewal and extension be on the same terms as the June 5, 1997, temporary modification to the 1956 Contract, which by this reference is incorporated herein, except that it now will relate to the 1998 Plan rather than the 1997 Operations Plan. This renewal and extension shall remain in effect until midnight of March 31, 1999, at which time it will expire automatically without action by either party.

If you wish to renew the temporary modification to the 1956 Contract, please sign both counterparts of this letter and return one original to Mr. James Bryant at the Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. You may retain the other copy for your files.

Sincerely,

ACTING FOR

  
Roger K. Patterson  
Regional Director

In Duplicate

PacifiCorp

By: 

Date: 6/8/98



United States Department of the Interior



BUREAU OF RECLAMATION  
MID-PACIFIC REGIONAL OFFICE  
2800 COTTAGE WAY  
SACRAMENTO, CALIFORNIA 95825-1898

IN REPLY  
REFER TO:  
KO-400  
PRJ - 13.00

MAY 21 1999

RECEIVED

MAY 24 1999

HYDRO RESOURCES

Mr. Randy Landolt, Managing Director, Hydro Resources  
PacifiCorp  
825 NE Multnomah, Suite 550  
Portland, Oregon 97232

**Subject:** Continuation of Temporary Modification of Contract No. 14-06-200-5075 dated June 5, 1997

Dear Mr. Landolt:

On March 8, 1999, Reclamation completed a draft 1999 Operations Plan (1999 Plan) Environmental Assessment. In anticipation of finalizing the 1999 Plan, Reclamation and PacifiCorp have agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (1956 Contract). Reclamation proposes that this renewal and extension be on the same terms as the June 5, 1997, temporary modification to the 1956 Contract, which by this reference is incorporated herein, except that it will now relate to the 1999 Plan (in its draft form until superseded by the final version) rather than the 1997 Operations Plan. This renewal and extension shall remain in effect until midnight of March 31, 2000, at which time it will expire automatically without action by either party.

If you wish to renew the temporary modification to the 1956 Contract, please sign both counterparts of this letter and return one original to Mr. James Bryant at the Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. You may retain the other original for your files.

Sincerely,

Kirk C. Rodgers  
Acting Regional Director

In Duplicate

PacifiCorp

By R. Landolt

Date 5/28/99



# United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

IN REPLY  
REFER TO:

KO - 400  
PRJ - 13.00

MAY 22 2000

Mr. Randy Landolt  
Managing Director, Hydro Resources  
PacifiCorp  
825 NE Multnomah  
Suite 550  
Portland, Oregon 97232

Subject: Continuation of Temporary Modification of Contract No. 14-06-200-5075  
(Dated June 5, 1997)

Dear Mr. Landolt:

On April 26, 2000, Bureau of Reclamation (Reclamation) completed the 2000 Operations Plan (2000 Plan). Reclamation and PacifiCorp have agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (1956 Contract). Reclamation proposes that this renewal and extension will be on the same terms as the incorporated herein, except that it will now relate to the 2000 Plan rather than the 1997 Operations Plan. This renewal and extension shall remain in effect until midnight of March 31, 2001, at which time it will expire automatically without action by either party.

If you wish to renew the temporary modification to the 1956 Contract; please sign both counterparts of this letter and return one original to Mr. James Bryant at the Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. You may retain the other original for your files.

Sincerely,

Kirk C. Rodgers  
Deputy Regional Director

In Duplicate

PacifiCorp

by Randy A. Landolt

Date 5/31/00





March 26, 2001

Mr. Karl Wirkus  
U.S. Bureau of Reclamation  
6600 Washburn Way  
Klamath Falls, OR 97603

**Re: Renewal of Modification to the 1956 Contract between Reclamation and  
PacifiCorp's Predecessor, COPCO.**

Dear Mr. Wirkus:

As you know, on May 31, 2000 PacifiCorp and Reclamation executed a renewal of the 1997 modification to the 1956 contract between Reclamation and PacifiCorp's predecessor, COPCO. By its terms, that renewal expires on March 31, 2001.

PacifiCorp expects to enter into another renewal this year. However, this year we believe it would be prudent to await resolution and finalization of the U.S. Fish & Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) biological opinions on Reclamation's project operations. The results of the USFWS biological opinion in particular may have implications for PacifiCorp's ability to implement Reclamation's operations plans.

As we discuss this over the coming weeks, please be aware that PacifiCorp will need written, interim direction from Reclamation for the period from April 1, 2001 until the execution of this year's renewal of the 1997 modification. Please provide your directions as soon as possible.

Sincerely,

Randy Landolt  
Director, Hydro Resources

cc:

T. Olson, PacifiCorp  
M. Smith, PacifiCorp



# United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

IN REPLY  
REFER TO:

KO - 400  
PRJ-13.00

AUG 08 2001

Mr. Randy Landolt  
Managing Director, Hydro Resources  
PacifiCorp  
825 NE Multnomah, Suite 550  
Portland, Oregon 97232

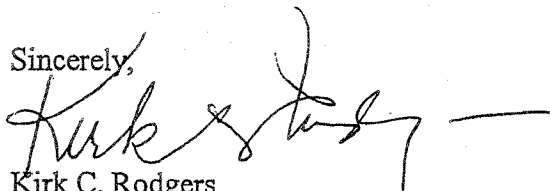
Subject: Continuation of Temporary Modification of Contract No. 14-06-200-5075 (Dated June 5, 1997)

Dear Mr. Landolt:

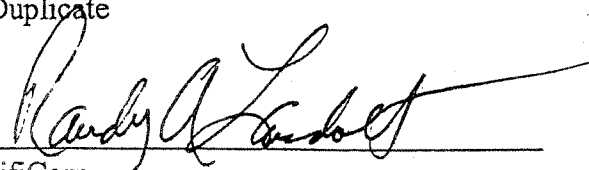
On April 6, 2001, Reclamation completed the 2001 Operations Plan (2001 Plan). Reclamation and PacifiCorp have agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (1956 Contract). Reclamation proposes that this renewal and extension will be on the same terms as the incorporated herein, except that it will now relate to the 2001 Plan rather than the 1997 Operations Plan. This renewal and extension shall remain in effect until midnight of March 31, 2002, at which time it will expire automatically without action by either party.

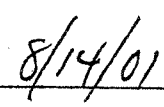
If you wish to renew the temporary modification to the 1956 Contract, please sign both counterparts of this letter and return one original to James Bryant at the Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. You may retain the other original for your files.

Sincerely,

  
Kirk C. Rodgers  
Acting Regional Director

In Duplicate

  
PacifiCorp

  
Date

825 N. E. Multnomah, Suite 1500  
Portland, Oregon 97232  
(503) 813-5000



March 28, 2002

Mr. Dave Sabo  
U.S. Bureau of Reclamation  
Klamath Basin Area Office  
6600 Washburn Way  
Klamath Falls, OR 97603

Subject: Continuation of Temporary Modification of Contract No. 14-06-200-5075 (Date June 5, 1997)

Dear Mr. Sabo,


On August 14, 2001 PacifiCorp renewed and extended the June 5, 1997 temporary modification to Contract No. 14-06-200-5075 (1956 Contract with Bureau of Reclamation). The renewal and extension was to remain in place until midnight of March 31, 2002 at which time it would automatically expire. The understanding was that by that date, Reclamation would have a new 2002 Operations Plan for the Klamath Irrigation Project in place and the 1997 temporary modification could be extended for another period of time.

In the absence of Reclamation's 2002 Operation Plan, PacifiCorp will continue to operate the Klamath Hydroelectric Project according to the 1997 modification until a 2002 plan is available. PacifiCorp will be responsible for daily operation and maintenance procedures at Link River Dam and will provide power to the irrigation loads designated in the 1956 Contract at identified prices, and Reclamation will have discretionary responsibility for specifying Klamath River flows and Upper Klamath Lake elevations. We anticipate signing another letter of agreement similar to past years with Reclamation once Reclamation's 2002 Operations Plan for the Klamath Irrigation Project is in place.

As you are aware, on March 15, 2002, PacifiCorp filed a 60-day notice of intent to sue the U.S. Fish and Wildlife Service under the Endangered Species Act. PacifiCorp views the 60-day notice as a necessary mechanism to support our continued cooperation and operation under the 1996 Biological Opinion. We also believe that continuing to implement our obligations under the 1996 BO is consistent with Reclamation's 2002 Biological Assessment that specifically excludes PacifiCorp's 1996 consultation.

PacifiCorp looks forward to continuing our close cooperation of water management in the Klamath basin.

Sincerely,



Randy Landolt  
Managing Director, Hydro Resources

cc:  
Jim Bryant – USBR Klamath Falls, OR



# United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898  
SEP 05 2002

IN REPLY  
REFER TO:  
KO-400  
PRJ-13.00

Mr. Randy Landolt  
Managing Director, Hydro Resources  
PacifiCorp  
825 NE. Multnomah, Suite 550  
Portland, Oregon 97232

Subject: Continuation of Temporary Modification of Contract No. 14-06-200-5075 (Dated June 5, 1997)

Dear Mr. Landolt:


On June 4, 2002, the Bureau of Reclamation completed the Klamath Project 2002 Annual Operations Plan (2002 Plan). Reclamation and PacifiCorp have agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (1956 Contract). Reclamation proposes that this renewal and extension be on the same terms as incorporated herein, except that it will now relate to the 2002 Plan rather than the 1997 Operations Plan. This renewal and extension will remain in effect until midnight of March 31, 2003, at which time it will expire automatically without action by either party.

Should you wish to renew the temporary modification to the 1956 Contract, please sign both counterparts of this letter and return one signed original to Mr. James Bryant, Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. Please retain one signed original for your files.

Sincerely,

  
Kirk C. Rodgers  
Regional Director

In Duplicate

  
PacifiCorp

9.13.02  
Date



## United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

IN REPLY  
REFER TO:

KO-400  
PRJ-13.00

SEP 18 2003

Copied 9/30 CS:hb  
Bevan - Copco  
O'Connor - 1500 LCT  
Olsen - 1500 LCT  
Smith - 600 LCT  
Snyder/FERCEASE - 1500 LCT  
File: Klamath, Iron Gate Dam,  
Compliance, FERC, USBR,  
Annual contract revival

Mr. Randy Landolt  
Managing Director, Hydro Resources  
PacifiCorp  
825 NE. Multnomah, Suite 550  
Portland, OR 97232

Subject: Continuation of Temporary Modification of Contract No. 14-06-200-5075  
(Dated June 5, 1997)

Dear Mr. Landolt:

On April 10, 2003, the Bureau of Reclamation completed the *Klamath Project 2003 Annual Operations Plan* (2003 Plan). Reclamation and PacifiCorp have agreed to renew and extend the June 5, 1997, temporary modification to Contract No. 14-06-200-5075 (Contract). Reclamation proposes that this renewal and extension will be on the same terms as incorporated herein, except that it will now relate to the 2003 Plan rather than the 1997 Operations Plan. This renewal and extension shall remain in effect until midnight of March 31, 2004, at which time it will expire automatically without action by either party.

If you wish to renew the temporary modification to the Contract, please sign both counterparts of this letter, and return one original to Mr. Cecil Lesley, Klamath Basin Area Office, 6600 Washburn Way, Klamath Falls, Oregon 97603. Please retain the second original for your files. If you have any questions, please contact Mr. Lesley at 541-88-6935.

Sincerely,

Kirk C. Rodgers  
Regional Director

In Duplicate

PacifiCorp

9.29.03

Date



## **APPENDIX B-8A**

### **Keno Contract with USBR for the Operation of Keno Dam**







IN REPLY  
REFER TO:

UNITED STATES  
DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION  
Region 2  
Klamath Project  
P. O. Box R  
Klamath Falls, Oregon 97601

January 16, 1968

APPENDIX B - Ken Contract with  
Reclamation for the Operation of  
Keno Dam

Pacific Power & Light Company  
Public Service Building  
Portland, Oregon

Attention: Mr. E. Robert deLuccia  
Senior Vice President

Gentlemen:

Enclosed are two bound copies of "Contract between the United States  
and Pacific Power & Light Company for Keno Development Pursuant to  
Klamath River Project No. 2082 as Amended," executed by Regional  
Director R. J. Pafford, Jr., for your use.

Sincerely yours,

*W. G. Ely*  
W. G. Ely  
Acting Project Manager

Encl. in dupl.

copied for Messrs. Jackson, Frisbee, McKee, Beard, Spicer,  
Hurlbut, Millay, Stiles\*, Alspaugh\*, Lisbakken (6)\*, Hadberg\*,  
Rives/H. Smith\*

\*w/encl.

(signed contracts sent to Central File)

with  
1811

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
Klamath Project, Oregon-California

R.O. Draft 3/22-1967  
Rev. R.O. 7/6-1967

Contract No.  
14-06-200-3579A

CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND PACIFIC  
POWER & LIGHT COMPANY FOR KENO DEVELOPMENT PURSUANT  
TO KLAMATH RIVER PROJECT NO. 2082 AS AMENDED

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3	United States to Be Held Harmless	7
4	Successors and Assigns Obligated	7
5	Officials Not to Benefit	7
	Signatures	8

1 UNITED STATES  
2 DEPARTMENT OF THE INTERIOR  
3 BUREAU OF RECLAMATION  
Klamath Project, Oregon-California

Contract No.  
14-06-200-3579A

4 CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND PACIFIC  
5 POWER & LIGHT COMPANY FOR KENO DEVELOPMENT PURSUANT  
6 TO KLAMATH RIVER PROJECT NO. 2082 AS AMENDED

7 THIS CONTRACT, made this 4<sup>th</sup> day of January, 1968,  
8 in pursuance generally of the Act of June 17, 1902 (32 Stat. 388),  
9 and acts amendatory thereof or supplementary thereto, between THE  
10 UNITED STATES OF AMERICA, hereinafter referred to as the United States,  
11 represented by the Regional Director, Region 2, Bureau of Reclamation,  
12 hereinafter referred to as the Contracting Officer, or his successor,  
13 and the PACIFIC POWER & LIGHT COMPANY, hereinafter referred to as the  
14 Company, a corporation organized under the laws of the State of Maine,

15 WITNESSETH, That:

16 EXPLANATORY RECITALS

17 WHEREAS, the parties hereto entered into a contract on  
18 June 23, 1930, as amended June 30, 1931, granting the Company certain  
19 rights upon public land acquired by the United States in connection  
20 with the reclamation development of the Klamath Project of the  
21 United States; and

22 WHEREAS, pursuant to the above contract, the Company has  
23 constructed at approximately Mile 235.8 in the Klamath River at Keno  
a needle-type dam for regulatory purposes; and

1           WHEREAS, the Company proposes to construct the Keno Development  
2     consisting as a first stage of removal of the existing needle-type dam,  
3     construction of a new diversion dam at approximately Mile 235, channel  
4     improvements upstream from said dam, and as a second stage construction  
5     of power facilities, all as proposed in the application for amendment  
6     of License for Project No. 2082 made March 29, 1965, before the Federal  
7     Power Commission; and

8           WHEREAS, the Federal Power Commission on November 29, 1965,  
9     issued an Order Further Amending License for Klamath River Project  
10    No. 2082, and said Order provides in Article 55 thereof:

11           "Article 55. The Licensee shall enter into a formal  
12    agreement with the United States Bureau of Reclamation for  
13    the purpose of regulating the level of Lake Ewauna and the  
14    Klamath River between Keno Dam and Lake Ewauna, and in the  
15    event that the Licensee and the Bureau fail to reach agree-  
16    ment, the Commission will prescribe the terms of such  
17    regulation after notice and opportunity for hearing.";

18    and

19           WHEREAS, this contract is entered into under said Article 55  
20    and shall not be construed to affect the obligations of the Company  
21    under any other provision of the License not related to Article 55; and

1           WHEREAS, the operation by the Company of the proposed  
2 works under the conditions and stipulations herein contained will  
3 not impair the Klamath Project of the United States and will  
4 provide additional channel capacity during high flows for Klamath  
5 Project purposes;

6           NOW, THEREFORE, in consideration of the mutual and dependent  
7 covenants herein contained, it is agreed by the parties hereto as  
8 follows:

9                           TERM OF CONTRACT

10           1. This contract shall be effective on the date that the  
11 portion of the Keno Development, which includes the new diversion  
12 dam at Mile 235 and the planned channel improvements, is sufficiently  
13 completed to permit regulation of the Klamath River (Lake Ewauna  
14 to Keno) as hereinafter provided, such date to be evidenced by  
15 written notification by the Company to the United States. As of  
16 the effective date of the contract, the contract of June 23, 1930,  
17 as amended, shall be superseded and canceled and the Klamath River  
18 shall be regulated as provided herein; until such time, the said  
19 contract of June 23, 1930, as amended, shall continue to be in  
20 effect, except that regulation as provided for in the contract of  
21 June 23, 1930, as amended, shall be provided by the new diversion  
22 dam. The term of this contract shall extend for the term of the  
23 Federal Power Commission License for Klamath River Project No. 2082.

OPERATION OF DIVERSION DAM FOR REGULATION OF WATER LEVELS

2. (a) When the United States is diverting water from the Klamath River for uses within the Klamath Project, the Company will operate the diversion dam so that the upstream water level will not be below the minimum normal objective operating height of elevation 4085.0, Bureau of Reclamation datum, at or near the location of the present Highway No. 66 bridge at Keno, Oregon, unless the flow in the Klamath River at the diversion dam equals or exceeds six thousand (6,000) cubic feet per second.

(b) The Company shall operate the diversion dam when desired by the United States to provide for the discharge of three thousand (3,000) cubic feet per second from the Lost River Diversion Channel and three hundred (300) cubic feet per second from the Klamath Straits Drain at all times when the flow from Link River is at or below ten thousand (10,000) cubic feet per second. When flow from Link River exceeds ten thousand (10,000) cubic feet per second, the parties shall cooperate in operating their facilities in order to minimize loss and damage to the area. The United States may increase its inflow to the Klamath River at or downstream from the Klamath Straits Drain from three hundred (300) cubic feet per second to one thousand (1,000) cubic feet per second when the flow from Link River is at or below nine thousand three hundred (9,300)

1 cubic feet per second. The United States will limit its discharges  
2 in accordance with the foregoing except when, and to the extent  
3 that, a greater discharge, together with the Company's planned  
4 discharge from Link River and other inflow (with the gates at the  
5 diversion dam adjusted to accommodate the total planned flow)  
6 will not raise the water level above elevation 4086.5 (Bureau of  
7 Reclamation datum) in the upper portion of Lake Ewauna.

8 (c) The Company and the United States will exchange  
9 information on recorded and estimated flows, will agree on criteria  
10 for operations affecting the other party and will notify the other  
11 party of proposed operations affecting the other party. Operating  
12 personnel of the respective parties will make appropriate arrange-  
13 ments for the foregoing.

14 (d) Elevations referred to in subdivisions (a) and (b)  
15 of this article are given on Bureau of Reclamation datum. Primary  
16 control point for such datum is a benchmark consisting of a brass  
17 cap established in 1907 and located on the intake works of "A"  
18 canal near Link River Dam at the outlet of Upper Klamath Lake.  
19 The benchmark is marked elevation 4148.0, which on the Bureau of  
20 Reclamation datum is elevation 4148.650 feet. Secondary benchmarks  
21 (the primary benchmark to control in case of question) used to  
22 establish elevations referred to in subdivisions (a) and (b) of  
23 this article are:

1 (i) Lake Ewauna: Benchmark L-74 (OSHD), set in  
2 1931 on the southwest corner of Main Street Link River  
3 Bridge. Elevation on Bureau of Reclamation datum is  
4 4095.90 feet.

5 (ii) Highway No. 66 bridge: Benchmark #11 (USGS)  
6 set in 1905 about 410 feet northeast of Highway 66 bridge  
7 across Klamath River at Keno in a rock outcrop. Elevation  
8 on Bureau of Reclamation datum is 4111.07 feet.

9 Established gages at Highway 66 bridge and Highway 97 by-pass  
10 bridge crossing the Link River (the latter to determine elevation  
11 of upper portion of Lake Ewauna) will be used for operations under  
12 this contract, and elevations established by reading of such gages  
13 shall be conclusive on all parties as to any matter hereunder. In  
14 case of question as to setting of such gages for future operations,  
15 the question will be resolved by reference to the primary benchmark.  
16 Gages other than those specified above may be used for operations  
17 under this contract provided that adequate correlation is established  
18 in advance and agreed to by both parties from the gage to the control  
19 point location specified in subdivisions (a) and (b) of this article.  
20 Upon the establishment of such alternate gages, elevations established  
21 by such gages shall be conclusive and the gages may be reset as  
22 provided above for the existing gages.



1                    UNITED STATES TO BE HELD HARMLESS

2            3. The Company shall reimburse the United States for damage  
3 to its property resulting from, and shall hold the United States  
4 harmless from all claims for damage caused by reason of, water  
5 levels in Klamath River and Lost River Diversion Channel other  
6 than would have obtained had the new diversion dam not been built  
7 or the then existing channel improvements made by the Company  
8 not been made.

9                    SUCCESSORS AND ASSIGNS OBLIGATED

10           4. The provisions of this contract shall apply to and bind  
11 the successors and assigns of the parties hereto.

12                    OFFICIALS NOT TO BENEFIT

13           5. No Member of or Delegate to Congress or Resident Commissioner  
14 shall be admitted to any share or part of this contract or to any  
15 benefit that may arise herefrom, but this restriction shall not be  
16 construed to extend to this contract if made with a corporation or  
17 company for its general benefit.

IN WITNESS WHEREOF, the parties hereto have executed  
this contract the day and year first above written.

THE UNITED STATES OF AMERICA

By *R. J. Padden*  
Regional Director, Region 2  
Bureau of Reclamation

PACIFIC POWER & LIGHT COMPANY,

(SEAL)

By *S. M. De Luccia*  
S. M. De Luccia  
Vice President  
AB

ATTEST:

\_\_\_\_\_  
Secretary

## PACIFIC POWER &amp; LIGHT COMPANY

## Certified Copy of Resolution

I, M. E. Thompson, a duly elected and acting Assistant Secretary of Pacific Power & Light Company, a corporation of the State of Maine, HEREBY CERTIFY that the following is a full and true copy of a certain resolution which was duly adopted by its board of directors, at a meeting thereof duly held on September 13, 1967, namely:

RESOLVED, that the President or a Vice-President and the Secretary or an Assistant Secretary of Pacific Power & Light Company be authorized, and each of them is hereby authorized, in the name of and on behalf of the Company to enter into and execute a contract between the United States of America, Department of Interior, Bureau of Reclamation and Pacific Power & Light Company referring to the operation of the Keno Development portion of FPC Project No. 2082 substantially in the form set out in the draft identified R.O. Draft 3/22-1967, REV R.O. 7/6-1967.

I FURTHER CERTIFY that said resolution has not been rescinded or modified, and is now in full force and effect as set forth above.

WITNESS my hand and the seal of Pacific Power & Light Company this 18th day of September, 1967.

*M. E. Thompson*  
Assistant Secretary

(Seal)

20

Mr. R. J. Pafford, Jr.  
Regional Director, Region 2  
United States Department of Interior  
Bureau of Reclamation, Region 2  
Sacramento, California 95825

Dear Mr. Pafford:


In accordance with the provisions of Article 1 of the "Contract Between the United States of America and Pacific Power & Light Company for the Klamath River Project No. 2082 as Amended", Contract No. 14-06-200-3579A, Pacific Power & Light Company hereby gives notice that the portion of the Keno Development which includes the new diversion dam at Mile 235 and planned channel improvements is sufficiently completed to permit regulating the Klamath River (Lake Ewauna to Keno) as provided in said contract.

Accordingly the effective date of such contract, as provided in Article 1 thereof, is the date of this letter.

Yours very truly,

PACIFIC POWER & LIGHT COMPANY

By

  
Senior Vice President

Dated: January 29, 1972

cc: Mr. C. D. Lawrence, Project Manager  
Bureau of Reclamation, Klamath Project  
P. O. Box R  
Klamath Falls, Oregon 97601

*JHS*  
*HWB*  
*A.E.G.*