

**PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY**  
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August 19, 2009

**VIA ELECTRONIC FILING**

Honorable Kimberly D. Bose, Secretary, and  
Nathaniel J. Davis, Sr., Deputy Secretary  
ATTN: OEP/DHAC  
FEDERAL ENERGY REGULATORY COMMISSION  
888 First Street, NE  
Washington, DC 20426

Re: **Rocky Reach Hydroelectric Project No. 2145**  
**Article 402 – Operations Plan**

Dear Secretary Bose and Deputy Secretary Davis:

On February 19, 2009, the Federal Energy Regulatory Commission (Commission) issued the “Order on Offer of Settlement and Issuing New License”<sup>1</sup> (License) for the Rocky Reach Hydroelectric Project (Project). License Article 402 requires the Public Utility District No. 1 of Chelan County, Washington (Chelan PUD or Licensee), to file the following plan for Commission approval.

- Article 402: *Operations Compliance Monitoring Plan.*

Within six months of the issuance date of the license and by February 15 each year thereafter, the licensee shall file for Commission approval an operations plan.

The plan shall include, but not be limited to, the following: (a) descriptions of fisheries- and water quality-related operating criteria for the project turbines, the downstream fish passage facility, fishways, spillways, and sluiceways; (b) descriptions of fisheries- and water-quality-related protocols for startup, in-season operation, shutdown, and inspection of the project turbines, the downstream passage facility, fishways (including fish salvage), spillways, and sluiceways; and (c) an annual schedule for operation and inspection of these facilities.

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<sup>1</sup> 126 FERC ¶ 61,138


The licensee shall prepare the plan after consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Environmental Quality, the Confederated Tribes of the Umatilla Reservation, the Confederated Tribes of the Colville Indian Reservation, and the Confederated Tribes and Bands of the Yakama Nation. The licensee shall include with the plan, copies of comments and recommendations on the completed plan after it has been prepared and provided to the above entities, and specific descriptions of how the entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

In accordance with the above License requirement, Chelan PUD hereby files the Operations Plan. Appendices E-G provide the record of consultation with federal, state and tribal resource agency members during the development of the Operations Plan.

We appreciate the Commission's understanding regarding this matter. Please do not hesitate to contact me regarding any questions or comments you may have.

Sincerely,



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cc: Patrick Regan (FERC-PRO)  
Adan Archuleta (FERC-PRO)  
Erich Gaedeke (FERC-PRO)

**ROCKY REACH HYDROELECTRIC PROJECT  
FERC Project No. 2145**

**FINAL**

**2009  
OPERATIONS PLAN**

**LICENSE ARTICLE 402**

**August 19, 2009**

**By  
Public Utility District No. 1  
Chelan County**

## **EXECUTIVE SUMMARY**

As required by the Federal Energy Regulatory Commission's (FERC's) License Order, Article 402, for the Rocky Reach Hydroelectric Project No. 2145 (Project), issued February 19, 2009, this Operations Plan describes (1) fisheries- and water quality-related operating criteria for the project turbines, the downstream fish passage facility, fishways, spillways, and sluiceways; (2) fisheries- and water-quality-related protocols for startup, in-season operation, shutdown, and inspection of the project turbines, the downstream passage facility, fishways (including fish salvage), spillways, and sluiceways; and (3) provides an annual schedule for operation and inspection of these facilities.

The turbines at Rocky Reach are operated as needed to produce electricity and do not have an operation season or schedule. However, during the juvenile fish migration season (April 1 through August 31), Public Utility District No. 1 of Chelan County (Chelan PUD) will prioritize the dispatch of generating units to achieve peak plant operating efficiency as follows 1,2,3,5,4,6,7,8,9,10,11 and turbine units 1 and 2 will operate at a soft-limit of 12 to 12.5 kcfs each. Turbine unit 11's loading may be adjusted as needed during daylight hours from May 1 through October 31 of each year, during periods when the powerhouse is not fully loaded. This can be used as a tool to enhance adult fish passage at the left (i.e., looking downstream) powerhouse entrance as necessary.

The Rocky Reach Juvenile Fish Bypass System (Bypass System) will operate continuously from April 1 to August 31 of each year. Operations outside these dates can occur if it is deemed necessary to encompass 95 percent of the juvenile salmon migration based on discussion with the Rocky Reach Habitat Conservation Plan Coordinating Committee (HCP-CC).

The Project normally provides spill for juvenile salmonid passage to cover 95 percent of the juvenile summer Chinook migration (see Table 3, "Chinook subyearling") in accordance with the criteria set forth by the HCP-CC. Spill levels and durations are correlated with Operational goals for meeting the HCP juvenile survival standards and the specific passage studies designed to measure attainment. Depending on annual survival study protocols, spill may also be provided to cover 95 percent of the juvenile sockeye salmon migration (see Table 3, "Sockeye"). Provisions for the spill program are listed in the HCP. Chelan PUD is continuing to conduct studies to evaluate compliance with state water quality criteria for total dissolved gas (TDG).

Adult fishways will be operated from March 1 to December 31 each year. If more time is required to complete critical fishway maintenance during the annual fishway overhaul period (January and February), the fishway outage may begin in December and be extended into March with the agreement of the HCP-CC.

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# 1. INTRODUCTION

The Rocky Reach Hydroelectric Project (Project) is owned and operated by the Public Utility District No. 1 of Chelan County (Chelan PUD). Chelan PUD received a new license (License) from the Federal Energy Regulatory Commission (FERC) on February 19, 2009, authorizing Chelan PUD to operate the Project dam and powerhouse for a period of 43 years.

The Project consists of a reservoir with a surface area of approximately 8,235 acres and a concrete-gravity dam approximately 130 feet high and about 2,847 feet long (including the powerhouse) that spans the river. The dam consists of:

- a forebay wall, which is integral with the dam and is formed by 10 blocks of various heights and widths between the powerhouse and west abutment;
- a powerhouse approximately 1,088 feet long, 206 feet wide and 218 feet high that includes 11 generating units and a service bay;
- a spillway that is integral with the dam and consists of twelve 50-foot-wide bays separated by 10-foot-wide piers, with flow through each bay controlled by a 58-foot-high radial gate;
- two non-overflow east abutment blocks that are integral with the dam, each 125 feet high by 60 feet wide;
- an east bank seepage cutoff, which is a buried structure that extends roughly 2,000 feet from the east end of the concrete portions of the dam and has a maximum depth of about 200 feet and;
- Dryden weir and Tumwater dams' fish ladders and trapping facilities. (These facilities are located some distance away from the Project on the Wenatchee River).

The Rocky Reach Project includes passage facilities for upstream and downstream migrating fish. The upstream migrant fishway has three main entrances. These are located between spillway bays 8 and 9, at the center of the dam adjacent to powerhouse unit 11, and at the powerhouse service bay between turbine unit 1 and the west shoreline. There are also several submerged orifice entrances at each end of the powerhouse. Fish pass from the entrances into fish collection channels, which converge to guide fish to a pool and weir fish ladder. There is a counting station at the fishway exit located near the west shoreline. Attraction water for the powerhouse fishway entrances is provided by three hydraulic turbine-driven pumps with a total capacity of 3,500 cfs. A gravity intake provides attraction water for the spillway entrance. The juvenile fish bypass system (bypass system) includes a surface collection system, turbine intake screens and collection system for turbines 1 and 2, a bypass conduit to the tailrace, and a fish sampling facility.

On February 19, 2009 the Federal Energy Regulatory Commission (FERC) issued its Order On Offer of Settlement and Issuing New License (License) for the Rocky Reach Hydroelectric Project for a term of 43 years to Chelan PUD (License ends February 1, 2052). Article 402 of the License order, *Operations Plan*, requires the following:

*Within six months of the issuance date of the license and by February 15 each year thereafter, the licensee shall file for Commission approval an operations plan.*

*The plan shall include, but not be limited to, the following: (a) descriptions of fisheries- and water quality-related operating criteria for the project turbines, the downstream fish passage facility, fishways, spillways, and sluiceways; (b) descriptions of fisheries- and water-quality-related protocols for startup, in-season operation, shutdown, and inspection of the project turbines, the downstream passage facility, fishways (including fish salvage), spillways, and sluiceways; and (c) an annual schedule for operation and inspection of these facilities.*

*The licensee shall prepare the plan after consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Environmental Quality (sic, Washington State Department of Ecology), the Confederated Tribes of the Umatilla Reservation, the Confederated Tribes of the Colville Indian Reservation, and the Confederated Tribes and Bands of the Yakama Nation. The licensee shall include with the plan, copies of comments and recommendations on the completed plan after it has been prepared and provided to the above entities, and specific descriptions of how the entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission.*

*The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.*

The License requires the continued implementation of the Habitat Conservation Plan (HCP) (and associated Anadromous Fish Agreement), which was incorporated into the License by Ordering Paragraphs E and F. The License also includes several provisions of the 2006 Rocky Reach Comprehensive Settlement Agreement (Settlement Agreement). It is from this document that the Rocky Reach Fish Forum (RRFF) is established to work with Chelan PUD in implementation of Chapters 2, 3, 4, 5, and 6 of the Comprehensive Plan, relating to Water Quality, White Sturgeon, Bull Trout, Pacific Lamprey, and Resident Fish, respectively. The RRFF shall also assist Chelan PUD in coordinating Chelan PUD's work plans and efforts with the Habitat Conservation Plan Coordinating Committee (HCP-CC) through joint membership and/or other such arrangements as the RRFF and the HCP-CC may mutually devise. The RRFF will be responsible for participating in the development of and implementing the adaptive management approach employed in the applicable chapters of the Comprehensive Plan.

The operations of the Project with regards to upstream and downstream fish passage are guided by the terms and conditions of the HCP. The HCP is a 50-year agreement, ending in 2054, to protect five species of Columbia River steelhead and salmon by implementing a combination of fish bypass systems, spill, off-site hatchery programs and evaluations, and habitat restoration work conducted in mid-Columbia tributary streams. This agreement was entered into by Chelan PUD with the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the Washington Department of Fish and Wildlife (WDFW), the Yakama Indian Nation (YN), and the Confederated Tribes of the Colville Reservation (Colville). The HCP



describes the year round Project operations necessary to protect Endangered Species Act (ESA)-listed Upper Columbia River steelhead (*Oncorhynchus mykiss*) and Upper Columbia spring chinook (*O. tshawytscha*) as well as non-listed late-run (summer/fall) chinook salmon (*O. tshawytscha*), sockeye salmon (*O. nerka*), and coho salmon (*O. kisutch*) (collectively referred to as “Plan Species”). A HCP-CC, consisting of one member from each of the signing Parties, oversees the implementation of the HCP. The HCP-CC will be used as the primary means of consultation between Chelan PUD and the other parties in connection with the conduct of studies and the implementation of measures set forth in the HCP.

The operation of the Project with respect to water quality is guided by the terms in Washington State Department of Ecology’s (Ecology) 401 Certification, which has been included as Appendix A of the License.

This Operations Plan provides details of operations and procedures necessary to safely pass fish through the Project facilities to meet the standards agreed upon in the HCP. Additionally, this Operations Plan provides the details of operations and procedures that are taken to meet water quality standards, particularly with relation to operations of the spillway to meet both fish passage requirements and abatement of total dissolved gas (TDG) resulting from spillway operations. Table 1 provides a schedule of Project operations for fisheries and water quality purposes at Rocky Reach.

**Table 1. Dates of Project Operations for Fisheries and Water Quality Purposes.**

<b>Project Name</b>	<b>Start Date</b>	<b>End Date</b>
Juvenile Fish Bypass System Operation	April 1	August 31
Fish Passage Efficiency Study	Mid-April	Early June
Juvenile Fish Survival Study	Mid-April	Early June
Juvenile Fish Bypass Evaluation (Species composition, fish condition evaluation)	April 1	August 31
Juvenile Fish Bypass Maintenance	Sept. 1	March 31
Spring Fish Spill* (sockeye only)	TBD	TBD
Summer Fish Spill* (subyearling chinook)	June	August
Dissolved Gas Monitoring	April 1	August 31
Adult Fishway Operation**	March 1	Dec. 31
Adult Fishway Maintenance**	Jan. 2	March 1

\*Actual dates may vary according to in-season run-timing for each species.

\*\*Months of fishway operation and maintenance may vary according to scope of maintenance work for a given year.

The Operations Plan will be revised as necessary by Chelan PUD to incorporate changes to Project operations and maintenance as a result of new facilities, changes in operational procedures, or information gained from evaluations. Future revisions may incorporate changes adopted through ESA consultations or through agreement of the HCP-CC and RRFF.

### **1.1 Emergency Deviations from the Operations Plan**

Operational emergencies may occur which could require projects to deviate temporarily from the Operations Plan. To the extent possible, these deviations will be conducted to minimize impacts to fish and TDG and will be coordinated with the RRFF and HCP-CC. Normally, coordination occurs prior to an action. However, if an emergency situation requires immediate attention, coordination will occur as soon as possible after the action.

### **1.2 System Load Shaping**

The Project is a participant in the Mid-Columbia Hourly Coordination Agreement (Hourly Coordination). Hourly Coordination operates the seven dams from Grand Coulee through the Priest Rapids Dam to meet system load requests while minimizing the reductions in head that could result if the projects independently used active storage in their reservoirs to meet individual loads. Efficient load following is accomplished by matching load requests to the movement of water released from Grand Coulee as it passes sequentially through the downstream projects, while maintaining the forebays of these projects as near full as possible. Limitations to operations flexibility at any of the projects with active storage result in greater fluctuations in discharge and forebay elevation at the remaining coordinated projects.

Hourly Coordination is also an important tool used to minimize spill (and resultant TDG levels) and headwater losses during special operations, including fish survival studies, spill gate testing, and repair and maintenance of turbine generating units at each of the projects.

To the extent it reduces TDG, Chelan PUD will avoid spill by continuing to participate in the Hourly Coordination Agreement, or any successor agreement to which Chelan PUD is a party.

### **1.3 Adaptive Management Approach to Fishery Operations (HCP)**

The adaptive management approach that is used to direct Project fishery operations is clearly defined in the Rocky Reach Settlement Agreement, Page 4, ([http://www.chelanpud.org/documents/RR\\_Settlement\\_Agreement.pdf](http://www.chelanpud.org/documents/RR_Settlement_Agreement.pdf)):

*“Adaptive Management” is an iterative and rigorous process used to improve decision-making in the face of uncertainty. In the context of the Rocky Reach relicensing, it is intended to improve the management of natural resources affected by ongoing Project operations, in order to achieve desired goals and objectives as effectively and efficiently as possible, within the provisions of this Agreement. The process has seven steps:*

- a) Develop initial hypotheses regarding any ongoing Project impacts and potential remedial measures;*
- b) Develop goals and objectives for addressing any such impacts;*
- c) Develop and implement appropriate and reasonable measures in*

*accordance with an established schedule;*  
*d) Develop or identify monitoring and evaluation methodologies for determining whether such goals and objectives have been achieved;*  
*e) Monitor and evaluate the implementation of such measures and their effectiveness toward achieving such goals and objectives;*  
*f) Review monitoring and evaluation efforts; and*  
*g) Confirm that such goals and objectives have been achieved or, if not achieved, evaluate additional or revised measures, including those previously considered in the Comprehensive Plan, and implement any additional or revised appropriate and reasonable measures, or explain why such goals and objectives cannot be achieved. If such goals and objectives have not been achieved, the RRF may reevaluate and revise such goals and objectives.*

Implementation of Chelan PUD's adaptive management approach is described in the Rocky Reach Habitat Conservation Plan ([http://www.midcolumbiahcp.org/RR\\_HCP.pdf](http://www.midcolumbiahcp.org/RR_HCP.pdf)) and the Rocky Reach Settlement Agreement.

The HCP is a programmatic approach developed by Chelan PUD and the fisheries agencies and tribes for reducing and eliminating the effects of the Project on salmon and steelhead. The objective of the HCP is to achieve No Net Impact (NNI) for each Plan Species (spring, summer and fall Chinook salmon, sockeye salmon, coho salmon, and steelhead) affected by the Project on the schedule set out in the HCP and to maintain the same for the duration of the HCP. NNI consists of two components: (1) 91 percent Combined Adult and Juvenile Project Survival achieved by Project improvement measures implemented within the geographic area of the Project, (2) 9 percent compensation for Unavoidable Project Mortality provided through hatchery and tributary programs, with 7 percent compensation provided through hatchery programs and 2 percent compensation provided through tributary programs. The Parties intend these actions to contribute to the rebuilding of tributary habitat production capacity and basic productivity and numerical abundance of Plan Species. Adaptive management, as detailed in the HCP, provides for on-going modification of management practices to respond to new information and scientific development. Adaptive management will yield prescriptions that may vary over time.

The Settlement Agreement includes management plans that include goals and a process for developing protection, mitigation, and enhancement measures for species not covered by the HCP (i.e. white sturgeon, Pacific lamprey, bull trout, and resident species).

## **2. DESCRIPTION OF TURBINE OPERATING CRITERIA AND PROTOCOLS**

### **2.1 Turbine Operations**

The powerhouse contains 11 vertical-axis turbines. The turbines incorporate many fish-friendly design features, including minimal gaps between each blade's leading edge and the hub. At rated

capacity and head, units 1 through 7 discharge 14,600 cfs each and units 8 through 11 discharge 17,200 cfs each.

Generally, the turbines are operated as needed for producing electricity and do not have an operation season or schedule. However, during the juvenile fish migration season, Chelan PUD will prioritize the dispatch of generating units to promote optimal fish guidance efficiency of the Bypass System, with unit priority for starts and stops, as 1,2,3,5,4,6,7,8,9,10,11. During juvenile fish passage season (April 1 – August 31) turbine units 1 and 2 will operate at a soft-limit of 12 to 12.5 kcfs each to limit high velocities at the turbine intake screens.

Turbine unit 11's loading may be adjusted as needed during daylight hours from May 1 through October 31 of each year, during periods when the powerhouse is not fully loaded. This can be used as a tool to enhance adult fish passage at the left powerhouse fishway entrances.

Appendix A provides detailed information regarding annual operations related to the turbines.

## **2.2 Turbine Operation and Inspection Schedule**

Operation of the turbines at the Project is automated, including decisions to start, stop and adjust the output of the 11 generating units to achieve maximum efficiency. The Project's automated functions are backed up with around-the-clock, on-duty plant operators who monitor operations and can over-ride computer control if needed.

Turbines are inspected as necessary based on hours operated and other associated stresses. To the extent possible, maintenance of priority units will be scheduled outside of fish passage periods. Because units 1 and 2 provide attraction water flows they are important components of the bypass system; long-term outages of the two units will be avoided during the juvenile passage season.

Additionally, to minimize TDG uptake in the tailrace, Chelan PUD will, to the extent practicable, avoid maintenance outages during the high flow periods. Maintenance will be scheduled based on predicted flows when possible.

## **3. JUVENILE FISH BYPASS SYSTEM (BYPASS SYSTEM)**

### **3.1 Facilities Description**

Following over 15 years of testing and prototype operation, Chelan PUD constructed a permanent juvenile fish bypass system (bypass system) in 2002 and began operation of that system at Rocky Reach in 2003 to guide migrating fish before they enter the powerhouse and divert them downstream past the dam. The bypass system is a key component of Habitat Conservation Plans (HCPs) signed by Chelan PUD, the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Confederated Tribes of the Colville Reservation to meet HCP juvenile fish survival standards.

The juvenile fish passage facilities at the Project consist of three parts: a surface collector, an intake screen system in units 1 and 2, and a bypass conduit which includes a juvenile fish sampling facility.

### ***3.1.1 Surface Collection System***

The surface collector attracts the majority of the migrating juvenile fish into the bypass conduit. The surface collector is located in the forebay of the Rocky Reach powerhouse adjacent to the forebay wall, service bay, and turbine units 1, 2, and 3. The surface collector structure comprises three major sub-parts: the entrance, the de-watering structure, and the pump station. Trash racks, trash handling system and screen cleaners are provided to facilitate management of debris. The migrating fish pass over two surface collector control gates and are delivered to the bypass conduit by way of the surface collector weir box.

### ***3.1.2 Intake Screen System***

Studies indicate the second most likely path for migrating juvenile fish is through the turbine intakes for units C1 and C2. The intake screen system is designed to divert the majority of these fish and safely move them to the bypass conduit.

The intake screen system extends from the turbine intakes, up the gatewell slots, and into the gatewells of turbine units 1 and 2. The intake screen system consists of diversion and vertical barrier screens and 12 weir boxes (two boxes per intake slot, three slots per unit, and two units). The fish are guided by diversion screens in each intake, are routed up the gate well slot along the vertical barrier screens, and then pass over slide gates into the weir boxes. At normal forebay elevation (707 ft), a total of 10 cfs flows through each weir box. Flow from each of these weir boxes is directed into the gatewell collection piping and routed to the bypass conduit which consists of a combination of flumes and large diameter pipes.

### ***3.1.3 Bypass Conduit***

The bypass conduit is a combination of flumes and large diameter pipes and is designed to collect 240 cfs from the surface collector and 120 cfs from the intake screen system. Transport pipes from the surface collector and intake screen system penetrate the forebay wall at two separate locations and merge at a junction just south of the intake screen system pipe's exit from the forebay wall. The bypass conduit is 4,600 feet long and ranges from 90- to 108-inches in diameter. The bypass conduit originates south of the forebay wall and service bay and proceeds north along the tailrace deck. The bypass conduit then curves to the east across the center dam area and continues along the spillway to the Eastbank area. As soon as the bypass conduit reaches the east bank, it curves to the south and runs along the top of the bank, until it finally swings to the southwest for its last 500 feet. The bypass conduit terminates with an outfall structure. The velocity at the outfall terminus is 26 fps with impact velocities ranging from 40 to 48 fps depending on the tailrace elevation.

### ***3.1.4 Juvenile Fish Sampling Facility***

The juvenile fish sampling facility is comprised of a sampling screen, sampling flume, adult fish separator and return pipe, juvenile flume, raceway, and support building. The sampling screen is designed to be deployed into and retracted from the bypass conduit by large hydraulic cylinders. When deployed, the sampling screen will divert 20 to 25 cfs from the bypass conduit flow; this flow is then reduced to 4 cfs. Adult fish are separated automatically from the juvenile fish.

Adults are returned to the bypass conduit by means of the adult return pipe; juvenile fish fall between the bars of a separator and are delivered to the raceway by way of a juvenile flume. Juvenile fish are processed at the support building and returned to the bypass conduit or transported to other sites if needed for studies.

## **3.2 Operating Criteria and Protocol**

### ***3.2.1 Operation Schedule***

The Bypass System will operate continuously from April 1 to August 31. Operations outside these dates can occur if it is deemed necessary to encompass 95 percent of the juvenile salmon and steelhead run based on decisions by the HCP-CC.

### ***3.2.2 Operation Procedures***

The bypass system has been designed to provide fish guidance and bypass for river flows from 0 to 425 kcfs over forebay elevations ranging from 703 to 707 feet and over tailwater elevations ranging from 612 to 636 feet. The surface collector is operated to maintain a constant velocity of 2.85 feet per second at the entrance. At a normal forebay elevation of 707 feet, approximately 6,000 cfs is drawn into the entrance. After flowing through two dewatering channels, the 6,000 cfs is reduced to a bypass flow of 240 cfs at normal forebay elevation. A series of 36 screen cleaners sequentially remove debris from the surface collector dewatering screens. The diversion and vertical barrier screens in turbine units 1 and 2 will be cleaned routinely with a mobile intake screen cleaner. Cleaning will occur frequently enough to maintain the proper differential across the vertical barrier screens and to prevent descale/injury of migrating juvenile fish. Debris buildup will be monitored with a camera mounted to the screen cleaner; this monitoring will enable the cleaning schedule to be adjusted based on the debris load in the river. Slide gate settings (associated with weir boxes and the intake screen system) are controlled automatically to regulate a flow rate from 6 to 10 cfs from the gateway depending on forebay elevation. The design flow for each slide gate is based on a table that depends on gateway level. In general, higher gateway levels will have a weir flow target of 10 cfs, while levels in the lower ranges will have lower targets, falling to approximately 6 cfs. The weir boxes are designed to safely transition the weir flow over the slide gates into the gateway collection piping. Contingencies are in place to manually operate any of the automatic systems, if the need arises.

### ***3.2.3 Service Interruptions***

The bypass system is taken out of operation at the end of the juvenile fish bypass season (i.e. after August 31) for fall/winter shutdown and annual maintenance. The Bypass System may also be removed from service due to unforeseen emergency repairs during the fish migration season. A fisheries biologist will be on-site for coordination and oversight of maintenance activities during the April 1 to August 31 operating season.

### **3.3 Inspection and Maintenance Schedule**

#### ***3.3.1 Scheduled Maintenance***

Scheduled maintenance of the Bypass System will occur in the off-season, which typically runs from September through March of each year. At this time, the various systems that comprise the Bypass System will be inspected; worn and/or broken parts will be repaired or replaced.

#### ***3.3.2 Unscheduled Maintenance***

If unscheduled maintenance will cause an outage of the Bypass System during the juvenile fish migration season, Chelan PUD's biologists will inform the HCP-CC of the problem. If the problem is an emergency and immediate action must be taken, then the HCP-CC will be informed as soon as possible. If the problem is not an emergency, but serious enough that action will need to be taken during the migration season, Chelan PUD will coordinate efforts with the HCP-CC.

## **4. DESCRIPTION OF SPILLWAY OPERATING CRITERIA AND PROTOCOL**

The Project's gated spillway allows regulation of flows and headwater levels in the Project reservoir. The spillway structure is oriented roughly perpendicular to the flow of the river. The spillway section consists of twelve 50-foot-wide bays separated by 10-foot-wide piers. The crest of the ogee spillway section is at elevation 650 feet. Flow through each bay is controlled by a 58-foot-high radial gate. Each gate is operated by a stationary hoist and is equipped for remote operation from the control room in the Project powerhouse.

Spillway releases to pass water in excess of turbine capability for load requirements, or for fish passage, are controlled by computer. The Project's automated functions are backed up with around-the-clock, on-duty plant operators who monitor operations and can over-ride computer control if needed. When the headwater level exceeds operator-set maximum points, gates are automatically opened to pass the excess flow.

Spill gates are opened to create a tailrace pattern of turbulent water, the edges of which lead toward the adult fishway entrances. This spill pattern was designed to provide favorable guidance conditions for adult migrant salmon and steelhead. This spill pattern and alternate patterns were tested and it was determined this pattern was as good as, if not better than the alternate patterns (Schneider and Wilhelms, 2005). The same pattern (Table 2) is used for juvenile fish passage spill. During spill operations, whether for juvenile fish passage, TDG management, or for other purposes, the gates are operated via a computer automated system that follows the spill pattern.

During fish passage spill operations, the sequence and amounts of gate opening can also be adjusted to maximize the effectiveness of the water being spilled, both for juvenile passage and adult attraction. Based on the daily spill memo sent by the Chelan PUD Spill Coordinator by 10:00 a.m., the plant operators input into the system the volume of spill, begin time, and end time requested. On occasion the daily spill volumes are revised later in the day based on flows from

Grand Coulee and Chief Joseph dams. The computer then determines, based on the program, which gates to open and how far.

For spill other than designated fish passage spill, the gates can be operated either automatically with the above mentioned program or manually.

**Table 2. Spilling Schedule for Rocky Reach Dam. (Openings are in feet).**

Total Feet of Gate Open	Gate 2	Gate 3	Gate 4	Gate 5	Gate 6	Gate 7	Gate 8	Estimated flow in KCFS
2							2	4334
3							3	6501
4					2		2	8668
5					2		3	10835
6					3		3	13002
7			2		2		3	15169
8			2		3		3	17336
9			3		3		3	19476
10	2		2		3		3	21640
11	2		3		3		3	23804
12	2		3		3	2	2	25968
13	2		3		3	2	3	28132
14	2		3		3	3	3	30296
15	2		3	2	3	2	3	32460
16	2		3	2	3	3	3	34624
17	2		3	3	3	3	3	36788
18	2	2	3	3	2	3	3	38124
19	2	2	3	3	3	3	3	40242
20	2	2	3	4	3	3	3	42360
21	2	3	3	4	3	3	3	44478
22	2	3	3	4	4	3	3	46596
23	2	3	3	5	4	3	3	48714
24	2	3	4	5	4	3	3	50832
25	2	3	4	5	4	4	3	52950
26	2	3	4	5	4	4	4	55068
27	2	3	5	5	4	4	4	57186
28	2	3	5	5	5	4	4	59304
29	2	3	5	5	5	5	4	61422
30	2	3	5	6	5	5	4	63540
31	2	3	5	6	5	5	5	65658
32	2	3	5	6	6	5	5	67776
33	2	4	5	6	6	5	5	69894
34	2	4	5	6	7	5	5	72012
35	2	4	6	6	7	5	5	74130
36	2	4	6	6	7	6	5	76248
37	2	4	6	6	7	6	6	78366
38	2	4	6	6	8	6	6	80484



39	2	4	6	7	8	6	6	82602
40	2	4	6	7	8	7	6	84720
41	2	5	6	7	8	7	6	86838
42	2	5	7	7	8	7	6	88956
43	2	5	7	7	9	7	6	91074
44	2	5	7	7	9	8	6	93192
45	2	5	7	8	9	8	6	95310
46	2	5	8	8	9	8	6	97428
47	2	5	8	9	9	8	6	99546
48	3	5	8	9	9	8	6	101664
49	3	6	8	9	9	8	6	103782
50	3	6	8	9	10	8	6	105900
51	3	6	8	10	10	8	6	108018
52	3	6	8	10	10	9	6	110136
53	3	6	9	10	10	9	6	112254
54	3	6	9	10	11	9	6	114372
55	3	6	9	11	11	9	6	116490
56	3	7	9	11	11	9	6	118608
57	3	7	10	11	11	9	6	120726
58	3	7	10	11	11	10	6	122844
59	3	7	11	11	11	10	6	124962
60	3	7	11	12	11	10	6	127080
61	4	7	11	12	11	10	6	129198
62	4	8	11	12	11	10	6	131316
63	5	8	11	12	11	10	6	133434
64	5	8	11	12	11	11	6	135552
65	6	9	11	12	11	11	6	137670
66	6	9	11	12	11	11	6	139788
67	7	9	11	12	11	11	6	141906
68	7	9	12	12	11	11	6	144024
69	8	9	12	12	11	11	6	146142
70	8	10	12	12	11	11	6	148260
71	9	10	12	12	11	11	6	150378
72	9	11	12	12	11	11	6	152496
73	9	11	12	12	12	11	6	154614
74	9	11	12	12	12	12	6	156732
75	9	12	12	12	12	12	6	158850
76	9	12	13	12	12	12	6	160968
77	9	12	13	13	12	12	6	163086
78	9	12	13	13	13	12	6	165204
79	9	13	13	13	13	12	6	167322
80	9	13	13	13	13	13	6	169440
81	10	13	13	13	13	13	6	171558
82	10	13	14	13	13	13	6	173676
83	10	13	14	14	13	13	6	175794
84	10	13	14	14	14	13	6	177912
85	10	14	14	14	14	13	6	180030
86	10	14	14	14	14	14	6	182148

87	11	14	14	14	14	14	6	184266
88	11	14	15	14	14	14	6	186384
89	11	14	15	15	14	14	6	188502
90	11	14	15	15	15	14	6	190620
91	11	15	15	15	15	14	6	192738
92	11	15	15	15	15	15	6	194856
93	12	15	15	15	15	15	6	196974
94	12	15	16	15	15	15	6	199092
95	12	15	16	16	15	15	6	201210
96	12	15	16	16	16	15	6	203328
97	12	16	16	16	16	15	6	205446
98	12	16	16	16	16	16	6	207564
99	12	16	16	16	16	16	7	209682
100	12	16	16	16	16	16	8	211800
101	12	16	17	16	16	16	8	213918
102	12	16	17	17	16	16	8	216036
103	12	16	17	17	17	16	8	218154
104	12	17	17	17	17	16	8	220272
105	12	17	17	17	17	17	8	222390
106	13	17	17	17	17	17	8	224508
107	13	17	18	17	17	17	8	226626
108	13	17	18	18	17	17	8	228744
109	13	17	18	18	18	17	8	230862
110	13	18	18	18	18	17	8	232980
111	13	18	18	18	18	18	8	235098
112	14	18	18	18	18	18	8	237216
113	14	18	19	18	18	18	8	239334
114	14	18	19	19	18	18	8	241452
115	14	18	19	19	19	18	8	243570
116	14	19	19	19	19	18	8	245688
117	14	19	19	19	19	19	8	247806
118	15	19	19	19	19	19	8	249924
119	15	19	20	19	19	19	8	252042
120	15	19	20	20	19	19	8	254160
121	15	19	20	20	20	19	8	256278
122	15	20	20	20	20	19	8	258396
123	15	20	20	20	20	20	8	260514
124	15	20	20	20	20	20	9	262632
125	15	20	20	20	20	20	10	264750
126	15	20	21	20	20	20	10	266868
127	15	20	21	21	20	20	10	268986
128	15	20	21	21	21	20	10	271104
129	15	21	21	21	21	20	10	273222
130	15	21	21	21	21	21	10	275340
131	16	21	21	21	21	21	10	277458
132	16	21	22	21	21	21	10	279576
133	16	21	22	22	21	21	10	281694
134	16	21	22	22	22	21	10	283812

135	16	22	22	22	22	21	10	285930
136	16	22	22	22	22	22	10	288048
137	17	22	22	22	22	22	10	290166
138	17	22	23	22	22	22	10	292284
139	17	22	23	23	22	22	10	294402
140	17	22	23	23	23	22	10	296520
141	17	23	23	23	23	22	10	298638
142	17	23	23	23	23	23	10	300756
143	18	23	23	23	23	23	10	302874
144	18	23	24	23	23	23	10	304992
145	18	23	24	24	23	23	10	307110
146	18	23	24	24	24	23	10	309228
147	18	24	24	24	24	23	10	311346

Notes:

- 1) The Estimated flow values are only an estimate. Flow values are dependent on actual headwater (and possibly how far the gate is open).
- 2) The table only accounts for gates that are under SCADA control (2-8).
- 3) Other gates could be opened manually, which would change total flow.

#### 4.1 Fish Passage Spill Program

Since 2003, the University of Washington has been contracted to provide Chelan PUD with run-timing predictions for spring and summer out migrating salmon and steelhead using the Program RealTime run-time forecasting model. Program RealTime provides daily forecasts and cumulative passage percentiles for steelhead, yearling Chinook, sockeye, and subyearling Chinook at both Rocky Reach and Rock Island. The program enables the Chelan PUD to better predict the date when a selected percentage of these species will arrive, or when a given percentage of any stock has passed (e.g. the 5 percent passage point for juvenile subyearling Chinook at Rocky Reach to trigger summer spill). The program utilizes daily fish counts from the juvenile sampling facility at Rocky Reach and the bypass trap at Rock Island. Estimates of the program’s forecast error in daily run projections will be calculated and displayed with the daily predictions at [www.cbr.washington.edu/rt/rt.html](http://www.cbr.washington.edu/rt/rt.html).

The Project normally provides spill for juvenile sockeye and summer Chinook salmonid passage to cover 95 percent of the run at each of the projects in accordance with the criteria set forth in the HCP. Spill levels and durations are correlated with operations necessary for meeting the HCP juvenile survival standards and the specific passage studies designed to measure attainment.

**Table 3. Mean Historical Juvenile Fish Run-timing at Rocky Reach Dam, (Columbia Basin Research DART website).**

Species	Passage Dates						
	First	5%	10%	50%	90%	95%	Last
Chinook Yearling	4/01	4/16	4/24	5/21	6/03	6/05	7/28

Steelhead	4/11	4/28	4/30	5/15	5/27	5/28	7/31
Sockeye	4/3	5/8	5/8	5/11	5/27	5/28	7/16
Chinook Subyearling	6/3	7/5	7/6	7/29	8/6	8/9	9/7

Appendix A provides information on annual operations related to the spillways, including annual juvenile fish spill program details.

## 4.2 Operation and Inspection Schedule

Spillways are operated on the schedule outlined above when spilling solely for juvenile fish passage. Spill required for other reasons, such as passing inflows in excess of powerhouse capacity or generation requirements may occur on an as-needed basis throughout the year, but rarely outside of the May to July snowmelt period. Inspections generally occur between May and October every year and are coordinated with spill requirements.

## 4.3 TDG Monitoring and Control

The state water quality criteria TDG is 110% of saturation at ambient temperature and pressure, except when inflows to the Project exceed the seven-day, 10-year average maximum flow level (7Q10). During the juvenile salmon passage season, the Washington State water quality standards establish a special fish passage exemption for the Snake and Columbia rivers to aid in fish passage over hydroelectric dams when consistent with a Ecology-approved Gas Abatement Plan (GAP) (Appendix C). Per the exemption, TDG must not exceed an average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam. These averages are measured as an average of the twelve highest consecutive hourly readings in any one day, relative to atmospheric pressure. Additionally, a maximum TDG one hour average of 125% must not be exceeded during spill for fish passage.

Chelan PUD operates the Project in a manner to avoid spill as much as possible. When spilling for fish or due to excess inflow or generation, the spillway is operated using gate settings that have been shown to limit TDG production and meet fish passage requirements (Schneider and Wilhelms, 2005).

Under the Operational Plan for TDG (Appendix B), the Project's operations personnel will monitor the TDG levels hourly. If the previous six-hour average TDG level in the tailrace at the JBS outfall is at or above 120%, or the instantaneous TDG level is at or above 125%, the voluntary spill volume will be reduced by 3 kcfs, or as necessary to achieve an instantaneous TDG level below 120%. The new spill volume will be monitored for an hour. If the next six-hour average TDG level is not less than 120%, the spill will be reduced by another 2 kcfs and monitored for an hour. The cycle continues, with the spill reduced by 2 kcfs until the average TDG level of the previous six-hour period is less than 120% and remains at less than 120% through the next full hour. If the instantaneous TDG drops below 118% for one full hour, the spill will be increased by 2 kcfs and monitored. The objective is to maintain as much of the spill

level scheduled for fish passage operations as possible, without exceeding the tailrace TDG numeric criteria.

If the TDG level in the forebay of Rock Island Dam exceeds 115%, the Rock Island operations personnel will notify Rocky Reach operations personnel immediately. If the TDG level in the Rock Island forebay is greater than 115% and the TDG level in the forebay of Rocky Reach is less than 115%, the voluntary spill volume at Rocky Reach will be reduced by 3 kcfs for two hours. If, after two hours of reduced spill, the Rock Island forebay TDG levels are still above 115%, the spill will be reduced another 2 kcfs. If, subsequently, the instantaneous TDG level in the forebay of Rock Island is less than 113%, spill will be increased to the level necessary to comply with the TDG level of 115%. Since the TDG level in the Rock Island forebay is affected by mixing of powerhouse flows with spillway flows at the Project, Project operations personnel may develop additional protocols to adjust spill levels based on changes in powerhouse flow levels.

Additionally, as a condition of approval of the 2009 GAP, Chelan PUD will track spill gate configurations used during fish spill season, so that at the end of the season, this information can be used with information about spill volumes and TDG levels, to evaluate whether it is possible to further reduce TDG generation. Additional conditions of the GAP can be found in Appendix C.

To track Project compliance, Chelan PUD monitors TDG levels at three locations: one in the forebay of Rocky Reach Dam, one in the tailrace of the dam, and one in the forebay Rock Island Dam (the next downstream project). TDG monitoring begins on April 1 of each year and ends on August 31. During this time, TDG levels are recorded at 15-minute intervals. The 15-minute intervals are averaged into hourly readings for use in daily and 12-hour averages. The hourly average data is forwarded to the U.S. Army Corps of Engineers Reservoir Control Center on an hourly basis and posted on their site on the World Wide Web within a couple hours of receipt of data.

## **5. ADULT FISHWAYS**

### **5.1 Facilities Description**

Adult fish facilities provide upstream passage for both anadromous and native fish species at the Project. These facilities consist of a fishway with the right powerhouse entrance (RPE) and left powerhouse entrance (LPE), powerhouse collection and transportation channels, a spillway tunnel channel, a main spillway entrance (MSE), and a fish ladder. The LPE is located at mid-dam between the powerhouse and spillway. The RPE is located on the south end of the powerhouse. The fishway includes a counting station on the right bank.

The adult fish passage facilities include three turbine-driven propeller-type pumps that supply water from the tailwater of the Project for the powerhouse fishway entrances, most of the spillway entrance flow, and the six orifice gates along the powerhouse collection channel. Additional gravity-flow water can be supplied at the main spillway entrance to maintain the agreed upon criteria for that entrance. The powerhouse collection, left powerhouse, and

spillway channels merge in the junction pool area to form the transportation channel that guides fish to the lower end of the fish ladder. The fish ladder exit is located on the right bank of the Columbia River.

Construction activities and associated modification in operations have potential for impact on adult passage at the Project. Construction schedules and activities will be reviewed in advance to limit this potential. Activities which have a high probability of affecting passage will be scheduled during nighttime hours.

## 5.2 Operations Schedule

For operation and maintenance purposes, the primary fish passage season is considered to be April through November. Primary passage periods by species are included in Table 4. Adult fish facilities will be operated from March 1 to December 31 each year. If more time is required to complete critical fishway maintenance during the annual fishway overhaul period, the fishway outage may encompass the month of December in addition to January and February. Chelan PUD will notify the HCP-CC as soon as possible in the process and request the additional time. Chelan PUD’s annual goal is to have the fishway back in service by March 1. If unforeseen events or circumstances arise during the maintenance period which could extend the fishway outage beyond March 1, Chelan PUD will again notify the HCP-CC and request an extension beyond March 1.

**Table 4. Primary Adult Salmonid Passage Periods by Species at Rocky Reach Dam.**

Spring Chinook*	Mid-April to mid-late June
Summer Chinook*	Mid-late June to early September
Fall Chinook*	Early September to November
Steelhead	April to March
Coho	September to November
Sockeye	Late June to mid-August

\*For accounting purposes and based on historical run timing, the spring Chinook run occurs from April 15 to June 23, summer Chinook from June 24 to Sept. 1, and fall Chinook from Sept. 2 to Nov. 15.

## 5.3 Operation Criteria

- a. **Adult fishway:** Water depth over weirs will be maintained at 1.0 to 1.2 feet.
- b. **Transportation Channel (Between trifurcation pool and ladder):** A transportation velocity of 1.5 to 4.0 feet per second (fps) (preferably 2.0 fps) shall be maintained in the channel and the lower end of the fish ladder which is below tailwater elevation.
- c. **Entrances:**

1. General: A 1.0-foot minimum head will be maintained.
2. RPE: Rotary gates at RPE1 and RPE2 shall be fully open.
3. LPE: LPE1 and LPE3 shall be continuously open.

*Submerged weir crest elevation at the RPEs and LPEs for the following tailwater elevations shall be at or below:*

<u>Tailwater Elevation(ft)</u>	<u>Submerged<sup>1</sup>Weir Crest Elevation (ft)</u>
615.0	603.5
620.0	606.5

During periods of high tailwater (elev. 621.0 or above) the gates are set to maintain a depth of 10-12 feet.

4. Orifice Entrances: The following six orifice entrances shall be open: CC1, CC2, CC3, CC16, CC18, and CC20.
5. MSE: Open May 1 through October 31. One gate (MSE 1) is permanently closed. One gate (MSE 2) is permanently open.

*Submerged weir crest elevations at MSE 2 for the following tailwater elevations shall be at or below:*

<u>Tailwater Elevation (ft)</u>	<u>Submerged Weir Crest Elevation (ft)</u>
621.5	604.5
625.0	605.3

**d. Trashracks:**

1. Ladder Exit and Attraction Water Intake Trashracks: Visible buildup of debris shall be removed immediately.
2. Picketed Leads at Counting Window: Visible buildup of debris shall be removed immediately.

**e. Staff Gauges and Water Level Indicators:**

1. Gauges and indicators shall be readable at all water levels encountered during passage periods.
2. Staff gauges or water level indicators shall be located upstream and downstream from entrances, and at a convenient location for viewing along the fishway.
3. Staff gauges and/or water level indicators shall be consistent with panel board water surface readings in the fishway control room.
4. Water level indicators shall be maintained such that they are in continuous operation.

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<sup>1</sup>During periods of high tailwater (elev. 621.0 or above) it has been found that to keep a 1-foot differential at the LPE and MSE, gate depths cannot be set at the elevation listed. The depth that the gates are set at is generally between 10.0 and 12.0 feet. This has been coordinated with the Fish Passage Center.

## **5.4 Dewatering and Fish Handling**

The Project's adult fish facilities are dewatered for annual maintenance during the maintenance season (December 1 to March 1). On rare occasions, dewatering has been needed during the fish migration season to address emergency repairs. Although every effort is made to allow fish to leave the facilities voluntarily, rescue and evacuation of some fish is typically required. To facilitate voluntary exiting by fish, the upper fishway section is dewatered three to four days ahead of the lower fishway. Orifice gates and ladder entrances in the lower fishway will remain open during this time, so that fish are able to leave the facility.

When fish evacuation is necessary, a Project biologist will be on site to coordinate and oversee fish salvage and handling. He will ensure that proper procedures are followed, and the equipment needed to safely evacuate the fish is on hand. The Project biologist will determine where the rescued fish are to be returned to the river. This is at the location closest to the point of rescue, which is usually the tailrace.

The evacuation of adult fish that are listed as threatened or endangered is a priority. However, the goal is to successfully relocate all fish to the river in good physical condition.

## **5.5 Inspection and Reporting**

Chelan PUD's fishway attendants conduct two walk-throughs of the Rocky Reach fishway per day. A daily report is logged using information from the morning walk-through. The adult fish passage facilities are also inspected monthly by WDFW personnel. The Fish Passage Center (FPC) provides monthly reports covering inspections by WDFW for that month as well as a year-end report.

## **5.6 Maintenance**

Scheduled maintenance for the adult fishway will occur in the off-season from January 2 to March 1. The annual list of items that are checked is noted in Appendix D. Fishway attendants also record additional punch list items to address as they discover them throughout the fish passage season.

If unscheduled maintenance must occur during the fish passage season that results in the need for an outage of the attraction water system, the HCP-CC will be consulted. Historically, nighttime outages have been preferred.

## **6. DRYDEN AND TUMWATER FISHWAYS AND TRAPS**

Dryden weir and Tumwater Dam are located at river miles 17.6 and 32, respectively of the Wenatchee River. The Wenatchee River is a tributary of the Columbia River, with the confluence occurring approximately 7.5 miles downstream of Rocky Reach Dam. These facilities are owned and operated by Chelan PUD.



Chelan PUD uses the fish ladders and traps at these facilities to collect broodstock for its salmon and steelhead hatchery program, which is required pursuant to the HCP and used for the Rock Island project. This is the only connection between these fish ladders and trapping facilities and the Rocky Reach Project, and they serve no other purpose related to the Rocky Reach Project. However, because ongoing activities at these facilities are required by the License as mandated by FWS' incidental take statement, the fish ladders and trapping facilities at Dryden and Tumwater have been made Project facilities through Ordering Paragraph (B)(2) and Article 204 of the License.

## **6.1 Dryden Fishway and Trap**

At Dryden left and right bank fishways, the fishways begin operations based on river flows and the need for alternative fish passage routes. At Dryden left bank fishway, the fishway is opened for fish passage when river flow declines below 4 kcfs (June time frame). At Dryden right bank, the threshold is 5 kcfs (same time frame). The fishway attendants may open the fishways during slightly higher flows, if they observe that fish are beginning to have difficulty in migrating over the spillway (due to a declining hydrograph). The fishways remain in operation until late November/early December, or when river flow reaches 6 kcfs or greater in the winter.

The Dryden fish traps operate from July 1 through the end of November (or until the required number of coho and steelhead are collected for the Yakama Nation and Eastbank Hatchery's broodstock programs, respectively). Both traps are operated continuously on a weekly basis, Sunday night through Friday afternoon. WDFW personnel operate the traps from July through August. The Yakama Nation and WDFW personnel operate the traps from September through November. Adult summer Chinook, steelhead and coho are collected at the Dryden fish traps.

## **6.2 Tumwater Fishway and Trap**

The Tumwater fishway operates year round, with the exception of 1) the annual overhaul period (generally in January), and 2) river flow of 10 kcfs or greater. WDFW, the Yakama Nation, and USFWS trap adult steelhead, spring Chinook, summer Chinook, sockeye, and coho from mid-February through mid-December. During this period, the trap is collecting fish 24 hours per day, 7 days per week. From mid-February until approximately mid-April, the trap is passively operated, i.e. fish are removed from the trap hopper by WDFW personnel one to two times per day. As the numbers of spring Chinook increase (approximately mid-April), the trap is actively operated, and fish continually processed, with WDFW personnel on site from dawn to dusk. As steelhead numbers decrease in the winter (late November/early December), the trap is passively operated until freezing temperatures bring an end to trap operations. From approximately mid-December to mid-February, no trapping operations occur. Fish move through the fishway and are captured on video.

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# **Appendix A**

## **Rocky Reach Dam**

### **2009 Fish Spill Plan**

**Rocky Reach Dam**  
**2009 Fish Spill Plan**

**Steve Hemstrom**  
Public Utility District No. 1 of Chelan County  
Wenatchee, Washington

## **Introduction**

On June 21, 2004, the Federal Energy Regulatory Commission (FERC) license for Rocky Reach was amended to incorporate the Habitat Conservation Plans (HCP) into the Project license. Fish spill operations in 2009 at Rocky Reach will be implemented by Chelan PUD according to juvenile survival standards correlated spill levels that have been achieved by Chelan PUD, and some that have yet to be achieved. Spill levels proposed by Chelan PUD under provisions of the HCPs are summarized in Table 4 of this plan. Chelan PUD holds valid Incidental Take Statements (ITS) from NOAA Fisheries (NOAA) and the United States Fish and Wildlife Service (USFWS) for HCP fish spill operations at the Project.

For yearling Chinook and steelhead at Rocky Reach in 2009, Chelan PUD will operate the juvenile fish bypass (JFB) exclusively with no spill. For sockeye, Chelan PUD will conduct a juvenile survival test to evaluate the experimental difference between day time and night time releases for tagged juvenile sockeye smolts, and the effects on Project survival for both groups of fish. The test will include running turbine units in best efficiency mode to evaluate differences in route-specific survival and Project survival with all available river flow passing through turbines. During the summer outmigration of subyearling Chinook, Chelan PUD will spill 9% of day average river flow at Rocky Reach for a duration covering 95% of their outmigration.

### ***Summer Fish Spill Operations in 2009***

Juvenile run-timing information at Rocky Reach will be used to determine passage percentiles and the necessary spill duration for subyearling Chinook (0% to 95%). Daily fish counts from index sample periods at the juvenile collection facility, in combination with the University of Washington's Program RealTime run forecaster, will be used to determine spill timing for subyearling Chinook.

### ***Run-Timing Predictions in 2009***

Since 2003, the University of Washington has provided Chelan PUD with run-timing predictions for spring and summer out migrating salmon and steelhead using the Program RealTime run-time forecasting model. Program Real-Time provides daily forecasts and cumulative passage percentiles for steelhead, yearling Chinook, sockeye, and subyearling Chinook at both Rocky Reach and Rock Island. The program enables Chelan PUD to better predict the date when a selected percentage of these species will arrive, or when a given percentage of any stock has passed (e.g. the 5% passage point for spring species at Rock Island to trigger spring spill). The program utilizes daily fish counts from the juvenile sampling facility at Rocky Reach and the bypass trap at Rock Island. Estimates of the program's forecast error in daily run projections will be calculated and displayed with the daily predictions at [www.cbr.washington.edu/rt/rt.html](http://www.cbr.washington.edu/rt/rt.html).

### **Historic Run Timing**

Estimated historical run-times for each species at Rocky Reach are summarized in Table 2. At Rocky Reach, data is summarized from the JFB, 2003-2007. The 2.5 percentile for sockeye migrants occurs around May 8 (range May 5 - May 12), and reaches the 97.5 percentile

around June 5 (Table 2). The summer run (subyearling Chinook) generally begins the first week of June and reaches the 95<sup>th</sup> percentile sometime around August 6 (range July 24-August 21).

Table 2. Historic average run-time dates (range in parenthesis) at Rocky Reach and Rock Island dams. Rock Island based on data collected from 1985-2007. Rocky Reach is based on Index counts of smolts at the permanent JFB, 2003-2007. (See footnote 1).

Stock/species	Percentile			
	2.5%	5%	95%	97.5%
<b>Rocky Reach</b>				
Sockeye	8-May (5/5 - 5/10)	9-May (5/8 - 5/10)	27-May (5/23 - 6/2)	5-June (5/28 - 6/10)
Subyearling Chinook	15-Jun (6/7 - 7/2)	18-June (6/8 - 7/5)	6-Aug (7/31 - 8/13)	11-Aug (7/24 - 8/21)

### ***2009 Rocky Reach Index Sampling***

Chelan PUD will operate the JFB seven days per week in 2009 to obtain the necessary index samples for run timing analysis, and to collect fish for survival and passage route studies.

Sampling protocols at the JFB in 2009 will remain consistent with those used in 2008. Smolts will be sub-sampled daily from the bypass (Monday through Sunday) for four 30-minute “index periods” at 0800, 0900, 1000, and 1100 hours (Table 1). The sample target for each 30-minute period will be 350 fish combined for the spring migrating species, and 125 fish for summer migrating species (subyearling Chinook). If fish numbers are high in the first few minutes of a sampling period (300-350 fish), the sampling screen will be retracted and the number (collected) will be linearly expanded to the entire 30-minute period.

Table 1. Index sampling times and fish collection targets at the Rocky Reach JFB system in 2009.

0800 - 0830 hrs	30 min*	350 (spr) or 125 (sum)	Mon-Sun
0900 - 0930 hrs	30 min*	350 (spr) or 125 (sum)	Mon-Sun
1000 - 1030 hrs	30 min*	350 (spr) or 125 (sum)	Mon-Sun
1100 - 1130 hrs	30 min*	350 (spr) or 125 (sum)	Mon-Sun

\* Sample duration may be less than 30 minutes if fish numbers are met prior to that time  
Fish number will be proportionately expanded to account for Index samples shorter than 30 minutes

### ***Rocky Reach 2009 Spring Spill***

In 2009, Chelan PUD is proposing a juvenile sockeye survival test operating only the JFB, without designated fish spill. Unavoidable spill for reservoir headwater control may occur for sockeye at Rocky Reach during the sockeye outmigration. Information on this study

proposal is summarized below. This study is currently under review and requires approval by the HCP Coordinating Committee.

#### 2009 Day/Night Release Study for Juvenile Sockeye

Chelan PUD will conduct a Project survival study in 2009 at Rocky Reach to compare differences in reservoir and dam survival for acoustic tagged juvenile sockeye under a day time/night time fish release strategy. The Rocky Reach powerhouse will be operated with turbine units dispatched and operated under best-efficiency settings. The goal of this study is to determine if significant differences exist for survival of day time and night time released test fish under consistent powerhouse turbine operations for the day and night treatment groups. The purpose of the test is to determine if a differential survival effect is present for night vs. day migrating sockeye smolts. During the test, sockeye smolts will have the options to pass through the JFB (surface collector or bypass screens), or the powerhouse only.

#### Overview of Proposed Study Design for 2009 Sockeye Test

Chelan PUD will conduct this study for 24 days in May using 12 day time releases and 12 night time releases of acoustic tagged sockeye smolts at a release location below Wells Dam. Rocky Reach turbines will be operated at best efficiency set points but will increase in total discharge, as necessary, as river flow increases. No fish spill will occur during this test, but unavoidable spill may occur if river flow increases above turbine capacity. Tagged sockeye should arrive and pass Rocky Reach dam in near equal proportions both day and night. This will allow help to determine how predation rates affect passage survival at the dam under light and no light conditions. Information on route-specific passage efficiency and survival will be collected during both test and control conditions.

#### ***Rocky Reach 2009 Summer Spill***

Summer spill at Rocky Reach for subyearling Chinook will be 9% of day average river flow following completion of the juvenile sockeye survival test, sometime in the first week of June. Spill will continue through the 95 percentile passage point for the subyearling migrants<sup>2</sup>. The no-spill condition for the 2009 sockeye test will not be shortened by the potential early arrival of subyearling Chinook at Rocky Reach. Spill for subyearling Chinook may commence only after study requirements are met (all test fish are released upstream and all tags verified at downstream detection points) for the tagged sockeye. The guidelines for starting summer spill at Rocky Reach are as follows:

Summer spill will start upon verification that the spring sockeye study is complete by and all tagged sockeye have passed necessary detection points at the dam and downstream (likely sometime in the first week of June). *Subyearling* Chinook will be defined as any Chinook having a fork length from 75 mm to 150 mm.

2. Summer spill season will generally end no later than August 15, or when subyearling index counts from the juvenile collector are 0.3% or less of the cumulative run for three out of any five consecutive days (same protocol used in 2008) and Program RealTime shows the 95% passage percentile has been reached.

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<sup>2</sup> The HCP Coordinating Committee agrees that spill is intended for migrant subyearling Chinook (Chinook greater than 75 mm fork length).

**Spill Shaping at Rocky Reach**

Table 4 shows the proposed fish spill percentages and hourly shaping of spill at Rocky Reach in 2009. Chelan PUD will again shape spill volumes on a daily basis according to the observed diel passage of smolts at the project. The different spill percentages, or spill blocks, are calculated by time such that the summation of water volume from all spill blocks within the day will equal the volume of water that would have been spilled under a constant, unshaped spill level (for instance 9% spill at Rocky Reach with no shaping). This spill strategy attempts to maximize spill water volume to maximize effectiveness for passing smolts. Spill shape will be consistent with shaping from 2003 through 2008. Table 5 summarizes juvenile outmigration dates, spill percentages and run-coverage, and dates of operation for the Rocky Reach Juvenile Fish Bypass (JFB) in 2009.

Table 4. Spill percentages and hourly spill shaping in 2009.

Project/Season	Daily Spill Average	Spill Levels	Duration (# of hours)	Time of Day	Spill Shape %
<b>Rocky Reach Spring</b> (Chin 1, steelhead)	None	–	–	–	None
<b>Rocky Reach Spring</b> (sockeye)	None	No Spill Test	-	-	None
<b>Rocky Reach Summer</b> (subyearling Chins)	9%	Med	1	0000-0100	9.0
		Low	6	0100-0700	6.0
		Med	2	0700-0900	9.0
		High	6	0900-1500	12.0
		Med	9	1500-0000	9.0

Table 5. Summary of proposed spill percentages, approximate outmigration times and percent of run covered, and Rocky Reach JFB operation dates for 2009.

<b>Rocky Reach</b>	<b>Steelhead</b>	<b>Yearling Chinook</b>	<b>Sockeye</b>	<b>Subyearling Chinook</b>
Percent Spill	0	0	0	9%
Percent of run covered w/spill	0	0	0 (No Spill Test)	95% (0% - 95%)
~ Run dates	-	-	5/5 - 6/10	6/1 - 8/6
JFB Operating?	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31	Yes 4/1 – 8/31



***Spill Program Communication***

Chelan PUD's fish spill coordinator will contact the HCP Coordinating Committee (HCPCC) not less than once per week when fish passage numbers indicate that specific triggers for starting or stopping spill are likely to occur in the immediate future. Chelan PUD will also contact the HCPCC regarding any unforeseen issues that pertain to the spill program as the season progresses. Communications with the HCPCC will generally be made by email, conference calls, and scheduled meetings.

## **Appendix B**

**2009**

### **Rocky Reach Operational Plan for Total Dissolved Gas During Fish Spill Season**

**2009 Rocky Reach Operational Plan  
for Total Dissolved Gas During Fish Spill Season  
April 1 – August 31**

**(All spill between these dates is subject to the actions contained in this plan.)**

## **Protocol**

1. If tailrace TDG average is greater than ***120% for the 6-hour average***
  - reduce spill by 3 kcfs
  - monitor for 1 hour
  - if the 6-hr average TDG >120%, reduce spill by another 2 kcfs
  - monitor for 1 hour
  - continue reducing spill by 2 kcfs until 6-hr average TDG is less than 120% for one full hour
  - **if after reducing spill to control TDG levels, TDG drops below 118% for one full hour, increase spill by 2 kcfs and monitor \*\***
  
2. If tailrace TDG is greater than ***125% for 1 hr***
  - follow protocol outlined above, but instead, use **one-hour TDG levels of 125%** as the metric
  - continue until TDG is less than 125% for 1 hr and until the 6-hr average TDG <120%

If you receive a call from RI advising that the RI forebay is out of compliance (greater than 115%) and the RR forebay is 115% or less, reduce spill by 3 kcfs. Two hours after reducing spill, call RI to determine what the RI forebay gas levels are. If still above 115%, reduce spill another 2 kcfs. If after reducing spill for this reason, the Rock Island forebay drops to less than 113%, Rock Island will call again and advise. At this point, increase back to the hourly spill volume target by increasing spill in the reverse order it was decreased. For example, if to bring the RI forebay back into compliance, it was necessary to reduce spill by a total of 5 kcfs, begin by increasing spill by 2 kcfs, wait two hours, and call RI to determine what the forebay TDG levels are. If TDG is still below 115%, increase spill by 3 kcfs (back to the target volume in this case). This will allow for a ramping effect, rather than an open/shut effect which could bump the Rock Island forebay TDG levels back out of compliance (>115%).

**\*\* Note:** It will not be necessary to monitor for one full hour after re-opening if it appears that TDG is approaching the upper threshold, rather, the procedure will repeat upon reaching the threshold. It is anticipated that in time, the operators will “get a feel” for how much change in TDG will occur as a result of opening or closing gates and it will be possible to hold the TDG around 118% or 119% or so. Once the operators have this down, instead of closing a gate entirely, it may only be necessary to close partially, and visa versa for the opening process.

## **Appendix C**

**2009**

### **Rocky Reach Gas Abatement Plan**

**TOTAL DISSOLVED GAS ABATEMENT PLAN**  
**ROCKY REACH HYDROELECTRIC PROJECT**

February 2009

Prepared by:

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Prepared for:

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## **1. INTRODUCTION**

This Gas Abatement Plan (GAP) is being submitted to Washington State Department of Ecology as a condition of the 2006 Special Fish Passage Exemption (WAC 173-201A-200(1)(f)). Chelan County Public Utility District (Chelan PUD) respectfully submits this plan with the goal of receiving a waiver commencing with the 2009 fish spill season.

### **1.1 Total Dissolved Gas**

Research has shown that releasing water through spillways is a safe and effective means of passing downstream migrating salmonids past some hydroelectric projects. However, monitoring has shown that in doing so there may be adverse effects to water quality, specifically supersaturation of river water with atmospheric gases. The spilled water carries atmospheric gases to the depths of the river where increased hydrostatic pressure supersaturates the water with those gases.

Many variables contribute to the saturation levels of TDG, including, but not limited to, existing forebay gas concentrations, spill flow rates, tailwater depths, air entrainment, spill plunge depths, entrainment flows, and temperature of the water.

#### **1.1.1 Total Dissolved Gas and Impacts to Aquatic Life**

A potential consequence of total dissolved gas (TDG) supersaturation to fish and other aquatic species is a condition known as gas bubble trauma (GBT) (Jensen et al., 1986). GBT is a physically induced condition caused by pressure dis-equilibrium between liquid and gas phases (Jensen et al., 1986), which can result in tissue lesions (i.e., blood emboli and emphysema of fish), causing physiological dysfunction (Bouck, 1980). Although it has been shown that TDG levels of 110% can result in GBT when fish are held in shallow water, there is little evidence that TDG levels of 110% are detrimental to juvenile salmonids migrating through the mainstem of the Columbia River (Meekin and Turner 1974, Bouck et al., 1976; Weitkamp and Katz, 1980 and Bernard, 1993). The severity of GBT is related to the degree of TDG saturation relative to the depth where fish reside and the exposure time at a given concentration.

#### **1.1.2 Washington State Numeric Water Quality Criteria**

The Washington State water quality numeric criterion states TDG measurements shall not exceed 110 percent at any point of measurement in any state water body. However, WAC 173-201A-200(1)(f)(ii) provides a special fish passage criteria for TDG to aid fish passage over hydroelectric dams when consistent with a WDOE approved gas abatement plan:

*“The TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring plans. The elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The following special fish passage exemptions for the Snake and Columbia rivers apply when spilling water at dams is necessary to aid fish passage:*

- 1. TDG must not exceed an average of one hundred fifteen percent as measured in the forebays of the next downstream dams and must not exceed an average of one*



*hundred twenty percent as measured in the tailraces of each dam (these averages are measured as an average of the twelve highest consecutive hourly readings in any one day, relative to atmospheric pressure); and*

*2. A maximum TDG one hour average of one hundred twenty-five percent must not be exceeded during spillage for fish passage.”*

## **1.2 Habitat Conservation Plan**

More than fifteen years ago, Chelan PUD began to assess how it should respond to a changing regulatory environment that was increasingly affecting operation of Rocky Reach and Rock Island Hydroelectric Projects on the Columbia River. Chelan PUD has since developed two Habitat Conservation Plans (HCP) for anadromous fish in cooperation with federal and state regulatory agencies and Tribes. The HCPs were developed to conserve and protect all anadromous fish species over the long term, and to support ongoing compliance with the ESA while allowing continued operation of the Project. All measures proposed in the HCPs are intended to minimize and mitigate impacts to the Plan species, to the “maximum extent practicable” as required by the Endangered Species Act. Measures that promote fish passage survivability include spills and modified spills that generate TDG during the outmigration of juvenile fish. The plans commit Chelan PUD to a 50-year program to ensure our hydro projects have "no-net-impact" on mid-Columbia salmon and steelhead runs.

The HCPs began by implementing the “Phase I Plan to Achieve the Performance Standards”. Assessment (survival) studies have been conducted over the last three years to determine the survival rates of plan species. For the studies to be considered valid, the studies needed to take place during average flow conditions and normal project operating conditions consistent with the approved study design. This means project operations; including spill levels and configurations, as well as the overall project structure (such as spillway structures), need to remain constant during the survival studies. If Chelan PUD finds feasible gas abatement methods during these studies, implementation of those methods will be considered following Phase I.

## **2. GOALS AND OBJECTIVES**

The purpose of this TDG Abatement Plan is to outline the long-term plan for enhancing water quality at Rocky Reach Dam. This plan will identify Chelan PUD’s steps to meet the state of Washington’s Department of Ecology (DOE) TDG requirements at Rocky Reach.

The initial goal of this schedule is to identify measures that will aid Chelan PUD in improving water quality. However, Chelan PUD’s long-term goal is to choose reasonable and feasible measures that do not conflict with other natural resource protection goals (i.e. anadromous fish passage) and have a measurable biological benefit.

Flexibility will be necessary in the following schedule due to unknown factors, including levels of success in the Project’s permanent juvenile fish bypass system, success of Habitat Conservation Plan survival studies, and river conditions.

This Gas Abatement Plan summarizes the Rocky Reach Project, associated facilities and water management, discusses Rocky Reach Project spill scenarios and defines the measures associated with Chelan PUD's monitoring program during spill operations in support of juvenile fish passage, and provides a summary of past TDG activities and a future schedule of Rocky Reach Project TDG compliance activities.

### **3. ROCKY REACH PROJECT**

#### **3.1 Project Description**

Rocky Reach Dam is owned and operated by Chelan County Public Utility District No. 1. The project is located on the Columbia River at river mile 474, about 7 miles upstream of the city of Wenatchee. Construction of the dam and powerhouse began in 1956 and the project was completed and put into production in 1961. The impounding structures are a mass of reinforced concrete consisting of a forebay wall section about 460 feet long, a combined intake and powerhouse section 1,088 feet long, a non-overflow center dam spillway that is 740 feet long consisting of 12 bays, each controlled by a 50 foot wide, 58 foot high radial gate. A 2,000-foot sub-surface cutoff consisting of a grout curtain and a compacted impervious barrier limits seepage through a terrace forming the east bank.

The forebay wall consists of mass concrete gravity blocks of various heights, with a maximum height of 118 feet. The service bay connects the forebay wall to the powerhouse. The powerhouse consists of 11 units, each 86 feet wide and approximately 200 feet long. The 11 turbines provide the total nameplate generating capacity of 1,213 MW and a total hydraulic capacity of 217.5 thousand cubic feet per second (kcfs).

A permanent juvenile fish bypass system (JFB) was installed at the Project from September 2002 to March 2003, and has been in operation since then. The system consists of a surface collection system and a bypass conduit to provide downstream passage to juvenile salmon and steelhead.

#### **3.2 Runoff and Coordination**

The climate of the Columbia Basin in eastern Oregon, Washington and British Columbia is best described as desert. The major portion of the precipitation experienced within the basin falls in the form of snow during the period of November through March of each year. Runoff usually occurs from mid-April through July, with the historical peak occurring during the month of June. Storage dams in the U.S. and Canada capture spring and summer high flows to hold for release in the winter months.

In general, the hydropower system and reservoir operations in the Columbia River are coordinated through a set of complex agreements and policies to optimize the benefits and minimize the adverse effects of project operations, including the Mid-Columbia Hourly Coordination Agreement (Hourly Coordination).

The Rocky Reach Project is a participant in the Mid-Columbia Hourly Coordination Agreement (Hourly Coordination). Hourly Coordination operates the seven dams from Grand Coulee through the Priest Rapids Dam to meet system load requests while minimizing the reductions in head that could result if the projects independently used active storage in their reservoirs to meet individual loads. Efficient load following is accomplished by matching load requests to the movement of water released from Grand Coulee as it passes sequentially through the downstream projects, while maintaining the forebays of these projects as near full as possible. Limitations to operations flexibility at any of the projects with active storage result in greater fluctuations in discharge and forebay elevation at the remaining coordinated projects.

## **4. HISTORY OF OPERATIONS AND COMPLIANCE**

The passage and protection of migrating juvenile fish is provided at many dams with high levels of spill. At most projects, this route is preferred for safe passage and research indicates that survival of migrating juvenile salmonids is greatly enhanced via spill passage routes (NMFS 2000). However, at Rocky Reach Dam the JFB is the preferred method of juvenile fish passage, and spill is utilized as a supplemental method for fish bypass. At Rocky Reach Dam, TDG monitoring during fish passage spill has occurred since 1996.

### **4.1 Spill Scenarios**

The six main scenarios that could result in spill at Rocky Reach Dam are, but are not limited to:

- fish bypass spill
- flow in excess of hydraulic capacity
- powerplant load rejection spill
- immediate replacement spill
- maintenance spill
- error in communication with Corps reservoir

It is recognized that achieving regulatory TDG levels may not be possible during spill associated with large flood (7Q10) events. However, at Rocky Reach Dam it may be possible to achieve current regulatory TDG levels during releases for fish bypass and up to the 7Q10 flows (252 kcfs) by selective operation of spillway bays.

#### **4.1.1 Fish Spill**

Spill is an ineffective method of bypassing fish away from the turbines at Rocky Reach Dam (Raemhild, et al. 1984, Steig et al. 1997) and, consequently, is not considered as the solution for the long-term fish bypass program. As an alternative to spill, Chelan PUD is focusing its efforts on increasing the fish passage efficiency and survival through the JFB.

Spill is utilized as a supplemental method for fish bypass for downstream migrating juvenile salmonids. Fish spill at Rocky Reach falls into two categories, Spring Spill and Summer Spill. For more information regarding spill during the spring and summer spill seasons, please refer to Section 4.1 above.

#### **4.1.2 Flow in Excess of Hydraulic Capacity**

The minimal storage and limited hydraulic capacity of the project occasionally force Chelan PUD to spill water past the project. This spill is required to maintain headwater elevations within the limits set by the project's Federal Energy Regulatory Commission license, to prevent overtopping of the project, and to maintain optimum operational conditions. With this type of release, flows up to, and in excess of the 7Q10 flood flows (252 kcfs) can be accommodated.

To reduce negative impacts of flow in excess of hydraulic capacity Chelan PUD has completed and implemented a TDG Operational Plan. Chelan PUD anticipates that this will be an operational function, which will require no structural modifications.

#### **4.1.3 Plant Load Rejection Spill**

This type of spill occurs when the plant is forced off line by an electrical fault, which trips breakers, or any activity forcing the units off line. This is an emergency situation and generally requires emergency spill. When the units cannot process flow, the flow must be passed by other means to avoid overtopping the dam.

Chelan PUD has completed and will implement a TDG Operational Plan to address this emergency situation. This will be an operational function, which will require no structural modifications.

#### **4.1.4 Immediate Replacement Spill**

Immediate replacement spill is used to manage TDG levels throughout the Columbia River basin. The Technical Management Team (including National Marine Fisheries Services (NMFS), US Army Corps of Engineers, and Bonneville Power Administration) implements and manages this spill. Immediate replacement spill occurs when TDG levels are significantly higher in one river reach than they are in another reach. To balance the TDG levels throughout the basin, spill is reduced and generation increased in the reach with high TDG levels and the energy is transferred to reaches with lower TDG levels where spill is increased. The result is higher generation in the reaches with high TDG levels, increased spill in reaches with lower TDG levels, and equal distribution of TDG levels throughout the basin.

To control TDG levels that may result from immediate replacement spill, Chelan PUD has completed and will implement the TDG Plan. We expect that this will be an operational function, which will require no structural modifications.

#### **4.1.5 Maintenance Spill**

Maintenance spill is utilized for any maintenance activity that requires spill to assess the routine operation of individual spillways and turbine units. These activities include forebay debris flushing, checking gate operation, gate maintenance, and all other maintenance that would require spill. The Federal Energy Regulatory Commission requires that all spillway gates be operated once per year. This operation requires a minimal amount of spill for a short duration annually and is generally accomplished in conjunction with fish passage spill operations.

To control TDG levels that may result from immediate replacement spill, Chelan PUD has completed and will implement the TDG Operation Plan. We expect that this will be an operational function, which will require no structural modifications.

#### **4.1.6 Error in Communication Spill**

Error in communication with the U.S. Army Corps Reservoir Control Center, including computer malfunctions or human error in transmitting proper data, can contribute to spill. Hourly coordination between hydroelectric projects on the river minimizes this type of spill, but it does occur occasionally.

To control TDG levels that may result from immediate replacement spill, Chelan PUD has completed and will implement the TDG Operation Plan. We expect that this will be an operational function, which will require no structural modifications.

## **4.2 Compliance Activities in 2004-2008**

### **4.2.1 TMDL Activities**

The Summary Implementation Strategy (SIS) for the Mid-Columbia TDG TMDL outlined short-term implementation actions that each project had previously initiated, or was to initiate by 2006. As per the SIS, Chelan PUD was to begin a TDG literature review, or rather an engineering assessment of potential gas abatement techniques, by 2006. This review was completed in 2003, and a copy of the report submitted to the Department of Ecology in 2004.

### **4.2.2 Literature Review**

In addition to the engineering review completed in 2003, Chelan PUD, in partnership with the other Mid-C PUDs, funded a consultant to compile a document reviewing TDG literature from 1980-2007. This document has been completed and was presented to the Adaptive Management Team in 2008.

### **4.2.3 Spill Reductions**

The permanent JFB continues to serve as the primary fish survival tool at Rocky Reach Dam. The most efficient use of voluntary fish survival spill at Rocky Reach will be to supplement the effectiveness of the JFB, when needed, to reach survival goals of the HCP.

Due to the success of the JFB, Chelan PUD has been able to reduce spill at Rocky Reach. In the past, voluntary spill for fish passage has been as much as 24% of the current day's forecasted flow during the spring and 9% during the summer. In 2007 and 2008, Chelan PUD operated the JFB exclusively (no spill) for yearling Chinook and steelhead. For sockeye, Chelan PUD conducted a powerhouse operations test with no spill to evaluate differences in route-specific survival and Project survival with all available river flow passing through turbines. During the summer outmigration of subyearling Chinook, Chelan PUD spilled 9% of the day's forecasted average river flow for a duration covering 95% of their outmigration.

#### **4.2.4 Potential Operational Changes**

Potential operational changes that have been identified to date that are available at the project to meet state water quality standards and the required HCP spill to meet fish survival standards are:

- 1) changes to spill configurations
- 2) powerhouse operations
- 3) revise the operations protocol to be used when conditions of non-compliance may occur

## **5. PROPOSED OPERATIONS AND ACTIVITIES**

### **5.1 Operational Spill Plan**

Fish spill operations in 2009 at Rocky Reach will be implemented by Chelan PUD according to certain juvenile survival standards that have been achieved by Chelan PUD and some that have yet to be achieved.

During the juvenile fish migration season, Chelan PUD will prioritize the dispatch of generating units to achieve peak plant operating efficiency as follows 1,2,3,5,4,6,7,8,9,10,11.

#### ***Rocky Reach 2009 Spring Spill***

In 2009, Chelan PUD will operate the JFB for yearling Chinook and steelhead with no Project spill. For sockeye, Chelan PUD tentatively plans to conduct a survival study testing alternative day/night tagged fish release methods. During this study the powerhouse will operate under normal fish bypass operations, with no Project spill (this plan is awaiting final approval from the HCP Coordinating Committee). The goal of this study is to determine if there is a negative bias in survival studies by releasing fish during midday only, as has been done by Chelan PUD throughout previous years' survival studies.

#### ***Rocky Reach 2009 Summer Spill***

Summer spill at Rocky Reach for subyearling Chinook will be 9% of day average river flow. Spill will likely begin in the first week of June, after completion of the juvenile sockeye no-spill study. Spill for subyearling Chinook may commence only after study requirements (test fish released, test blocks completed, and detections verified) for sockeye have been completed. Summer spill will continue through the 95 percent passage for the subyearling migrants. The guidelines for starting summer spill at Rocky Reach are as follows:

1. Summer spill will likely start in the first week of June, but only upon verification that the spring sockeye study is complete and arrival of subyearlings at Rocky Reach is verified.
2. Summer spill season will likely end no later than August 15, or when subyearling index counts are 0.3% or less of the cumulative run for three out of any five consecutive days (same protocol as used in 2006-08) and Program RealTime shows the 95% passage percentile has been reached.

Spill not provided for juvenile passage will be shaped to avoid delay of upstream migrants according to agreements made within the HCP Coordinating Committee and will be shaped to follow the diel distribution of the fish present.

## **5.2 TDG Monitoring Program**

As required by issuance of a TDG exemption for the Rocky Reach Project, Chelan PUD will continue to implement a physical and biological monitoring program at Rocky Reach Dam during the juvenile fish migration season. Activities include fisheries management activities, participation in water quality forums, collection of TDG data during the migration season, and collection of biological monitoring data.

### **5.2.1 Fisheries Management Activities**

#### Juvenile

The JFB will run continuously from April 1 to August 31. Operations outside these dates can occur if it is deemed necessary to encompass 95% of the fish run based on discussion with the HCP Coordinating Committee.

#### Adult

The adult fish passage facilities at Rocky Reach Dam consist of a fishway with the right (RPE) and left (LPE) powerhouse entrances, powerhouse collection and transportation channels, a spillway tunnel channel, a main spillway entrance (MSE), and a fish ladder. The LPE is located at mid-dam between the powerhouse and spillway. The RPE is located on the south end of the powerhouse. The fishway includes a counting station on the right bank. The system includes a pumped attraction water supply and a gravity auxiliary water supply.

For operation and maintenance purposes, the primary fish passage season is considered to be April through November. Adult facilities will be open from March 1<sup>st</sup> to December 31<sup>st</sup> each year.

### **5.2.2 Water Quality Forums**

Chelan PUD regularly participates in the Regional Water Quality Team and Transboundary Gas Group.

### **5.2.3 Physical Monitoring**

Chelan PUD will maintain two fixed monitoring stations at the dam to monitor TDG levels annually from April through August, one in the forebay and one in the tailrace at the approved monitoring sites.

TDG measurements will be recorded throughout the monitoring season at 15-minute intervals, enabling plant operators to adjust spill volumes to maintain gas levels to prevent exceedances of the TDG criteria. These 15-minute intervals will be averaged into hourly readings for use in compiling daily and 12-hour averages. All hourly data will be forwarded to Chelan PUD headquarters building and then onto the US Army Corps of Engineers Reservoir Control Center and posted at their site on the World Wide Web.

Chelan PUD will enter into a Professional Services Agreement with Columbia Basin Environmental (CBE) to perform monthly calibrations and equipment maintenance during the 2008 monitoring season. It is anticipated at this time that Chelan PUD will continue to contract with CBE into the future. QA/QC measures will be accomplished through training in instrument maintenance, operation, and factory prescribed calibration methods. A detailed log will be maintained for all work done on the monitoring equipment, including monthly maintenance, calibration, exchange of instruments, and any other pertinent information. Redundant measurements with a mobile instrument to verify the accuracy of the in-situ instruments will be conducted during the monthly calibrations.

#### **5.2.4 Biological Monitoring**

Chelan PUD no longer conducts annual biological monitoring at Rocky Reach.

### **5.3 Compliance Activities for 2009-2012**

#### **5.3.1 HCP Survival Study Operations**

Because the project is operating under Phase I of the HCP, which requires survival studies be conducted during representative flow conditions and normal project operating conditions consistent with the approved study design, no significant changes can be made to operations until the end of Phase I. The actual year in which changes can be made is dependent upon the success of Phase I. At the completion of Phase I, if successful, Chelan PUD may know what levels of spill are necessary to ensure the survival goal is met. It is at this time Chelan PUD will be able to determine what gas abatement measures are feasible and necessary to meet water quality requirements and HCP survival standards.

#### **5.3.2 Spring Spill No Spill Test**

No spill will be provided for yearling Chinook and steelhead in 2008. In 2003, a study was conducted to determine the bypass efficiency for steelhead, Chinook yearlings, and sockeye. Based on the results from that study, and consistent with section 5.4a of the Rocky Reach HCP, spill was eliminated for Chinook yearlings and steelhead and set at 24% for sockeye for Phase I testing. While steelhead have met the HCP juvenile project survival standard of 93%, sockeye and Chinook have not, and spill may be used in the future for these species if empirical information suggests it is needed to reach the juvenile survival standards of the HCP. In 2008, Chelan PUD will not spill for the juvenile sockeye out migration because of a powerhouse study that modifies powerhouse operations to improve fish passage through the JFB and increased survival through the powerhouse.

Spill programs for 2010-2012 are unknown at this time, as the programs are dependent upon the continued success of the JFB and fish survival.

### **5.4 Additional Requirements**

Chelan PUD will operate the Project in accordance with the following:

1. 7Q10. The 7Q10 for Rocky Reach is 252 kcfs. The Project will not be expected to comply with state water quality standards for TDG for incoming flows exceeding this value.



2. Fish Spill. For the purposes of compliance, the “fish spill” season is taken to occur from April 1 – August 31; and “non-fish spill” season occurs from September 1 to March 31, unless otherwise specified in writing by Ecology.

3. Compliance During Non-Fish Spill. During non-fish spill, Chelan PUD will make every effort to remain in compliance with the 110% standard.

4. Compliance During Fish Spill. During fish spill, Chelan PUD will make every effort not to exceed an average of 120% as measured in the tailrace of the dam. The Project also must not exceed an average of 115% as measured in the forebay of the next downstream dam. These averages are based on the twelve (12) highest consecutive hourly readings in any 24-hour period. In addition, there is a maximum one-hour average of 125%, relative to atmospheric pressure, during spillage for fish passage. Nothing in these special conditions allows an impact to existing and characteristic uses.

5. TDG Monitoring. Chelan PUD will maintain two fixed monitoring stations at the dam to monitor TDG levels annually from April through August, one in the forebay and one in the tailrace at the approved monitoring sites. This information is available on a real time basis to all interested parties at the US Army Corps of Engineers website (<http://www.nwd-wc.usace.army.mil/report/tdg.htm>). Outside of the “fish spill” season, Chelan PUD may use spill volume as a surrogate for TDG levels.

6. Reporting Spill for Fish and TDG Exceedances. Chelan PUD will notify Ecology within 24 business hours of spill for fish and when TDG standards are exceeded. Reporting shall be electronically (via e-mail) to the hydropower project manager in Ecology’s Central Region Office.

7. General TDG Abatement Measures. Chelan PUD will manage spill toward meeting water quality criteria for TDG during all flows below 7Q10 levels, but only to the extent consistent with meeting the passage and survival standards sets forth in the HCP and Fish Management Plans, as follows:

- a. Minimize voluntary spill,
  - b. During fish passage, manage voluntary spill levels in real time in an effort to continue meeting TDG numeric criteria,
  - c. Minimize spill, to the extent possible, by scheduling maintenance based on predicted flows.

8. Annual TDG Monitoring Report. Chelan PUD shall submit an annual monitoring report. A draft monitoring report of the year’s monitoring report shall be submitted to Ecology by October 31 of the monitoring year. Chelan PUD will submit the final report, incorporating Ecology’s suggested corrections, by December 31 of the same year. The contents of the report shall include, at a minimum:

- a. Flow and TDG levels, on a daily basis, with purpose of spill (e.g. fish spill, turbine down time),
- b. Summary of exceedances and what was done to correct the exceedances,

- c. Results of the fish passage efficiency (FPE) studies and survival per the HCP
9. Revised Gas Abatement Plan (GAP). Chelan PUD will revise the GAP annually, to reflect any changes, and new or improved information and technologies. Chelan PUD will submit a draft to Ecology for review and approval by February 28 of the year of implementation. The GAP shall be in the format of Chelan PUD's 2009 GAP, unless modifications are requested by Ecology.
10. Ecology Contact. Chelan PUD will direct its correspondence to:
- Pat Irle, Hydropower Projects Manager
  - Department of Ecology, Central Region Office
  - Water Quality Program
  - 15 W. Yakima Ave., Suite 200
  - Yakima, WA 98902-3452

## **6. REVISIONS TO THE TAILRACE MONITORING PLAN**

Based on the recommendation of a study conducted by Waterways Experiment Station in 2002, Chelan PUD installed a probe on the outfall of the JFB in 2007 to determine if the site would be acceptable as a new permanent tailrace monitoring location that would better represent the impacts of spill on TDG levels than the Odabashin Bridge location. Because there was some concern that the JFB outfall location may experience eddies and other water conditions that may result in poor representation of the impacts of spill on TDG, Chelan PUD maintained the Odabashin Bridge site and collected data for nearly two seasons at the outfall location to ensure the data would be representative before permanently relocating the site.

Data collected from the site was compared to predicted levels computed using an equation developed by Michael L. Schneider and Steven C. Wilhelms of the U.S. Army Engineer Research and Development Center in a 2005 report on Operational and Structural Total Dissolved Gas Management at Rocky Reach. Development of the model included actual data from numerous locations in the forebay and tailrace (including near the JFB outfall) of Rocky Reach collected during a field study conducted in 2002. The model uses TDG data from the existing tailrace monitoring location and spill volume to predict TDG levels at the JFB outfall location. Details of this prediction tool and how it was developed are included in the Schneider and Wilhelms report. The data comparison supported the theory that the JFB outfall location would provide a representative sample of spill impacts on TDG. Therefore, late in the 2008 monitoring season Chelan PUD permanently relocated Rocky Reach tailrace monitoring site to the JFB outfall.

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# **Appendix D**

## **Annual Maintenance List**

**for**

## **Rocky Reach Fishway**

## 2008/2009 ROCKY REACH ANNUAL FISH LADDER OVERHAUL

### Annual Overhaul List:

- a. Perform maintenance on gate and hoist motors.
- b. Inspect and repair/replace aluminum diffuser grating.
- c. Clean and test fishway annunciators.
- d. Replace burned-out tunnel lamps.
- e. Check and clean/repair attraction water intake screens.
- f. Check and clean traveling screens.
- g. Inspect fishway gates and repair as needed.
- h. Inspect fishway attraction water system which includes:
  1. Inspect turbine pumps A, B, and C.
  2. Check clearances on lower guide bearings.
  3. Check clearance runner crown and stay ring bore.
  4. Inspect carbon seals.
- i. Inspect fishway-traveling screens:
  1. Clean debris from traveling screen area.
  2. Inspect penstock intake chamber.
  3. Inspect and replace bearings as needed.
  4. Inspect sprockets and shaft bushings.
- j. Fishway flap and wing gate:
  1. Inspect and repair flap gates.
  2. Inspect seals and indicator rods.
  3. Inspect wing gates.
- k. Fishway regulating gate and picket weir:
  1. Inspect control valves and hoses at the middle spillway entrance (MSE).
  2. Inspect and replace cables on MSE regulating gates.
  3. Inspect left powerhouse entrance (LPE) regulating gates.
  4. Clean, inspect and repair picket barrier gate hoist.
  5. Drain and clean CS-S1 (valve that controls make-up water in the upper fishway).
- l. Put turbine pump through dry run and test alarms.
- m. Clean stilling wells and check operation of orifice valves.
- n. Clean and polish fish counting window.

## **Appendix E**

### **Email Cover Letters Requesting Comments on Two Drafts of Operations Plan**

**Request for Comments on Preliminary Draft  
Sent on June 12, 2009**

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY  
P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave.,  
Wenatchee, WA 98801  
(509) 663-8121 • Toll free 1-888-663-8121 • [www.chelanpud.org](http://www.chelanpud.org)

To: Phil Archibald, USDA Forest Service  
Art Viola, Washington Department of Fish and Wildlife  
Bob Huber, ALCOA  
Bob Rose, Confederated Tribes and Bands of the Yakama Indian Nation  
Brad James, Washington Department of Fish and Wildlife  
Bryan Nordlund, National Marine Fisheries Service  
James Blanchard, US Bureau of Reclamation  
Jerry Marco, Confederated Tribe of the Colville Reservation  
Jim Harris, Washington State Parks  
Keith Vradenburg, City of Entiat  
Molly Hallock, Washington Department of Fish and Wildlife  
Pat Irle, Washington Department of Ecology  
Reed Glesne, National Park Service  
Steve Lewis, US Fish and Wildlife Service  
Susan Rosebrough, National Park Service  
Tony Eldred, Washington Department of Fish and Wildlife  
Patrick Verhey, Washington Department of Fish and Wildlife  
Steve Hays, Chelan County PUD  
Jeff Osborn, Chelan County PUD  
Steve Hemstrom, Chelan County PUD

From: Waikele Hampton, Environmental Permit Coordinator  
Public Utility District No. 1 of Chelan County (Chelan PUD)

Re: Rocky Reach Hydroelectric Project No. 2145  
License Article 402 - Operations Plan

Rocky Reach Fish Forum Representatives and Participants:

In accordance with Article 402, Chelan PUD invites comment letters on the attached initial draft Operations Plan. Please submit your comment letters on or before 5:00 p.m., June 25, 2009 to me via email at [waikele.hampton@chelanpud.org](mailto:waikele.hampton@chelanpud.org) or via fax to (509) 661-8203.

Pursuant to License Article 402, Chelan PUD will file the Operations Plan with FERC by August 14, 2009.

All received comment letters will be appended to the plan with a description of how each comment or recommendation was incorporated in the plan, or, if the licensee does not adopt a recommendation, the filing with

the FERC will include the licensee's reasons, based on project-specific information for not adopting such recommendation. A final draft of the Operations Plan will be available for your review on July 11.

If you have any questions, please do not hesitate to contact me.



**Request for Comment on Preliminary Draft  
Sent on June 18**

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY  
P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave.,  
Wenatchee, WA 98801  
(509) 663-8121 • Toll free 1-888-663-8121 • [www.chelanpud.org](http://www.chelanpud.org)

To: Carl Merkle, Confederated Tribes of the Umatilla Indian  
Reservation

From: Waikele Hampton, Environmental Permit Coordinator  
Public Utility District No. 1 of Chelan County (Chelan PUD)

Re: Rocky Reach Hydroelectric Project No. 2145  
License Article 402 - Operations Plan

Mr. Merkle:

In accordance with Article 402, Chelan PUD invites your comment on the attached **INITIAL DRAFT** Rocky Reach Operations Plan. Please submit your comment letter on or before 5:00 p.m., July 1, 2009 to me via email at [waikele.hampton@chelanpud.org](mailto:waikele.hampton@chelanpud.org) or via fax to (509) 661-8203. You will have another opportunity to review and comment on the **FINAL DRAFT** of the plan during the required 30-day comment period beginning July 11, after initial comments have been received and addressed.

All received comments will be appended to the plan with a description of how each comment or recommendation was incorporated in the plan, or, if the licensee does not adopt a recommendation, the filing with the FERC will include the licensee's reasons, based on project-specific information for not adopting such recommendation.

Pursuant to License Article 402, Chelan PUD will file the Operations Plan with FERC by August 14, 2009.

If you have any questions, please do not hesitate to contact me.

Thank you,  
Waikele Hampton

**Request for Comments on Final Draft  
Sent on July 10, 2009**

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY  
P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave.,  
Wenatchee, WA 98801  
(509) 663-8121 • Toll free 1-888-663-8121 • [www.chelanpud.org](http://www.chelanpud.org)

To: Phil Archibald, USDA Forest Service  
Art Viola, Washington Department of Fish and Wildlife  
Bob Huber, ALCOA  
Bob Rose, Confederated Tribes and Bands of the Yakama Indian Nation  
Brad James, Washington Department of Fish and Wildlife  
Bryan Nordlund, National Marine Fisheries Service  
James Blanchard, US Bureau of Reclamation  
Jerry Marco, Confederated Tribe of the Colville Reservation  
Jim Harris, Washington State Parks  
Keith Vradenburg, City of Entiat  
Molly Hallock, Washington Department of Fish and Wildlife  
Pat Irle, Washington Department of Ecology  
Reed Glesne, National Park Service  
Steve Lewis, US Fish and Wildlife Service  
Susan Rosebrough, National Park Service  
Tony Eldred, Washington Department of Fish and Wildlife  
Patrick Verhey, Washington Department of Fish and Wildlife  
Steve Hays, Chelan County PUD  
Jeff Osborn, Chelan County PUD  
Steve Hemstrom, Chelan County PUD  
Bill Tweit, Washington Department of Fish and Wildlife  
Mike Schiewe,  
Jim Craig, USDA Forest Service  
Steve Parker, Confederated Tribes and Bands of the Yakama Indian  
Nation  
Dennis Beich, Washington Department of Fish and Wildlife  
Lee Carlson, Confederated Tribes and Bands of the Yakama Indian  
Nation

From: Waikele Hampton, Environmental Permit Coordinator  
Public Utility District No. 1 of Chelan County (Chelan PUD)

Re: Rocky Reach Hydroelectric Project No. 2145  
License Article 402 - Operations Plan

Rocky Reach Fish Forum Representatives and Participants, and HCP-CC  
Members:

In accordance with Article 402, Chelan PUD invites comment letters on the  
linked FINAL Draft Operations Plan

[http://www.chelanpud.org/departments/licensingCompliance/rr\\_implementation/ResourceDocuments/Final%2032771.pdf](http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/Final%2032771.pdf).

Please submit your comment letters on or before 5:00 p.m., August 9, 2009 to me via email at [waikele.hampton@chelanpud.org](mailto:waikele.hampton@chelanpud.org) or via fax to (509) 661-8203.

Pursuant to License Article 402, Chelan PUD will file the Operations Plan with FERC by August 14, 2009.

All received comment letters will be appended to the final plan with a description of how each comment or recommendation was incorporated in the plan, or, if the licensee does not adopt a recommendation, the filing with the FERC will include the licensee's reasons, based on project-specific information for not adopting such recommendation.

HCP-CC Members - I am passing this along to you as part of the review process in coordination with the new Rocky Reach License.

If you have any questions, please do not hesitate to contact me.

**Request for Comments on Final Draft  
Sent on July 14, 2009**

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY  
P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave.,  
Wenatchee, WA 98801  
(509) 663-8121 • Toll free 1-888-663-8121 • [www.chelanpud.org](http://www.chelanpud.org)

To: Carl Merkle, Confederated Tribes of the Umatilla Indian  
Reservation

From: Waikele Hampton, Environmental Permit Coordinator  
Public Utility District No. 1 of Chelan County (Chelan PUD)

Re: Rocky Reach Hydroelectric Project No. 2145  
License Article 402 - Operations Plan

Mr. Merkle:

In accordance with Article 402, Chelan PUD invites comment letters on the  
linked FINAL Draft Operations Plan  
[http://www.chelanpud.org/departments/licensingCompliance/rr\\_implementation/ResourceDocuments/Final%2032771.pdf](http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/Final%2032771.pdf).

Please submit your comment letters on or before 5:00 p.m., August 9, 2009  
to me via email at [waikele.hampton@chelanpud.org](mailto:waikele.hampton@chelanpud.org) or via fax to (509) 661-  
8203.

Pursuant to License Article 402, Chelan PUD will file the Operations Plan  
with FERC by August 14, 2009.

All received comment letters will be appended to the final plan with a  
description of how each comment or recommendation was incorporated in the  
plan, or, if the licensee does not adopt a recommendation, the filing with  
the FERC will include the licensee's reasons, based on project-specific  
information for not adopting such recommendation.

If you have any questions, please do not hesitate to contact me.

## **Appendix F**

### **Consultation Comment Emails**

**Preliminary Draft:**

Comments on the preliminary draft were received from Washington State Department of Ecology; however, these were in the form of edits/comments made directly to the document in red-line format. The marked-up document has not been attached here, but comments and responses have been included in the summary table in Appendix G.

**Final Draft:**

Comments on the final draft were received from Washington State Department of Fish and Wildlife and U.S. Fish and Wildlife Service. Comment letters are included in this appendix.

State of Washington

Department of Fish and Wildlife  
3860 Chelan Highway 97-A  
Wenatchee, WA 98801

July 14, 2009

Waikele Hampton  
Environmental Coordinator  
Chelan County Public Utility District  
Wenatchee, WA 98807

Draft Rocky Reach Hydro Project Operations Plan

Dear Waikele:

I have reviewed the draft Rocky Reach Hydro Project No. 2145 Operations Plan (OP) required by New License Article 402, but not any of the accompanying extensive appendices. The changes I suggest are indicated by **bold** print.

Executive Summary, page ii, 2nd paragraph, 5<sup>th</sup> and 6<sup>th</sup> lines: "... turbine units 1 and 2 will operate at a soft-limit of 12 to 12.5 kcfs". Is this discharge amount for each individual unit or both units together? This should be clarified.

Page ii, 8<sup>th</sup> line: "This can be used as a tool to enhance adult fish passage at the left (**i.e., looking downstream**) powerhouse entrance as necessary".

Page ii, 4th paragraph: "Rocky Reach Dam normally provides spill for juvenile salmonid passage to cover 95% of the juvenile summer Chinook migration (insert **also see "CH-0", Table 3, page 10**) in accordance with the criteria ....".

Page ii, 4<sup>th</sup> paragraph: "Depending on annual survival study protocols, spill may also be provided to cover 95%" of the juvenile sockeye salmon migration (**also see "SOCK", Table 3, page 10**).

Introduction. Page 1, 2nd paragraph, 2nd sentence, 3rd line: "... The dam consists **of** a forebay wall, ....". This second sentence in the paragraph is *very* lengthy. I have heard such referred to as a "freight train sentence". It is unnecessarily long ... *nine* lines. Generally, a sentence should not be more than three lines in length. "Flow" and reader comprehension is enhanced when sentence length is controlled. When there are several discernable parts (such as successive, different or somewhat different thoughts) within a very lengthy sentence, then a semi-colon (;) or period (.) can be used to indicate a break between such parts, rather than a comma.

Page 1, 2nd paragraph, 9th line: "... each 125 feet high by 60 feet wide; **and** east bank seepage cutoff, ....". The "and" is necessary in this case to couple the last car to the train.

Page 1, 2nd paragraph, lines 12 through 22: It is recommended these 10 lines be broken into several discernable parts. It might be done as in the following manner.  
"... The upstream migrant fishway has three main entrances. **These are** located between spillway bays 8 and 9; at the center dam adjacent to powerhouse unit 11; and at the powerhouse service bay between turbine unit 1 and the west shoreline. **There are also** several submerged orifice entrances at each end of the powerhouse. Fish pass from the entrances into fish collection channels which converge to guide fish to a pool-and-weir fish ladder. **There is** a counting station at the fishway exit **located** near the west shoreline. Attraction water for the powerhouse fishway entrances is provided by three hydraulic turbine-driven pumps with a total capacity of 3,500 cfs. **A** gravity intake provides attraction water for the spillway entrance. The juvenile fish bypass (**JFB**) system includes a surface collection system; turbine intake screens and collection system for turbines 1 and 2; a bypass conduit to the tailrace; and a fish sampling facility".

Page 2, paragraph 1 (excluding the italicized *Operations Plan* quote from the New License), next to last line. "The RRF will be responsible for participating in **the development of** and implementing the Adaptive Management approach ....".

Page 2, paragraph 2, next to last sentence (following *O. kisutch*). "An HCP Coordinating Committee, consisting of one member from each of the signing **Parties**, ....".

### Page 5. 3. JUVENILE FISH BYPASS SYSTEM (JFB)

3.1 Facilities Description (3.1.1-3.1.4). The description of the JFB is very detailed and no doubt, very accurate. Reading it was also exhausting to this reviewer. The number of acronyms may be mind-numbing for readers not familiar with the system and could interfere with comprehension. I think some the potential comprehension- misery can be eliminated (or largely neutralized) by eliminating the acronyms and using the complete names of systems. Also, the written presentation (and reasonable reader assimilation of this material) deserves an accompanying good drawing which clearly illustrates how this system functions.

3.1.2 Page 6, Intake Screen System, 1<sup>st</sup> paragraph, lines 1 and 2: "... is through the turbine intakes for units C1 and C2". ("unit" should be plural).

Page 6, 2<sup>nd</sup> paragraph, line 2: "(VBS)" and "screens" should be transposed.



#### Operating Criteria and Protocol

3.2.2 Operation Procedures. Comment: “The JFB has been designed to provide fish guidance and bypass for river flows from 0 to 425 kcfs, over forebay elevations ranging from 703 to 707, and over tailwater elevations ranging from 612 to 636 feet”. Attaining the flexibility to be able to do this over such a wide range of river conditions must have been quite challenging design-wise. Is the conceptual JFB completed and operational? How long has the JFB been operating, in its present state of development,? How effective and reliable has the Juvenile fish Bypass System proven, and over how long a period? Providing safe passage of young anadromous fish past a large hydro dam is a matter of high-order responsibility for an operating entity. The development and operation of a seemingly successful and safe fish bypass system in a mainstem dam on a major stream is a notable achievement. For the benefit of the fisheries resource and other parties involved in this field, this achievement deserves a written, candid history of Chelan PUD’s agony and ecstasy experience in this endeavor.

#### 4. DESCRIPTION OF SPILLWAY OPERATING CRITERIA AND PROTOCOL

Page 9, Table 2, Spilling Schedule for Rocky Reach Dam: I suggest the “Total” column be labeled “Total feet open”.

#### 4.3 TDG Monitoring and Control

Page 11, 1<sup>st</sup> paragraph, hyphenate at line 10: “... when consistent with a department-approved gas abatement plan”.

Page and paragraph same as above, @ line 12: “... must not exceed an average of 120% as measured in the tailrace of **that same next dam downstream**”.

#### **REFERENCES, PAGE 15**

The “y” in Rocky (Reach) is omitted in the 2<sup>nd</sup> and 5<sup>th</sup> citations.

Yours truly,

Tony Eldred  
WDFW/Habitat Program/Major Projects Division

**Comment Email from U.S. Fish and Wildlife Service  
Dated July 20, 2009**

Hi Waikele-

Thanks for giving us the opportunity to comment on the Draft 2009 Rocky Reach Operations Plan. It is our understanding that Chelan PUD is soliciting comments on this document by August 124, 2009. Please realize that the Project has a new operating license with a duration of 43 years. As such, operations have the potential to change in order to adapt to changing resource management obligations. In that same vane, please consider the following comments in an effort to make a more complete document:

- ***Section 5.4 Dewatering and Fish Handling (page 14):*** This section makes no mention or criteria of how adult and juvenile will be released either above or below Rocky Reach Dam. We suggest adding a discussion within the context of this section to provide further clarity. For example, if an adult bull trout or sub-adult bull trout is salvaged in the fishway, who determines where this individual is released?
- ***Section 5.6 Maintenance (page 14):*** We do not believe this section fully reflects the operations that Chelan PUD conducts during its off-season fishway operations. For example, it is our understanding that Chelan PUD maintains at least one operational adult fishway for fish passage purposes in the event in the event that one of its adult fishway is dewatered for maintenance purposes. This section does not specify this action.
- ***Rocky Reach Dam 2009 Fish Spill Plan:*** Unless spelled out elsewhere in this document, we did not see a discussion of the phased survival standards in accordance with the Rocky Reach Habitat Conservation Plan for salmon and steelhead. We suggest inserting a chart into the document which specifies achievement/steady progress towards applicable salmon and steelhead survival standards.
- ***Non-Plan HCP Species:*** At this time, it appears that this document is focused on salmon and steelhead. We suggest providing a cross-walk in this document which discusses potential ladder modifications for the non-plan HCP species such as Pacific lamprey. It is our view that any modifications related to salmon and steelhead for this non-plan HCP species needs to be closely coordinated.
- ***Tumwater and Dryden Dams:*** Per the Rocky Reach license order, it is our understanding that Tumwater and Dryden dams are now part of the FERC accepted project boundary. We suggest inserting brief discussions of these projects' operations for the benefit of FERC.

If you need further clarification on this comments, do not hesitate to contact me.

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## **Appendix G**

### **Summary Table of Chelan PUD Responses to Agency Comments**

<b>Submitting Entity and Date Received</b>	<b>Section, Paragraph</b>	<b>Agency Comment</b>	<b>Chelan PUD Response</b>
WDOE 6/24/09	General	Suggested grammatical, formatting, etc revisions.	Thank you for the suggested changes. Chelan PUD has accepted all changes possible, based on other comments received from other reviewers.
	General	Suggestions for further details about various project components.	Detailed descriptions of the turbines, spillways, fishways, and juvenile fish bypass system are available in the Rocky Reach License Application.
	Executive Summary	“Chelan PUD will prioritize the dispatch of generating units to achieve peak plant operating efficiency as follows...” But not use this priory during non-fish spill? Why not?	This operation is carried out to promote fish passage, but cannot be carried out throughout the remainder of the year because it is necessary to run the units in such a way that they experience even use over the course of the year. Chelan PUD tries to ensure all units have equal time on-line each year.
	Executive Summary	“Spill levels and durations are correlated with Operational goals...” What is this? Can you explain it somewhere in this document?	Section 1.3 addresses this comment.
	List of Appendices	Suggestion to merge App B and App C into one.	Comment noted, but because the GAP (App C) has already been approved in the original form, the suggested change was not made in this Operations Plan. However, Chelan PUD will merge the two appendices in future annual submittals of the Operations Plan.
	Introduction	“We note that FERC mistakenly used “Department of Environmental Quality” rather than “Department of Ecology”.	Added “(sic, Washington State Department of Ecology)” following the reference to Department of Environmental Quality.
	Introduction	Comment regarding the consistent use of abbreviations.	The document has been reviewed for the use of abbreviations and, where necessary, changes were made for consistency.
	Introduction	Suggested language regarding operations of the project with respect to water quality.	Suggested language has been accepted.
	Introduction	“...Biological Opinion...” What is the status of this?	Language has been modified in response to comment.
	Table 1	Might be helpful to include flows in a forth column.	As a run-of-the-river project, Chelan PUD has no control over flow and there is no specified flow regime for these components.
	Section 1.3	“.....Plan Species affected by the Project on the schedule set out herein and to maintain the same for the duration of the Agreement.” Is the same agreement as identified above?	Language has been modified in response to comment.

	Section 2.	Suggestion to add more detail about the turbines (how many, how much water, etc).	Language has been modified in response to comment.
	Section 2.2	“Units 1 and 2 are important components of the JFB; long-term outages of the two units will be avoided during the juvenile passage season.” Could you explain in more detail?	Language has been modified in response to comment.
	Section 3.1	Above there is a statement that turbines 1 and 2 are also components of the JFB. Can you explain here as well?	Language has been modified in response to comment.
	Section 3.1.4	“....this flow is then dewatered to 4 cfs.” Sounds odd to me....How do you de-water water?	Language has been modified in response to comment.
	Section 3.2.2	Again, dewatering water seems odd to me.	Language has been modified in response to comment.
	Section 4	Suggestions to add another section for facility description.	Another section has not been added, but language has been added in response to comment.
	Section 4	“Spill gates are opened alternately in different amounts....” This is very unclear to me. What does this mean?	Language has been modified in response to comment.
	Section 4	“...the edges of which lead toward the adult fishway entrances...” Please explain more completely.	Language has been modified in response to comment.
	Section 4	“...is shown to be effective for juvenile passage.” What about TDG?	Language has been modified in response to comment.
	Section 4	“Based on the daily spill memo from the Spill Coordinator, the plant operators input into the system the volume of spill, begin time, and end time requested.” What time of day? How often are multiple memos issued?	Language has been modified in response to comment.
	Table 2	What drives which “schedule will be used? Can you explain it, at least in general terms? Can you cite the report that it is based on? Was TDG generation evaluated/addressed? Can you include approximate discharge and amount of TDG that would be generated? And, would “configuration” be a better term, rather than “schedule”?	There is only one schedule. The table represents the sequence in which gates are opened/closed as spill volume changes up or down. Modified language in the first paragraph of this section also addresses this comment. Chelan PUD uses the term schedule internally for this table so we have chosen to leave it as is.
	Section 4.1	How is TDG addressed in determining spill amounts or gate configuration?	Added a citation for report completed by Schneider and Wilhelms. Additionally added language in Section 4.3 to response to comment.
	Section 4.1	“Spill levels and durations are correlated with Operational goals for meeting...” Could you explain?	Language has been modified in response to comment.
	Section 4.1	Can we coordinate TDG measurements with flow and configuration?	Added a citation for report completed by Schneider and Wilhelms. Additionally added language in Section 4.3 to response to comment.

	Section 4.1	“Provisions for the spill...” Means what?	Language has been modified in response to comment.
	Table 3	Suggestion to add a key or spell out complete name.	Abbreviations have been replaced with full names.
	Suggested Section 4.3	Suggestion to add another section to address coordination of spills for fish and TDG.	Added language in Section 4.3 addressed this comment, but a new section has not been added.
	Original Section 4.3	“The hourly average data will also be forwarded to the US Army Corps of Engineers Reservoir Control Center (USACE-RCC) and posted at their site on the World Wide Web.” When is it forwarded and when is it posted?	Language has been modified in response to comments.
	Original Section 4.3	“...gate settings that have been shown to limit TDG production...” Could you describe more completely and include citations?	Citation has been added to address comment.
	Original Section 4.3	“...approved 2009 Gas Abatement Plan...” Please summarize the important conditions here.	Conditions can be found in Appendix C. Added a reference to Appendix C within the text of the paragraph.
	Section 5.1	“The system includes a pumped attraction water supply...” Do you need to address how this will be operated?	Language has been modified in response to comment. For further detail about this component, please refer to the Rocky Reach License.
	Section 5.1	Could you describe the orifice entrances and number?	Language has been modified in response to comment. For further detail about this component, please refer to the Rocky Reach License.
	Section 5.1	“...and a gravity auxiliary water supply.” Do you need to address how this will be operated?	Language has been modified in response to comment. For further detail about this component, please refer to the Rocky Reach License.
	Section 5.3	“Transportation channel...” Was this addressed above?	Revised language in Section 5.1 addresses this comment.
	Section 5.3	Did you mean to include the RPE?	Yes. It has been added.
	Section 5.3	Tailwater elevations...What happens between 615 and 620?	As stated previously in the section, the weir crest elevations will vary between 603.5 and 606.5 to maintain weir depth of 1.0 to 1.2 ft over the weirs.
	Section 5.3	Tailwater elevations... What happens between 621.5 and 625?	As stated previously in the section, the weir crest elevations will vary between 604.5 and 605.3 to maintain weir depth of 1.0 to 1.2 ft over the weirs.
	Appendices	Various comments related to appendices.	Comments within the appendices have been noted, but have not been addressed in this year’s Operations Plan, as the documents (as included in the original document) have

			already been finalized; and therefore, cannot be changed at this time. However, the suggested changes will be addressed in future annual Operations Plans.
<b>WDFW</b> 7/27/09	Executive Summary 2 <sup>nd</sup> Paragraph	"... turbine units 1 <u>and</u> 2 will operate at a soft-limit of 12 to 12.5 kcfs". Is this discharge amount for each individual unit or both units together? This should be clarified.	This discharge amount is for each unit and has been clarified in the document by adding the word "each" following kcfs.
	Executive Summary 2 <sup>nd</sup> Paragraph	"This can be used as a tool to enhance adult fish passage at the left ( <b>i.e., looking downstream</b> ) powerhouse entrance as necessary".	Suggested clarifying language has been added.
	Executive Summary 4 <sup>th</sup> Paragraph	"Rocky Reach Dam normally provides spill for juvenile salmonid passage to cover 95% of the juvenile summer Chinook migration (insert <b>also see "CH-0", Table 3, page 10</b> ) in accordance with the criteria ..."	Suggested language has been added.
	Executive Summary 4 <sup>th</sup> Paragraph	"Depending on annual survival study protocols, spill may also be provided to cover 95"% of the juvenile sockeye salmon migration ( <b>also see "SOCK", Table 3, page 10</b> ).	Suggested language has been added.
	Introduction 2 <sup>nd</sup> Paragraph	"... The dam consists <b>of</b> a forebay wall, ...". This second sentence in the paragraph is <i>very</i> lengthy. I have heard such referred to as a "freight train sentence". It is unnecessarily long ... <i>nine</i> lines. Generally, a sentence should not be more than three lines in length. "Flow" and reader comprehension is enhanced when sentence length is controlled. When there are several discernable parts (such as successive, different or somewhat different thoughts) within a very lengthy sentence, then a semi-colon (;) or period (.) can be used to indicate a break between such parts, rather than a comma.	The sentence has been replaced with a bullet list of dam components.
	Introduction 2 <sup>nd</sup> Paragraph	"... each 125 feet high by 60 feet wide; <b>and</b> east bank seepage cutoff..." The "and" is necessary in this case to couple the last car to the train.	"And" has been added.
	Introduction 2 <sup>nd</sup> Paragraph Lines 12-22	It is recommended these 10 lines be broken into several discernable parts. It might be done as in the following manner. "... The upstream migrant fishway has three main entrances. <b>These are</b> located between spillway bays 8 and 9; at the center dam adjacent to powerhouse unit 11; and at the powerhouse service bay between turbine unit 1 and the west shoreline. <b>There are also</b> several submerged orifice entrances at each end of the powerhouse. Fish pass from the entrances into fish collection channels which converge to	Suggested changes incorporated into the paragraph.



		guide fish to a pool-and-weir fish ladder. <b>There is</b> a counting station at the fishway exit <b>located</b> near the west shoreline. Attraction water for the powerhouse fishway entrances is provided by three hydraulic turbine-driven pumps with a total capacity of 3,500 cfs. <b>A</b> gravity intake provides attraction water for the spillway entrance. The juvenile fish bypass ( <b>JFB</b> ) system includes a surface collection system; turbine intake screens and collection system for turbines 1 and 2; a bypass conduit to the tailrace; and a fish sampling facility”.	
	Introduction 5 <sup>th</sup> Paragraph	“The RRFF will be responsible for participating in <b>the development of</b> and implementing the Adaptive Management approach ...”.	Suggested wording has been added.
	Introduction 6 <sup>th</sup> Paragraph	“An HCP Coordinating Committee, consisting of one member from each of the <b>signing Parties</b> ...”	Suggestion has been incorporated.
	Section 3.1	The description of the JFB is very detailed and no doubt, very accurate. Reading it was also exhausting to this reviewer. The number of acronyms may be mind-numbing for readers not familiar with the system and could interfere with comprehension. I think some the potential comprehension-misery can be eliminated (or largely neutralized) by eliminating the acronyms and using the complete names of systems. Also, the written presentation (and reasonable reader assimilation of this material) deserves an accompanying good drawing which clearly illustrates how this system functions.	Acronyms in this section have been eliminated, which is consistent with the License Application, License, and HCP. Juvenile Fish Bypass System has been shorted to “Bypass System” after the first mention of such.  Bypass System drawings meet the criteria for Critical Energy Infrastructure Information (CEII); therefore, Chelan PUD is not able to include any drawings of such in this Plan. Members of the public interested in requesting CEII classified materials may contact Chelan PUD’s public information officer for more information.
	Section 3.1.2	“... is through the turbine intakes for units C1 and C2”. (“unit” should be <u>plural</u> ).	Change made.
	Section 3.1.2	“(VBS)” and “screens” should be transposed.	Because acronyms have been eliminated, this is no longer an issue.
	Section 3.2.2	“The JFB has been designed to provide fish guidance and bypass for river flows from 0 to 425 kcfs, over forebay elevations ranging from 703 to 707, and over tailwater elevations ranging from 612 to 636 feet”. Attaining the flexibility to be able to do this over such a wide range of river conditions must have been quite challenging design-wise. Is the conceptual JFB completed and operational? How long has the JFB been operating, in its present state of development? How effective and reliable has the Juvenile fish Bypass System proven, and over how long a period?	A brief history of the Bypass System has been added to Section 3.

		Providing safe passage of young anadromous fish past a large hydro dam is a matter of high-order responsibility for an operating entity. The development and operation of a seemingly successful and safe fish bypass system in a mainstem dam on a major stream is a notable achievement. For the benefit of the fisheries resource and other parties involved in this field, this achievement deserves a written, candid history of Chelan PUD's agony and ecstasy experience in this endeavor.	
	Section 4 Table 2	Spilling Schedule for Rocky Reach Dam: I suggest the "Total" column be labeled "Total feet open".	"Total feet of gate open" has been added.
	Section 4.3 1 <sup>st</sup> Paragraph	"... when consistent with a department-approved gas abatement plan".	Change made.
	Section 4.3 1 <sup>st</sup> Paragraph	"... must not exceed an average of 120% as measured in the tailrace of <b>that same next dam downstream</b> ".	Language has been modified to be consistent with WAC 173-201A-200(1)(f).
	References	The "y" in Rocky (Reach) is omitted in the 2 <sup>nd</sup> and 5 <sup>th</sup> citations.	Corrections have been made.
<b>USFWS</b> 7/20/09	Section 5.4	This section makes no mention or criteria of how adult and juvenile will be released either above or below Rocky Reach Dam. We suggest adding a discussion within the context of this section to provide further clarity. For example, if an adult bull trout or sub-adult bull trout is salvaged in the fishway, who determines where this individual is released?	Language has been added to address this comment.
	Section 5.6	We do not believe this section fully reflects the operations that Chelan PUD conducts during its off-season fishway operations. For example, it is our understanding that Chelan PUD maintains at least one operational adult fishway for fish passage purposes in the event in the event that one of its adult fishway is dewatered for maintenance purposes. This section does not specify this action.	The District does indeed maintain at least one operational fishway at <b>Rock Island Dam</b> during the winter overhaul period. However, with the single fishway at Rocky Reach Dam, the District does not have that option at the Project during the overhaul period.
	Appendix A	Unless spelled out elsewhere in this document, we did not see a discussion of the phased survival standards in accordance with the Rocky Reach Habitat Conservation Plan for salmon and steelhead. We suggest inserting a chart into the document which specifies achievement/ steady progress towards applicable salmon and steelhead survival standards.	Comment noted. However, the suggested chart has not been added because the purpose of this plan is to summarize project operations related to fisheries and water quality. It is not intended to provide a review of the HCP itself or achievements/steady progress toward the applicable survival standards. A link to the HCP has been added to the Plan in Section 1.3 for readers who wish to learn more about the phased survival standards, etc. Information regarding achievements/steady progress toward the survival standards

			<p>can be found at the following link:  <a href="http://www.midcolumbiahcp.org/Coordinating/Annual%20Reports/Chelan%20PUD/2008/RR%20Annual%20report_2008.pdf">http://www.midcolumbiahcp.org/Coordinating/Annual%20Reports/Chelan%20PUD/2008/RR%20Annual%20report_2008.pdf</a></p>
	General comment	<p>At this time, it appears that this document is focused on salmon and steelhead. We suggest providing a cross-walk in this document which discusses potential ladder modifications for the non-plan HCP species such as Pacific lamprey. It is our view that any modifications related to salmon and steelhead for this non-plan HCP species needs to be closely coordinated.</p>	<p>Comment noted. Chelan PUD agrees that ladder modifications need to be included when the time is right; however, Chelan PUD has no plans to make any modifications to the ladders in 2009 (this plan is for 2009 operations only). As modifications to the adult fishway are developed by the RRRFF, the Operations Plan will be updated.</p>
	General comment	<p>Per the Rocky Reach license order, it is our understanding that Tumwater and Dryden dams are now part of the FERC accepted project boundary. We suggest inserting brief discussions of these projects' operations for the benefit of FERC.</p>	<p>Brief discussions of these projects have been added. Please note that only the fish ladder and trapping operations are included in the discussion, as those are the only aspects FERC included as project facilities in the license.</p>